




TORONTO'09

CORS-INFORMS International



Joint International Meeting
Canadian Operational Research Society
Institute for Operations Research & the Management Sciences

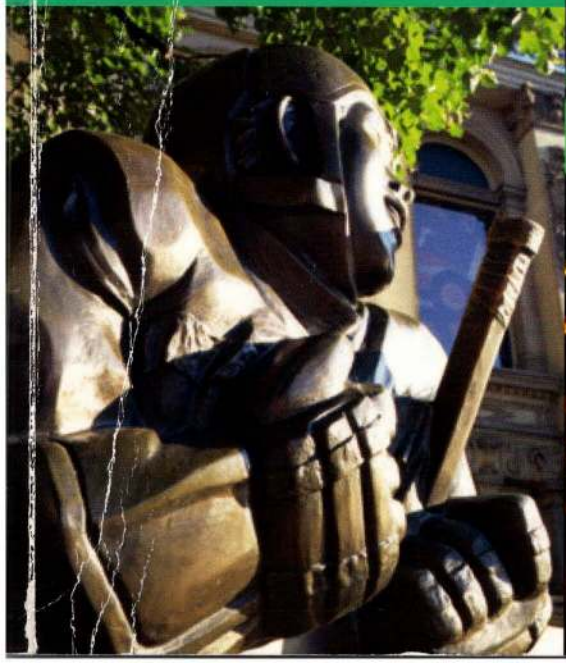


Canadian Operational Research Society
Société Canadienne de Recherche Opérationnelle

informatics

*Institute for Operations Research
and the Management Sciences*

June 14-17, 2009
Westin Harbour Castle
Toronto, Canada





TORONTO'09
CORS-INFORMS International

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Welcome from the General Chair

RYERSON
UNIVERSITY

DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING
FACULTY OF ENGINEERING, ARCHITECTURE AND SCIENCE

Dear Colleagues,

As conference General Chair, it is my great pleasure to welcome you to the CORS-INFORMS 2009 Joint International Meeting and to the city of Toronto, one of the most dynamic multicultural cities in the world. Toronto is a city with more than 100 cultures coming together to create unique cuisine, shopping and art you won't experience anywhere else.

This CORS-INFORMS joint international meeting includes plenaries by Steve Gallivan, Richard Karp and Gilbert Laporte, 15 tutorials, and about 900 papers in 126 contributed, 106 sponsored and 76 invited sessions. Moreover, the conference also has a number of CORS competitions (Student Paper, SIMUL8 Simulation, and Practice) and five software demo sessions.

I would like to take this opportunity to thank all of the authors for your contributions and participation. I would also like to thank the members of the Organizing Committee: Saeed Zolfaghari, Bernard Gendron, Richard Caron, Joseph Milner, Bjarni Kristjansson, Anne Robinson, Allen Holder, Vinh Quan and John Blake for their hard work in various aspects of organizing this meeting, as well as all of the cluster and session organizers for their contributions. This joint conference also features GDN 2009 as a meeting-within-a-meeting. I would like to acknowledge Marc Kilgour for his contribution in organizing GDN 2009.

While the academic program will offer the usual vigorous intellectual exchange, I hope that you will also enjoy the social program and take the opportunity to explore the city. The conference social program consists of a Welcome Reception on Sunday, June 14, and a General Reception at the Hockey Hall of Fame on Monday, June 15.

Finally, I would like to express my gratitude to INFORMS meetings staff (Terry Cryan, Paulette Bronis, Cheryl Clark, Sandy Owens, Jessica Bennett and Ellen Tralongo) and CORS staff (Wendy Caron), for their invaluable assistance in organizing the conference.

Welcome to Toronto and enjoy the conference and the city!



Liping Fang
General Chair

Mot de bienvenue du Président



DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING
FACULTY OF ENGINEERING, ARCHITECTURE AND SCIENCE

Chers collègues,

À titre de président général du congrès, j'ai l'immense plaisir de vous inviter au congrès conjoint international SCRO-INFORMS 2009 qui se tiendra à Toronto, l'une des villes multiculturelles les plus dynamiques du monde. À Toronto, le métissage de plus de cent cultures offre une diversité culinaire, commerciale et artistique que vous ne retrouverez nulle part ailleurs.

Le congrès conjoint international SCRO-INFORMS comprend des plénières de Steve Gallivan, Richard Karp et Gilbert Laporte, 15 exposés magistraux et quelque 900 communications présentées dans le cadre de 126 sessions libres, 106 sessions parrainées et 76 sessions invitées. De plus, la rencontre inclut divers concours de la SCRO (meilleur article par un étudiant, simulation SIMUL8 et concours sur la pratique) et cinq sessions de démonstration de logiciels.

J'aimerais profiter de cette occasion pour remercier tous les auteurs de leurs contributions et de leur participation. Je voudrais aussi témoigner ma reconnaissance aux membres du comité organisateur : Saeed Zolfaghari, Bernard Gendron, Richard Caron, Joseph Milner, Bjarni Kristjansson, Anne Robinson, Allen Holder, Vinh Quan et John Blake pour les efforts qu'ils ont consacrés aux divers aspects de l'organisation de cette rencontre ainsi qu'aux organisateurs des blocs et des sessions pour leur collaboration. Le congrès conjoint accueillera aussi le congrès satellite GDN 2009. J'aimerais souligner le travail de Marc Kilgour qui a organisé GDN 2009.

Comme toujours, le programme technique proposera des échanges intellectuels vigoureux, mais j'espère que vous apprécierez également le programme social et que vous en profiterez pour explorer la ville. Parmi les activités sociales prévues figurent la réception de bienvenue, le dimanche 14 juin, et une réception générale au Temple de la renommée du hockey, le lundi 15 juin.

En conclusion, j'aimerais exprimer toute ma gratitude à l'équipe d'INFORMS (Terry Cryan, Paulette Bronis, Cheryl Clark, Sandy Owens, Jessica Bennett et Ellen Tralongo) ainsi qu'au personnel de la SCRO (Wendy Caron) pour leur aide inestimable à l'organisation du congrès.

Bienvenue à Toronto et bon congrès!

Liping Fang
Président général

Program at a Glance

NOTE:

Technical sessions are held at the Westin Harbour Hotel. Check the Master Track Schedule on pages 116 & Inside Back Cover for specific room locations.

KEY

CC – Conference Centre, Westin: Levels 1 & 2
H – Westin Hotel: Lower Level, Main Lobby, Convention Level

MASTER TRACK SCHEDULE

Page 116 & and Inside Back Cover – a convenient summary showing the tracks, times and locations.

BADGES REQUIRED FOR TECHNICAL SESSIONS

CORS-INFORMS International 2009 badges must be worn to all sessions and events. Badges will be checked at the entrance to technical session rooms. Attendees without badges will be directed to the INFORMS registration desk to register and pick up their badges. All attendees, including speakers and session chairs, must register and pay the registration fee. Lost badges can be replaced at the registration desk.

COFFEE BREAKS

All coffee breaks take place in the Westin Conference Centre, Metro Grand East-Level 2.

Sunday

3:00pm-3:30pm

Monday

9:30am-10:00am

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3:00pm-3:30pm

Tuesday

9:30am-10:00am

3:00pm-3:30pm

Wednesday

9:30am-10:00am

SATURDAY, JUNE 13

4:00pm-7:00pm Registration Metro Grand East, CC-Level 2

SUNDAY, JUNE 14

7:00am-5:00pm Registration Metro Grand East, CC-Level 2
9:00am-3:30pm Exhibits Metro Grand East, CC-Level 2
10:00am-11:30am Technical Sessions (SB) Hotel & Conference Centre
11:30am-12:30pm Lunch Break (on your own)
12:30pm-2:00pm Technical Sessions (SC) Hotel & Conference Centre
2:10pm-3:00pm Omega Rho Lecture: Gilbert Laporte Metro Grand Centre, CC-Level 2
3:00pm-3:30pm Coffee Break Metro Grand East, CC-Level 2
3:30pm-5:00pm Technical Sessions (SD) Hotel & Conference Centre
5:30pm-6:30pm GDN Journal-Editorial Board Pier 4, H-Convention Level
6:30pm-8:00pm Welcome Reception Metro Grand Centre, CC-Level 2

MONDAY, JUNE 15

7:00am-5:00pm Registration Metro Grand East, CC-Level 2
9:00am-3:30pm Exhibits Metro Grand East, CC-Level 2
8:00am-9:30am Technical Sessions (MA) Hotel & Conference Centre
8:00am-9:30am CORS Student Paper Prize Bay Room, CC-Level 1
9:30am-10:00am Coffee Break Metro Grand East, CC-Level 2
10:00am-10:50am IFORS Lecture: Richard Karp Metro Grand Centre, CC-Level 2
11:00am-12:30pm Technical Sessions (MB) Hotel & Conference Centre
11:00am-12:30pm CORS Student Paper Prize Bay Room, CC-Level 1
12:30pm-1:30pm Lunch Break (on your own)
12:30pm-1:30pm CORS Council Meeting (by invitation) Dockside 8, H-Lower Level
1:30pm-3:00pm Technical Sessions (MC) Hotel & Conference Centre
1:30pm-3:00pm CORS SIMUL8 Competition Bay Room, CC-Level 1
3:00pm-3:30pm Coffee Break Metro Grand East, CC-Level 2
3:30pm-5:00pm Technical Sessions (MD) Hotel & Conference Centre
3:30pm-5:00pm CORS SIMUL8 Competition Bay Room, CC-Level 1
5:30pm-6:30pm Handbook of GDN Contributors Pier 4, H-Convention Level
5:30pm-6:30pm ISI-IEOR Business Meeting Pier 2, H-Convention Level
7:30pm-9:30pm General Reception Hockey Hall of Fame

Buses leave beginning at 7:15pm. Exit the main lobby of the hotel, go left and proceed to street level. Buses leave the reception beginning at 8:30pm, with the last bus leaving at 9:45pm. The Hockey Hall of Fame is an approximately ten-minute walk; see page 13 for walking directions.

Program at a Glance

TUESDAY, JUNE 16

7:00am-5:00pm	Registration	Metro Grand East, CC-Level 2
9:00am-3:30pm	Exhibits	Metro Grand East, CC-Level 2
8:00am-9:30am	Technical Sessions (TA)	Hotel & Conference Centre
8:00am-9:30am	CORS Practice Prize Final	Bay Room, CC-Level 1
9:30am-10:00am	Coffee Break	Metro Grand East, CC-Level 2
10:00am-10:50am	Harold Larnder Memorial Lecture: Steve Gallivan	Metro Grand Centre, CC-Level 2
11:00am-12:30pm	Technical Sessions (TB)	Hotel & Conference Centre
11:00am-12:30pm	CORS Practice Prize Final	Bay Room, CC-Level 1
12:30pm-1:30pm	Lunch Break (on your own)	
12:30pm-1:30pm	CORS Luncheon-Annual Meeting (CORS Members)	Harbour Salon B, H-Conv. Level
1:30pm-3:00pm	Technical Sessions (TC)	Hotel & Conference Centre
1:30pm-3:00pm	NSERC Information Session	Bay Room, CC-Level 1
3:00pm-3:30pm	Coffee Break	Metro Grand East, CC-Level 2
3:30pm-5:00pm	Technical Sessions (TD)	Hotel & Conference Centre
3:30pm-5:00pm	NSERC Grant Workshop	Bay Room, CC-Level 1
5:30pm-6:30pm	INFORMS GDN Section Meeting	Pier 4, H-Convention Level
7:00pm-10:00pm	CORS Awards Banquet (CORS Members)	Acqua Restaurant, 10 Front St. W.
7:30pm-9:30pm	GDN Banquet (GDN Registrants)	Harbour Salon B, H-Convention Level

WEDNESDAY, JUNE 17

7:00am-12:00pm	Registration	Metro Grand East, CC-Level 2
8:00am-9:30am	Technical Sessions (WA)	Hotel & Conference Centre
9:00am-11:30am	Exhibits	Metro Grand East, CC-Level 2
9:30am-10:00am	Coffee Break	Metro Grand East, CC-Level 2
10:00am-11:30am	Technical Sessions (WB)	Hotel & Conference Centre
11:30am-12:30pm	Lunch Break (on your own)	
11:30am-12:30pm	CORS Council Meeting (by invitation)	Dockside 8, H-Lower Level
12:30pm-2:00pm	Technical Sessions (WC)	Hotel & Conference Centre

WHERE TO GO FOR LUNCH?

Westin Harbour Castle

The Mizzen Restaurant
6:30am-9:30pm
Main lobby, à la carte dishes and buffet.

The Coffee Bar
6:30am-2:00pm
Main Lobby, take-out counter, lattes, bagels and more.

Toulà Restaurant & Bar
12:00pm-12:00am
Top of the South Tower, view of the city skyline, Italian cuisine.

Additional Nearby Restaurants Within Walking Distance

Alexandros Take-Out - 5 Queens Quay W.
Lunch daily, Greek cuisine, gyros, wraps.

Waterfront Deli - 12 Queens Quay W.
Lunch daily, deli sandwiches.

Captain John's - 1 Queens Quay W.
Lunch daily, Sunday lunch buffet, seafood.

Oyshi Sushi - 12 Queens Quay W.
Lunch Monday-Saturday.

Harbour Sports Grille - 10 Yonge St.
Lunch Monday-Friday, Italian and Asian.

Piazza Manna - 10 Bay St.
Lunch Monday-Friday Italian food.

CORS Functions



Canadian Operational Research Society
Société canadienne de recherche opérationnelle

This is the 51st conference of the Canadian Operational Research Society (CORS) and the following events are scheduled by CORS. Some of the events are open to all attendees of the conference.

CONFERENCE SESSIONS – OPEN TO ALL ATTENDEES

CORS Student Paper Prize Final

Monday, June 15, Bay Room, CC-Level 1

8:00am-9:30am, MA4

11:00am-12:30pm, MB4

The sessions feature finalists of the 2009 CORS student paper competition that recognizes the contribution of a paper either directly to the field of operational research through the development of methodology or to another field through the application of operational research. Prizes are awarded in two categories: Undergraduate and Open.

Third Annual CORS 2009 SIMUL8 Simulation Competition

Monday, June 15, Bay Room, CC-Level 1

1:30pm-3:00pm, MC4

3:30pm-5:00pm, MD4

In this annual simulation competition, teams of 2-4 students from the same university work on a simulation problem that can be solved using SIMUL8. Five finalist teams are selected to present their solutions and compete for the top three prizes.

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CORS Practice Prize Final

Tuesday, June 16, Bay Room, CC-Level 1

8:00am-9:30am, TA4

11:00am-12:30pm, TB4

Sessions feature the finalists of the 2009 CORS Practice Prize competition to recognize the challenging application of the OR approach to the solution of applied problems. The main criteria considered are project impact on the client organization, contribution to the practice of OR, quality of analysis, degree of challenge and quality of written and oral presentation. The presentations by the finalists are part of the competition. A jury selects the winner(s) after the sessions and the results are announced at the CORS Awards Banquet.

Harold Larnder Memorial Lecture

Tuesday, June 16, 10:00am-10:50am

Plenary Presentation - Metro Centre, CC-Level 2

This lecture is delivered by the winner of the Harold Larnder Prize, awarded annually to an individual who has achieved international distinction in operational research. Steve Gallivan will deliver this year's Harold Larnder Lecture. Harold Larnder was a well-known Canadian in wartime OR. He played a major part in the development of an effective, radar based, air defence system during the Battle of Britain. He returned to Canada in 1951 to join the Canadian Defence Research Board, and was President of CORS in 1966-67.

NSERC Information Session

Tuesday, June 16, 1:30pm-3:00pm, TC4

Bay Room, CC-Level 1

During this session, NSERC staff will provide information on the most recent federal budget and will give an update on the recent changes brought to the Discovery Grants Program. A description of the changes to the structure to be implemented for the 2010 competition will also be presented. NSERC will also present a report on the results of the most recent Discovery Grants competition. While the workshop will be most helpful to faculty members and senior doctoral students in Canadian universities, all researchers are welcome to attend.

NSERC Discovery Grant Program Workshop

Tuesday, June 16, 3:30pm-5:00pm, TD4

Bay Room, CC-Level 1

Michel Gendreau, a member of the NSERC Industrial Engineering Grant Selection Committee, will make a presentation to familiarize researchers with the peer review process and the way in which selection committees function. Advice will be given on how to prepare a Discovery Grant application. While the workshop will be most helpful to new faculty members and senior doctoral students in Canadian universities and those preparing applications this fall, all researchers are welcome to attend.

CORS MEMBERS-ONLY FUNCTIONS

CORS Luncheon & Annual General Meeting

Tuesday, June 16, 12:30pm-1:30pm

Harbour Salon B, H-Conv. Level

The CORS Annual General Meeting is open to all CORS members. It starts with lunch and concludes with a business meeting. CORS members will receive a ticket in their registration envelope.

CORS Awards Banquet

Tuesday, June 16, 7:00pm-10:00pm

Acqua Restaurant, 10 Front St. W.

The banquet will feature the presentation of the following prizes and awards: Student Paper Prize, SIMUL8 Simulation Competition, Service Awards, Omond Solandt Award, Award of Merit and Practice Prize. CORS non-student members will receive a ticket in their registration envelope. A limited number of tickets are available for guests at CAN\$60 – please go to the Registration Desk to purchase.

Directions to Acqua Restaurant: exit the Westin and turn right onto Queens Quay E. Walk about half a block and take a left onto Yonge Street. Walk up Yonge Street until you get to Front Street; turn left onto Front Street. The restaurant is immediately on your right, at 10 Front St. W.

CORS MEETINGS – BY INVITATION

CORS Council Meeting

Monday, June 15, 12:30pm-1:30pm

Dockside 8 – Westin, Lower Level

CORS Council Meeting

Wednesday, June 17, 11:30am-12:30pm

Dockside 8 – Westin, Lower Level



À l'occasion de son 51^e congrès, la Société canadienne de recherche opérationnelle (SCRO) a organisé les activités suivantes. Certaines d'entre elles sont ouvertes à tous les participants du congrès.

SESSIONS DU CONGRÈS – OUVERTES À TOUS

Finale du Concours du meilleur article par un étudiant de la SCRO

Lundi 15 juin, Bay Room, CC-Niveau 1
8 h-9 h 30, MA4
11 h-12 h 30, MB4

Ces sessions présentent les finalistes du Concours du meilleur article par un étudiant de la SCRO 2009 qui souligne la contribution d'un article, soit directement au domaine de la recherche opérationnelle par le développement d'une méthodologie, soit à une autre discipline par une application de recherche opérationnelle. Les prix sont décernés dans deux catégories : Niveau baccalauréat et Ouvert à tous.

Troisième concours annuel de simulation SIMUL8 SCRO 2009

Lundi 15 juin, Bay Room, CC-Niveau 1
13 h 30-15 h, MC4
15 h 30-17 h, MD4

Dans ce concours annuel de simulation, deux équipes de 2 à 4 étudiants de la même université travaillent à un problème de simulation qui peut être résolu à l'aide de SIMUL8. Cinq équipes finalistes sont sélectionnées pour présenter leurs solutions et se disputer trois grands prix.

Parrainée par VISUAL8 Corporation



Finale du Concours sur la pratique de la SCRO

Mardi 16 juin, Bay Room, CC-Niveau 1
8 h-9 h 30, TA4
11 h-12 h 30, TB4

Ces sessions présentent les finalistes du Concours sur la pratique de la SCRO 2009 qui vise à reconnaître l'excellente application de la méthode de la recherche opérationnelle à la résolution de problèmes pratiques. Les critères considérés lors de l'évaluation des soumissions sont l'impact du projet au sein de l'organisation-cliente, la contribution à la pratique de la recherche opérationnelle, la qualité de l'analyse, le niveau de difficulté du problème et la qualité des présentations écrites et orales du projet. Les présentations par les finalistes font partie intégrante du concours. Un jury sélectionne le ou

les lauréat(s) après les sessions et le résultat est annoncé dans le cadre du Banquet de remise des prix de la SCRO.

Conférence Harold Larnder

Mardi 16 juin, 10 h-10 h 50
Présentation de la plénière - Metro Grand, CC-Niveau 2
Cette conférence est donnée par le lauréat du Prix Harold Larnder, décerné tous les ans à une personne qui s'est distinguée à l'échelle internationale pour ses réalisations dans le domaine de la recherche opérationnelle. C'est Steve Gallivan qui prononcera cette année la Conférence Harold Larnder. Harold Larnder est un Canadien s'étant illustré par ses travaux en recherche opérationnelle durant la guerre. Il a joué un rôle clé dans la mise au point d'un système efficace de défense antiaérienne par radar durant la bataille d'Angleterre. M. Larnder est revenu au Canada en 1951 pour se joindre au Conseil de recherches pour la défense du Canada. Il a été président de la SCRO en 1966-1967.

Séance d'information du CRSNG

Mardi 16 juin, 13 h 30-15 h, TC4
Bay Room, CC-Niveau 1
Durant cette séance, le personnel du CRSNG donnera de l'information sur le dernier budget fédéral et fera le point sur les récents changements apportés au Programme de subventions à la découverte. On y décrira aussi les modifications de structure qui seront mises en œuvre pour le concours de 2010. Le CRSNG présentera aussi un rapport sur les résultats du plus récent concours du Programme des subventions à la découverte. Bien que cette session s'adresse plus particulièrement aux professeurs et aux étudiants au doctorat des universités canadiennes, tous les chercheurs sont invités à y assister.

Atelier du Programme de subventions à la découverte du CRSNG

Mardi 16 juin, 15 h 30-17 h, TD4
Bay Room, CC-Niveau 1
Michel Gendreau, membre du Comité de sélection des subventions en génie industriel du CRSNG, fera une présentation visant à familiariser les chercheurs avec le processus d'évaluation par les pairs et le fonctionnement des comités de sélection. Il donnera des conseils sur la préparation d'une demande de subvention à la découverte. Bien que l'atelier s'adresse plus particulièrement aux nouveaux professeurs et aux étudiants au doctorat des universités canadiennes, tous les chercheurs sont invités à y assister.

ACTIVITÉS RÉSERVÉES AUX MEMBRES DE LA SCRO

Assemblée générale annuelle-déjeuner de la SCRO

Mardi 16 juin, 12 h 30-13 h 30
Harbour Salon B, Niveau congrès-H
Tous les membres de la SCRO peuvent assister à l'assemblée générale annuelle de la Société. La rencontre commence par un déjeuner et se termine par une séance administrative. Les membres de la SCRO recevront un billet pour le déjeuner dans leur trousse d'inscription.

Banquet de remise des prix de la SCRO

Mardi 16 juin, 19 h-22 h
Restaurant Acqua, 10, rue Front Ouest
Les prix suivants seront remis dans le cadre du banquet : Concours du meilleur article par un étudiant, Concours de simulation SIMUL8, Prix de services, Prix Omond Solandt, Prix du mérite et Concours sur la pratique. Les membres non étudiants de la SCRO recevront un billet pour le banquet dans leur trousse d'inscription. Un nombre limité de billets au coût de 60 \$CAN sont disponibles pour les invités – pour en acheter, veuillez vous adresser au comptoir d'inscription.

Pour se rendre au restaurant Acqua : sortir du Westin et tourner à droite sur Queens Quay E. Marcher environ la moitié d'un pâté de maisons et tourner à gauche sur la rue Yonge jusqu'à la rue Front; tourner à gauche sur la rue Front. Le restaurant est immédiatement à droite, au 10, rue Front O.

RÉUNIONS DE LA SCRO – SUR INVITATION

Réunion du Conseil de la SCRO

Lundi 15 juin, 12 h 30-13 h 30
Dockside 8 – Westin, Niveau inférieur

Réunion du Conseil de la SCRO

Mercredi 17 juin, 11 h 30-12 h 30
Dockside 8 - Westin, Niveau inférieur

Group Decision & Negotiation 2009

GDN INTERNATIONAL MEETING ON GROUP DECISION AND NEGOTIATION

GDN 2009, the 10th annual meeting in the GDN sequence, is a meeting-within-a-meeting at CORS-INFORMS International. It is a joint conference of the INFORMS Section on Group Decision and Negotiation, the EURO Working Group on Decision and Negotiation Support, and the EURO Working Group on Decision Support Systems.

General Chair

Melvin F. Shakun, New York University
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Program Chair

D. Marc Kilgour
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mkilgour@wlu.ca

GDN 2009 TECHNICAL SESSIONS

Technical sessions are open to all attendees registered for the CORS-INFORMS meeting.

Sunday, June 14

10:00am-11:30am (SB12)

Pier 4, Hotel, Conv. Level

First Nations Negotiations in Canada: Action Research using ESD and Smartsettle

10:00am-11:30am (SB13)

Pier 5, Hotel, Conv. Level

Strategic Analysis of Brownfield Redevelopment Projects

12:30pm-2:00pm (SC12)

Pier 4, Hotel, Conv. Level

Perspectives on Electronic Negotiation Support

12:30pm-2:00pm (SC13)

Pier 5, Hotel, Conv. Level

Strategic Analysis of Group Decisions

3:30pm-5:00pm (SD12)

Pier 4, Hotel, Conv. Level

Negotiation Support and the Law

3:30pm-5:00pm (SD13)

Pier 5, Hotel, Conv. Level

E-Negotiation Simulation and Assessment

Monday, June 15

8:00am-9:30am (MA12)

Pier 4, Hotel, Conv. Level

Bidding and Bargaining in E-Market Systems

8:00am-9:30am (MA13)

Pier 5, Hotel, Conv. Level

Game Theory in Group Decision and Negotiation

11:00am - 12:30pm (MB12)

Pier 4, Hotel, Conv. Level

Collaborative Information Technologies

11:00am - 12:30pm (MB13)

Pier 5, Hotel, Conv. Level

Negotiation and Game Theory

1:30pm-3:00pm (MC12)

Pier 4, Hotel, Conv. Level

GDN Keynote Session I

3:30pm-5:00pm (MD12)

Pier 4, Hotel, Conv. Level

Tools for GDSS Facilitators

3:30pm-5:00pm (MD13)

Pier 5, Hotel, Conv. Level

Preference, Strategy and Consensus

Tuesday, June 16

8:00am-9:30am (TA12)

Pier 4, Hotel, Conv. Level

Collaboration Support for Requirements Engineering I

8:00am-9:30am (TA13)

Pier 5, Hotel, Conv. Level

Phased-Conflict Analysis Transformation and Resolution I

11:00am-12:30pm (TB12)

Pier 4, Hotel, Conv. Level

Collaboration Support for Requirements Engineering II

11:00am-12:30pm (TB13)

Pier 5, Hotel, Conv. Level

Phased-Conflict Analysis Transformation and Resolution II

1:30pm-3:00pm (TC12)

Pier 4, Hotel, Conv. Level

GDN Keynote Session II

3:30pm-5:00pm (TD12)

Pier 4, Hotel, Conv. Level

Panel Discussion: Finding Common Ground Through Negotiation Dialogue

3:30pm-5:00pm (TD13)

Pier 5, Hotel, Conv. Level

Preferences in Negotiations

Wednesday, June 17

8:00am-9:30am (WA12)

Pier 4, Hotel, Conv. Level

Negotiation Support and Applications

8:00am-9:30am (WA13)

Pier 5, Hotel, Conv. Level

Group Decisions and Coalitions

10:00am-11:30am (WB12)

Pier 4, Hotel, Conv. Level

Group Decision Models and the Strategic Problems of Organizations

10:00am-11:30am (WB13)

Pier 5, Hotel, Conv. Level

Community-Based Group Decision Systems: Methods and Issues

12:30pm-2:00pm (WC12)

Pier 4, Hotel, Conv. Level

Strategic Analysis in Systems Management

GDN MEETINGS & BANQUET

Group Decision and Negotiation Journal – Editorial Board

Sunday, June 14, 5:30pm-6:30pm

Pier 4, Hotel, Conv. Level

Handbook of Group Decision & Negotiation – Contributors Meeting

Monday, June 15, 5:30pm-6:30pm

Pier 4, Hotel, Conv. Level

INFORMS Section on Group Decision and Negotiation – Business Meeting

Tuesday, June 16, 5:30pm-6:30pm

Pier 4, Hotel, Conv. Level

GDN Banquet

Tuesday, June 16, 7:30pm-9:30pm

Harbour Salon B, Hotel, Conv. Level

The banquet is the major networking event for the 10th Annual Meeting on Group Decision and Negotiation. Join old friends and make new ones.

Open only to attendees who registered and paid for GDN 2009. A ticket for this banquet is included in your registration envelope. If you would like to purchase a ticket for the banquet, go to the Registration Desk: fee is \$110.



TORONTO'09
CORS-INFORMS International

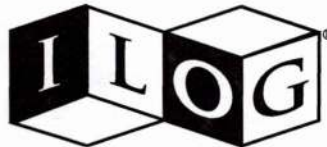
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Speaker Information

SPEAKER GUIDELINES

Audio-Visual Services

Every room will be equipped with an LCD projector. Please follow these guidelines to ensure a successful presentation using the LCD projector:

- Bring your laptop PC to your session. We supply the projector, but we DO NOT supply the computer.
- Bring your AC power adaptor with you. There will be convenient AC power in every session room.
- Arrive at your session at least 30 minutes before it begins. All presenters in a session should set up and test the connection to the projector before the session begins.
- Do NOT attempt to run your presentation off the laptop battery, no matter how trustworthy.
- Produce and bring overhead transparencies as a backup.

Speaker Ready Room

There will be a special Speaker Ready Room available in the Metro Grand East (Conference Centre-Level 2) during the meeting. You can stop by and practice connecting your laptop to the projector. We will also have quick instructions at each session room and technical assistance available for any problems.

Presentation Guidelines

The room and location of your session are listed in the Technical Sessions section and in the Master Track Schedule. Please be on time for your session and check in with the session chair. Presentations should be limited to key issues with a brief summary. Time your presentation to fit within your designated time span (determined by the number of speakers presenting in that session) and leave time for audience participation and questions. Bring copies of your paper or other handouts relating to your oral presentation to distribute to the audience. No proceedings are produced for this meeting. To obtain complete copies of any papers abstracted in the program, please contact the authors directly at the address supplied with each abstract.

For Questions about the Program: Program Information Desk

If you have general questions about the meeting and/or questions about your own presentation, stop at the Program Information Desk located in Metro Grand East. We ask Session Chairs to notify the Information Desk about any last-minute changes or cancellations; these changes will be posted outside the meeting rooms.

For Assistance During Your Session:

Session Monitor Desks

Session Monitor Desks are located in several areas (see hotel maps for specific locations). If you have a problem in your session room related to AV needs or any other requests, go to the Session Monitor Desk in the area to ask for assistance.

SESSION CHAIR GUIDELINES

The role of the Chair is to coordinate the smooth running of the session. The Chair:

- Begins and ends each session on time. Each session lasts 90 minutes, with the time per presentation determined by the number of papers in the session. Equal time should be given to each paper.
- Introduces each presentation (just the title of the paper and the name of the presenting author).
- Ensures that presentations are made in the order shown in the program. This allows for "session jumping." If a speaker cancels or does not attend, the original time schedule should be adhered to rather than sliding every talk forward.
- Completes the session attendance form (forms will be in the room).

REGISTRATION & GENERAL INFORMATION

Messages

The best way for people to reach you is to contact you directly at your hotel. Please leave your hotel phone number with your colleagues and family members. For urgent messages, call the Westin at 416-869-1600 and ask for the CORS-INFORMS Registration Desk. Registration staff will transcribe the message and post it on the message board located near registration. You can also contact colleagues attending the meeting using this message board. Please check the message board periodically to see if you have received a message.

Badges Required for Technical Sessions

CORS-INFORMS International 2009 badges must be worn to all sessions and events. Attendees without badges will be directed to the registration desk to register and pick up their badges. All attendees, including speakers and session chairs, must register and pay the registration fee.

Registration

Conference Bags sponsored by



Your registration fee includes admittance to the complete technical program and most special programs. The following social/food events are also included: Sunday evening Welcome Reception, Monday evening General Reception, and all morning and afternoon coffee breaks. No other meals are included.

Guest Registration

If your guest would like to accompany you to the major social events, you can purchase a guest registration (\$100) that covers admission to the Sunday Welcome Reception and Monday evening General Reception. Guests are not eligible to attend the technical sessions. Go to the registration desk to register your guest.

INTERNET ACCESS AND BUSINESS CENTRE

Wireless Internet will be available in the Exhibit area, Metro Grand East (Conference Centre-Level 2) during the meeting.

The Business Centre is located on the Lower Level of the Westin Harbour Castle. It is open 7 days a week, Monday-Friday 8:00am-7:30pm, Saturday and Sunday 9:00am-5:00pm. Westin guests may access the Internet computers on a 24-hour basis by using a guest room key card.

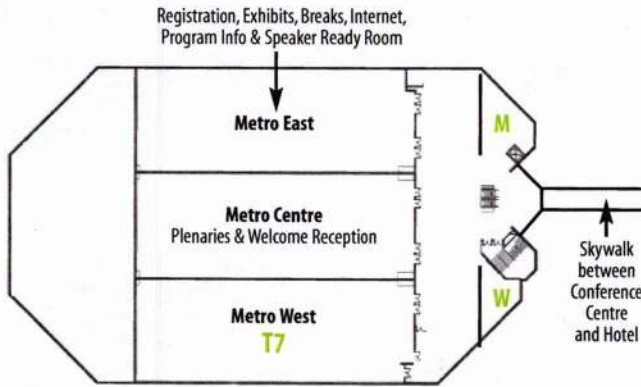
Hotel Floor Plans

Track numbers shown for Technical Session Rooms

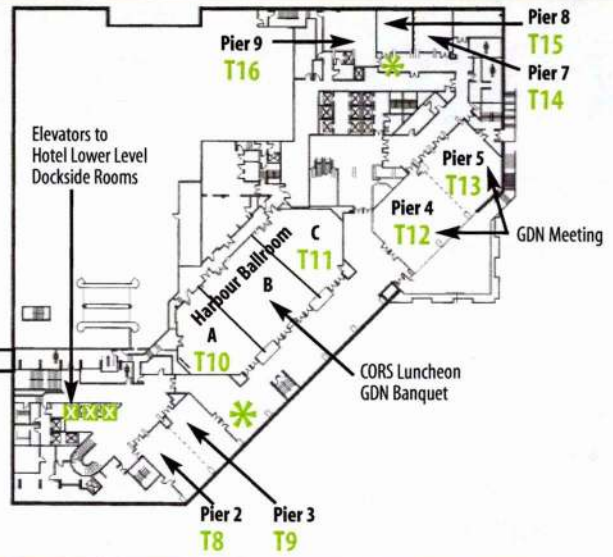
Westin Harbour Castle

CONFERENCE CENTRE-LEVEL 2

TRACKS
7-16



HOTEL-CONVENTION LEVEL



HOTEL-MAIN LOBBY LEVEL

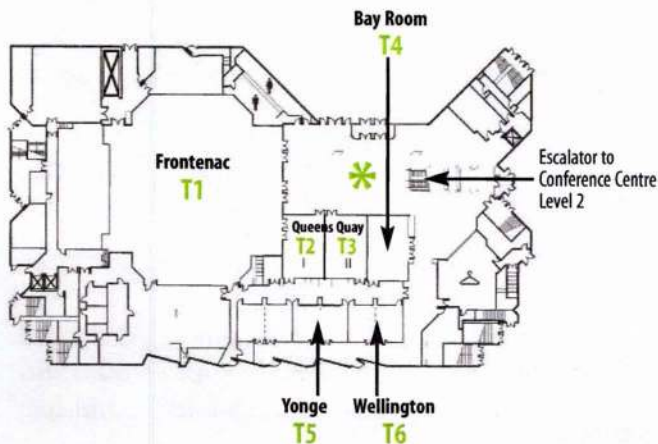
TRACK
17

* Session Monitor Desk

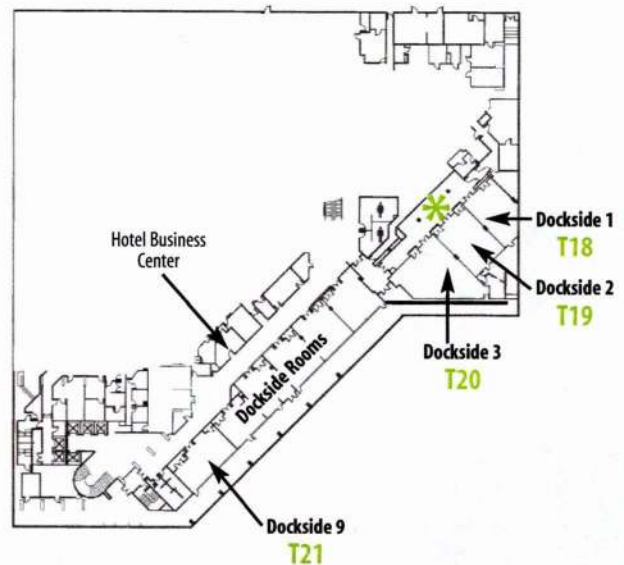


CONFERENCE CENTRE-LEVEL 1 / STREET LEVEL

TRACKS
1-6, 18-21



HOTEL-LOWER LEVEL



Social Events, Guest Program & Tours

SOCIAL EVENTS

Wear badge for admission to these Receptions.

Welcome Reception

Sunday, June 14, 6:30pm-8:00pm
Westin, Metro Grand Centre, CC-Level 2

CORS, INFORMS and the CORS-INFORMS International Organizing Committee welcome you to the meeting with an evening of fellowship and fun. Meet with colleagues and enjoy some great food. Soft drinks and water are complimentary, with a cash bar available for other beverages.

General Reception

Monday, June 15, 7:30pm-9:30pm
Hockey Hall of Fame

Buses depart from the Westin beginning at 7:15pm. Exit the main lobby of the hotel, go left and proceed to street level. Buses leave the reception beginning at 8:30pm, with the last bus leaving at 9:45pm.

Walking directions (approx. 12 minutes): exit the Westin and turn right onto Queens Quay E. Walk about half a block to Yonge Street. Walk up Yonge Street until you get to Front Street. The Hockey Hall of Fame is located at 30 Yonge Street at the corner of Yonge and Front.

The reception, the largest and most popular social event of the meeting, will be held at the Hockey Hall of Fame. Attendees will have exclusive access to the complete museum – over 57,000 square feet of interactive activities and hockey-related artifacts. You will be able to test your slap shot, touch the Stanley Cup and learn about the hockey greats that shaped Canada's favorite pastime. Enjoy networking with colleagues and all the fabulous exhibits of this unique museum. An adventurous variety of food will be served, including vegetarian-friendly Tex-Mex fajitas, mini-burgers, stir-fry, cheeses and finger desserts. Soft drinks and water are complimentary, with a cash bar available for other beverages.

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GUEST REGISTRATION

The Welcome Reception and General Reception are open to all registered attendees. If you have a guest who would like to accompany you, you can purchase a guest registration (\$100 US) that covers admission to both receptions. NOTE: guests are not eligible to attend the technical sessions. Go to the Registration Desk to purchase a guest registration.

CORS EVENTS

CORS Luncheon & Annual General Meeting (CORS Members)

Tuesday, June 16, 12:30pm-1:30pm
Harbour Salon B, H-Conv. Level
The CORS Annual General Meeting is open to all CORS members. It starts with lunch and concludes with a business meeting. CORS members will receive a ticket in their registration envelope

CORS Awards Banquet (CORS Members)

Tuesday, June 16, 7:00pm-10:00pm
Acqua Restaurant, 10 Front St. W.
The banquet will feature the presentation of the following prizes and awards: Student Paper Prize, SIMUL8 Simulation Competition, Service Awards, Omond Solandt Award, Award of Merit and Practice Prize. CORS non-student members will receive a ticket in their registration envelope. A limited number of tickets are available for guests at CAN\$60 – please go to the Registration Desk to purchase.

Directions to Acqua Restaurant: exit the Westin and turn right onto Queens Quay E. Walk about half a block and take a left onto Yonge Street. Walk up Yonge Street until you get to Front Street; turn left onto Front Street. The restaurant is immediately on your right, at 10 Front St. W.

GDN BANQUET

Group Decision & Negotiation Banquet

Tuesday, June 16, 7:30pm-9:30pm
Westin, Harbour Salon B-Convention Level
The banquet is the major networking event for the 10th Annual Meeting on Group Decision and Negotiation. Join old friends and make new ones.

Open only to attendees who registered and paid for GDN 2009. A ticket for this banquet is included in your registration envelope. If you would like to purchase a ticket for the banquet, go to the Registration Desk: fee is \$110 US.

TOURS

Buses will leave at the beginning time listed for each tour, and will return at the ending time listed. Exit the main lobby of the hotel and proceed to street level to board the bus.

You may still be able to register for these tours. Go to the Registration Desk for information on availability.

Niagara Falls – the 7th Wonder of the World

Sunday, June 14, 9:00am-4:00 pm
\$85 US (lunch included)
Our tour boat, the Maid of the Mist, takes you as close as possible to Niagara Falls. We will travel from the Canadian docks past the base of the American Falls, then into the basin of the Canadian Horseshoe Falls. After you disembark, proceed to Elements on the Falls, the closest restaurant to the falls, for a buffet lunch and another optimal view of Niagara. After lunch, the tour continues to Niagara-on-the-Lake, a town that features a historic fort site, marina and heritage shopping district.

Discover Toronto Tour

Tuesday, June 16, 9:00am-12:00pm
\$50 US (lunch not included)
Explore the shining skyscrapers of the financial district, the trendy fashion district, the world-class theatre district and Toronto's many diverse cultural neighborhoods. Many displays of artistic expression can be found in structures, historic buildings and museums throughout the city. Uncover the history of Canada's largest city, as you become part of the tales that have shaped its development.

Plenary Presentations

OMEGA RHO DISTINGUISHED LECTURE

Sunday, June 14, 2:10pm-3:00pm
Metro Grande Centre, Conference Centre-Level 2

Fifty Years of Vehicle Routing

Gilbert Laporte, Canada Research Chair in Distribution Management, HEC Montréal

In the vehicle routing problem (VRP), the aim is to design a set of m minimum cost vehicle routes through n customer locations, so that each route starts and ends at a common location and some side constraints are satisfied. Common applications arise in newspaper and food delivery, and in milk collection. The problem was introduced by Dantzig and Ramser (*Management Science*, 1959) under the name "The Truck Dispatching Problem." Since then, several exact and heuristic algorithms have been proposed for the VRP. To this day the VRP can be solved exactly for only relatively small instances. Heuristics remain the preferred solution methodology. In recent years several powerful metaheuristics have been designed for the VRP. In this talk I will survey the most important VRP algorithms developed over the past fifty years.



Gilbert Laporte obtained his PhD in operations research at the London School of Economics in 1975. He is Professor of Operations Research at HEC Montréal, Chairholder of the Canada Research Chair in Distribution Management, and adjunct Professor at Molde University College, the University of Bilkent, the University of Alberta and Université Laval. He is also a member of the Centre for Research on Transportation (serving as director from 1987-1991) and founding member of the Groupe d'études et de recherche en analyse des décisions (GERAD). He has authored or coauthored 15 books, as well as more than 300 scientific articles in combinatorial optimization, mostly in the areas of vehicle routing, location and timetabling. He has received many scientific awards including the Pergamon Prize (UK) in 1987, the 1994 Merit Award of the Canadian Operational Research Society, and the CORS Practice Prize on two occasions. In 1999, he obtained the ACFAS Jacques-Rousseau Prize for Interdisciplinarity, and the President's Medal (Operational Research Society, UK). In 2001, he was awarded the Pedagogy Prize by HEC Montréal. He has been a member of the Royal Society of Canada since 1998, and a Fellow of INFORMS since 2005. In 2007 he received the Innis-Gérin medal from the Royal Society of Canada.

OMEGA RHO

Omega Rho, the official Honor Society of INFORMS, was founded in 1976 to recognize superior scholarship and encourage leadership in operations research, management science and related disciplines. The society has 37 active collegiate chapters and more than 5,500 student and faculty members. It is a member of the Association of College Honor Societies. In addition to sponsoring Omega Rho Distinguished Lectures at INFORMS annual and international meetings, Omega Rho provides financial support to the annual INFORMS Colloquium and to its local chapters.

Honorary Membership in Omega Rho is bestowed upon individuals who provide leadership and extraordinary support for the encouragement of operations research and management science through their professional activities. Prior to delivering the 34th Omega Rho Distinguished Lecture, Gilbert Laporte will be inducted as the 42nd Honorary Member of Omega Rho.

IFORS DISTINGUISHED LECTURE

Monday, June 15, 10:00am-10:50am
Metro Grande Centre, Conference Centre-Level 2

Three Combinatorial Problems in Computational and Genomic Biology

Richard M. Karp, Professor, University of California at Berkeley;
Research Scientist, International Computer Science Institute, Berkeley

The quest to understand how living cells work requires the extraction of knowledge from large bodies of genomic and molecular data. This effort leads to large-scale combinatorial optimization problems that must be attacked by heuristic methods. We present such methods for three key problems: alignment of multiple genomes, discovery of functional protein modules from protein interaction data, and discovery of genetic interaction from natural genomic variation. This is joint work with colleagues at UC Berkeley, UC San Diego and Tel Aviv University.



Richard M. Karp received a PhD from Harvard University in 1959. From 1959 to 1968 he was a member of the Mathematical Sciences Department at IBM Research. From 1968 to 1994 and from 1999 to the present he has been a Professor at the University of California, Berkeley, where he held the Class of 1939 Chair and is currently a University Professor. From 1988 to 1995 and 1999 to the present, he has been a

Research Scientist at the International Computer Science Institute in Berkeley. From 1995 to 1999 he was a Professor at the University of Washington. His honors and awards include, among others, the U.S. National Medal of Science, Turing Award, Kyoto Prize, Fulkerson Prize, Harvey Prize (Technion), Centennial Medal (Harvard), Dickson Prize (Carnegie Mellon), Lanchester Prize, Von Neumann Theory Prize, Von Neumann Lectureship, Babbage Prize, EATCS Award, Miller Research Professor (Berkeley), and SIGACT Distinguished Service Award. Dr. Karp is a member of the U.S. National Academies of Sciences and Engineering, the American Philosophical Society, the French Academy of Sciences, and a Fellow of the American Academy of Arts and Sciences, the American Association for the Advancement of Science, the Association for Computing Machinery, INFORMS and SIAM.

Plenary Presentations

CORS HAROLD LARNDER MEMORIAL LECTURE

Tuesday, June 16, 10:00am-10:50am
Metro Grande Centre, Conference Centre-Level 2

You can't get there from here – reflections on an unlikely career in OR

Steve Gallivan, Professor, Clinical Operational Research Unit,
University College London

Those who have read my biographical summary will have noted a somewhat chaotic career path. As a poorly achieving schoolboy, I opted to specialize in mathematics, my worst subject in terms of exam grades. To the surprise of many, I was accepted to do an undergraduate degree in mathematics at University College London (UCL), followed by a pure mathematics PhD. Next, I turned my hand to research in a practical subject, applying computer methods to the design and control of road traffic systems. My career in health-related OR came about by having the good fortune to meet Ray Jackson in 1984, who convinced me to join him in the Clinical Operational Research Unit to apply OR to health care problems.

For many years, quantitative methods in clinical research were dominated by medical statistics. By the mid-1980s, applying OR was regarded as something of a novelty by most clinicians. As a result, there were plenty of opportunities for applying it to a broad range of health problems. My talk will concern examples to illustrate this. Such is the nature of OR, there have been opportunities to bring to health research methods from transport research and sometimes even from pure mathematics.



Steve Gallivan obtained a first class degree in mathematics from University College London (UCL) in 1971. As an undergraduate, he was fortunate to secure a job in a work-study department of a chain-making company, his first contact with OR. His PhD concerned generalizations of the mathematics underlying linear programming. Following this, he joined the UK's Transport and Road Research Laboratory, later moving to the Transport

Studies Group at UCL. He worked on a variety of problems associated with traffic signal system design and control. This practical work contributed to the development of methods that are used worldwide.

In 1985, Dr. Gallivan joined the newly formed Clinical Operational Research Unit (CORU) at UCL. He has worked on projects in a wide range of clinical areas, including cardiac surgery, cardiology, cancer, genetic screening, primary health care, and more. He has co-authored over 200 publications, including papers in pure mathematics, transport science and OR journals. The research for which he is most well known concerns the development of analytical methods for monitoring adverse clinical events, particularly post-operative deaths.

HAROLD LARNDER MEMORIAL LECTURE

This lecture is delivered by the winner of the Harold Larnder Prize, awarded annually to an individual who has achieved international distinction in OR. Harold Larnder was a well-known Canadian in wartime OR. He played a major part in the development of an effective, radar based, air defence system during the Battle of Britain. He returned to Canada in 1951 to join the Canadian Defence Research Board, and was President of CORS in 1966-67.

CORS & INFORMS Future Meetings

CORS

May 24-29, 2010
CORS 2010 Edmonton
Jointly held with MITACS
Conference Chair: Armann Ingolfsson
armann.ingolfsson@ualberta.ca

INFORMS

October 11-14, 2009
INFORMS Annual Meeting 2009 San Diego
San Diego Convention Center & Hilton San Diego
San Diego, California
Chair: Soheila Jorjani, CSU-San Marcos
<http://meetings.informs.org/SanDiego09>

April 18-20, 2010
INFORMS Practice Conference
Hilton Bonnet Creek Resort
Orlando, Florida
Chair: William Klimack, Decision Strategies, Inc.
bklimack@decisionstrategies.com

June 6-9, 2010
ALIO-INFORMS International
Law School, University of Buenos Aires
Buenos Aires, Argentina
Chair: Irene Loiseau, University of Buenos Aires
<http://meetings.informs.org/BuenosAires09>

November 7-10, 2010
INFORMS Annual Meeting 2010 Austin
Austin Convention Center & Hilton Austin
Austin, Texas
Chair: Jonathan Bard, University of Texas at Austin
jbard@mail.utexas.edu

November 13-16, 2011
INFORMS Annual Meeting 2011 Charlotte
Charlotte Convention Center
Charlotte, North Carolina
Chair: Cem Saydam, University of North Carolina at Charlotte
saydam@uncc.edu

October 14-17, 2012
INFORMS Annual Meeting 2012 Phoenix
Phoenix Convention Center
Phoenix, Arizona
Chair: Ronald Askin, Arizona State University
ron.askin@asu.edu

2012 - dates to be announced.
INFORMS International Beijing
In conjunction with the Operations Research Society of China
Beijing, China
Chair: Jian Chen, Tsinghua University
jchen@mail.tsinghua.edu.cn

IFORS

July 10-15, 2011
IFORS 2011
Melbourne Convention Centre
Melbourne Australia
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Buenos Aires

BUENOS

Association of Latin-Iberoamerican Operational Research Societies
Institute for Operations Research and the Management Sciences



2010

ALIO-INFORMS Joint International Meeting

June 6-9, 2010

**Law School, University of Buenos Aires
Buenos Aires, Argentina**

<http://meetings.informs.org/>
BuenosAires2010

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Teaching Effectiveness Colloquium

James Cochran, Louisiana State University, USA

Exhibits & Software Tutorials

Exhibit: Metro Grand East, Conf. Centre-Level 2.
Exhibit hours: Sun. – Tues., 9:00am-3:30pm,
Wed, 9:00am – 11:30am

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CORS takes a leadership role in the advancement of the theory and practice of Operational Research (OR) in Canada, and represents the Canadian OR community in the International Federation of Operational Research Societies (IFORS). The Society strives to meet its objectives through the publication of the Journal INFOR and a news Bulletin, the website, an annual National Conference, events organized by local sections, and the CORS Diploma.

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IFORS 2011

84 Queensbridge St.
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Australia
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IFORS 2011 is the Triennial Conference of the International Federation of Operational Research Societies that is being held in Melbourne in July 2011. We are here to talk to delegates at CORS-INFORMS to promote the IFORS conference, and to answer questions about the conference, the city of Melbourne and Australia.

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Maximal Software has decided to give away a FREE full-size development license of the MPL Modeling System to every registered participant at CORS-INFORMS! To sign up for your free copy, or just to find out why we are now giving away development copies of our MPL software, please visit us at our exhibit table, or attend either our Maximal Software tutorial session on Sunday at 3:30pm (SD17) or one of our regular talks during the meeting.

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SOFTWARE TUTORIALS

Regatta, Hotel-Main Level

Maximal Software, Inc. - Recent News and Trends in Optimization and Modeling

Sunday - SD17, 3:30pm-5:00pm

SAS - Operations Research with SAS: What's New, What's Next

Monday - MA17, 8:00am-9:30am

JMP Division-SAS - Introduction to JMP

Monday - MB17, 11:00am-12:30pm

ILOG, An IBM Company - What's New-IBM ILOG CPLEX®

Monday - MC17, 1:30pm-3:00pm

FICO - Building Optimization Applications in Xpress-MP

Monday - MD17, 3:30pm-5:00pm

SOFTWARE WORKSHOP

VISUAL8 Corporation

Wednesday - WC14, 12:30pm-2:00pm
Pier 7, Hotel-Convention Level

All tutorials take place in Metro Grand West, Conference Centre-Level 2.

SUNDAY

■ SB07

10:00am-11:30am

Exploring Best Practices in the Teaching of OR/MS

Jill Hardin, Virginia Commonwealth University

This tutorial explores pedagogical techniques in the teaching of operations research and management science. We begin with an overview of best practices presented in the OR/MS literature and place them in the context of the broader literature on teaching and learning. Discussion and examples of effectively implementing such practices in the OR/MS classroom follow and various resources will be presented.

■ SC07

12:30pm-2:00pm

An Introduction to Trajectory-Based Heuristics

Michel Gendreau, CIRRELT/Université de Montréal

We present an overview of the main heuristic methods that rely on the local search paradigm and follow a trajectory to explore the solution space of problems: classical local search, simulated annealing, tabu search, variable neighborhood descent, etc. Applications of these approaches in the fields of location and vehicle routing will also be presented and discussed.

■ SD07

3:30pm-5:00pm

Queuing Systems with Flexibility

Douglas Down, McMaster University

Queuing systems with flexible servers arise as models applicable to service and production systems with cross-trained workers, as well as in computer service provisioning. In this tutorial, planning (which servers should be capable of doing which tasks) and operational issues (where servers should be assigned in real-time) will be discussed. Important insights and methodologies will be highlighted as well as current open problems of interest.

MONDAY

■ MA07

8:00am-9:30am

OR Applications in Forestry

Taraneh Sowlati, University of British Columbia

The forest industry is one of the important sectors in many countries. Forests provide different types of products and services. Decision-making and planning in forestry covers a broad range of problems from strategic problems such as forest management to short-term operational problems such as log break down problem. Operations research methods have been widely used for planning and managing complex systems in forestry. This tutorial provides an overview of OR applications in forestry.

■ MB07

11:00am-12:30pm

Correcting the Foundations of OR

Jonathan Barzilai, Dalhousie University

Errors that require the attention of operations research teachers, practitioners, and theoreticians will be reviewed: utility theory includes an intrinsic contradiction; the characteristic function of game theory is ill-defined; in measurement theory the models of the most elementary variables are incorrect; in decision theory what is being measured is not understood; and there are other errors.

■ MC07

1:30pm-3:30pm

Data Envelopment Analysis for Policy Analysis and Managerial Benchmarking: Some Future Directions

Liam O'Neil, University of North Texas,

Dash Wu, University of Toronto

We consider recent advances in data envelopment analysis (DEA) for both policy analysis and managerial decision-making. We compare DEA with econometric techniques, such as stochastic frontier analysis (SFA). The bootstrap method is considered to increase the robustness of DEA results. Techniques are considered to increase model validity for both the input- and output-oriented models. Merger and dynamic DEA models are also presented.

■ MD07

3:30pm-5:00pm

Assessing Solution Quality in Stochastic Programs

David Morton, University of Texas at Austin

Assessing whether a solution is (near-) optimal is fundamental in optimization. We describe a simple sampling-based procedure for assessing the quality of a candidate solution to a stochastic program. The procedure is easy to implement and widely applicable. Our simplest procedure allows significant computational improvements, which we discuss. Motivating applications thread their way through the presentation, illustrating results from the procedures we describe.

TUESDAY

■ TA07

8:00am-9:30am

OR Challenges in Water Security Applications

William Hart and Jean-Paul Watson

Sandia National Laboratories

Reliable, clean water is critical for maintenance of public health, protection of public infrastructure and the operation of key industries. We describe a variety of OR challenges that have arisen when addressing water security challenges related to contamination threats. We will review this application area, describe OR models used to deploy water sensors that can minimize contamination risks, and highlight technical hurdles that remain in practical applications.

■ TB07

11:00am-12:30pm

Semidefinite Programming and Application to Hard Combinatorial Optimization Problems

Henry Wolkowicz, University of Waterloo

The interest in semidefinite programming, SDP, has grown tremendously during the last twenty years. This is partly due to the many diverse applications. This is a tutorial on the theory, algorithms, and applications for SDP. We emphasize the applications to solving hard combinatorial optimization problems, e.g. to: max-cut; quadratic assignment; graph partitioning; and ad-hoc sensor localization.

■ TC07

1:30pm-3:00pm

Optimization, Operations Research and the Engineering Sciences

Tamas Terlaky, Lehigh University

Mathematical, quantitative modeling of physical problems is in the core of engineering methodology. Let it be design, process or systems modeling, the models usually include parameters or system variables to optimize for performance, strength, cost of operation or other objectives. The need for powerful and easy-to-use optimization methodology is evident. On the other hand, optimization methods and tools have been developed by quantum steps in the last decades. Here we survey some notable successes, and review what optimization methods and tools enable us to optimize today in the area of engineering optimization that was not possible before the interior point revolution.

■ TD07

3:30pm-5:00pm

Numerical Inversion of Transforms Occurring in Queueing and Other Stochastic Processes

Mohan Chaudhry, Royal Military College of Canada

We consider the numerical inversion of three classes of GFs: classes of probability generating functions (PGFs) that are given in rational and non-rational forms, and a class of GFs that are not PGFs. Particular emphasis is on those PGFs that are not explicitly given but contain a number of unknowns. We show that the desired sequence can be obtained to any given accuracy, so long as enough numerical precision is used.

WEDNESDAY

■ WA07

8:00am-9:30am

Introduction to Radiotherapy Optimization

Dionne Aleman, University of Toronto

In this hands-on tutorial, the basics of radiation therapy treatment techniques will be discussed. Specifically, optimization methods for external beam radiotherapy will be presented. There are numerous competing theories on the appropriateness of various approaches of radiotherapy optimization in the literature, and the merits and difficulties of each approach will be examined. Participants will gain an understanding of a broad range of ideologies regarding radiotherapy optimization techniques.

■ WB07

10:00am-11:30am

The Formal Design of Modeling Languages for Mathematical Programming

Joseph Young, University of Bergen

We introduce the formal theory of modeling language design. The key to this approach lies in the development of rigorous mathematical semantics tailored specifically to mathematical programs. Based on this framework, we show how to use this methodology to insure the correctness of many advanced modeling features such as symbolic manipulation. Finally, we explain how to use this process to produce a clear blueprint for a language that can be rapidly implemented using readily available tools.

■ WC07

12:30pm-2:00pm

A Feasibility Model for Healthcare Resource Planning: Applications and Potential Future Research Opportunities

Murray Coté, University of Colorado Denver

Healthcare resource planning is the art and science of predicting the quantity and perhaps the specific attributes of the resources required to deliver healthcare (such as doctors, nurses, technicians, medical and clinical support staff, etc.) at specified levels of quality and cost. We will use a generic formulation of the resource planning problem with four basic constraint sets: 1) budget for resources, 2) desired customer service metric or performance measures, 3) bounds on the capacity variables, and 4) integrality of the capacity variables. The model allows for a compact representation of the resource-planning problem that encompasses all the essential complexities of a healthcare delivery system. It also is adaptive as it has both the budget and the customer service metrics or performance measure constraints. Third, the model is flexible as it can be easily modified to model a variety of resource planning problems. Real-world applications of this model will be presented and areas for future research will be discussed.

Invited & Sponsored Cluster Chairs

INVITED CLUSTER CHAIRS

Analyses for Geo-Strategic Challenges

Greg Parlier
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Competitions

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Design Optimization under Uncertainty

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Large Scale Optimization & Applications

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Optimization-Combinatorial Optimization

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Optimization-Metaheuristic

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Optimization-Mixed Integer Nonlinear Programming & Conic Optimization

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Optimization-Stochastic Programming

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SPONSORED CLUSTER CHAIRS

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How to Navigate the Technical Sessions

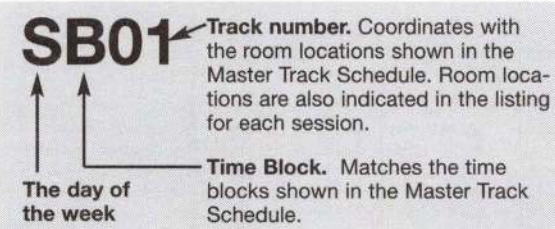
There are four primary resources to help you understand and navigate the Technical Sessions:

- This Technical Session listing, which provides the most detailed information. The listing is presented chronologically by day/time, showing each session and the papers/abstracts/authors within each session.
- The Session Chair, Author, and Session indices provide cross-reference assistance (pages 104-115).
- The floor plans on page 11 show you where technical session tracks are located.
- The Master Track Schedule is on page 116 and the inside back cover. This is an overview of the tracks (general topic areas) and when/where they are scheduled.

Quickest Way to Find Your Own Session

Use the Author Index (pages 106-111) — the session code for your presentation(s) will be shown along with the track number. You can also refer to the full session listing for the room location of your session(s).

The Session Codes



Time Blocks

Sunday

- B - 10:00am – 11:30am
- C - 12:30pm – 2:00pm
- D - 3:30pm – 5:00pm

Monday- Tuesday

- A - 8:00am – 9:30am
- B - 11:00am – 12:30pm
- C - 1:30pm – 3:00pm
- D - 3:30pm – 5:00pm

Wednesday

- A - 8:00am – 9:30am
- B - 10:00am – 11:30am
- C - 12:30pm – 2:00pm

Plenaries and lunch breaks are interspersed among the technical session time blocks.

Room Locations/Tracks

All tracks and technical sessions are held in the Westin Harbour Castle. Rooms are shown in the Master Track Schedule, technical session listing, and hotel floor plans.

Sunday, 10:00am - 11:30am

SB01

Frontenac - CC Lev. 1

Rich Vehicle Routing Problems

Sponsor: Transportation Science & Logistics

Sponsored Session

Chair: Teodor Gabriel Crainic, Department Management & Technology, ESG, UQAM, C.P. 8888, Succ. Centre-ville, Montreal, QC, H3C 3J7, Canada, theo@crt.umontreal.ca

Co-Chair: Michel Gendreau, CIRRELT/University of Montreal, C.P. 6128, Succ. Centre-ville, Montreal, QC, H3C 3J7, Canada, michel.gendreau@cirrelt.ca

1 - An ILP Program to Solve the Weekly Log-Truck Scheduling Problem

Nizar El Hachemi, PhD Student, Interuniversity Research Centre on Enterprise Networks, Logistics and Transportation (CIRRELT), C.P. 6128, Succursale Centre-ville, Montreal, H3C 3J7, Canada, nizar@crt.umontreal.ca, Issmail El Hallaoui, Louis-Martin Rousseau, Michel Gendreau

We present the LTSP integrating routing and scheduling of trucks. This problem includes aspects such as pick-up and delivery and multiple products. We propose a two-phase approach. In the first one, we solve an ILP program that determines the optimal destinations of the logs over a week while in the second one, we solve an ILP problem that ensures routing and scheduling of trucks in a daily basis. Almost all of the instances were solved within 2 minutes with less than 1% of gap.

2 - Routing City Freighters in Two-Tier City Logistics Systems

Yuvraj Gajpal, Post Doctoral Fellow, CIRRELT / UQAM, Pavillion Andre Aisenstadt Bureau 3520, 2920 Chemin de la Tour, Montreal, QC, H3T1J4, Canada, gajpaly@crt.umontreal.ca, Teodor Gabriel Crainic, Michel Gendreau

In two-tier City Logistics systems, two types of facilities are used to organize the distribution of goods to their ultimate destination: City Distribution Centers and satellite platforms. In this paper, we focus on the problem of routing "city freighters," the vehicles that move goods between satellites and final customers, which involves the combination of several routes from different satellites for each freighter. We propose decomposition-based heuristics to solve the problem.

3 - Multi-thread Cooperative Optimization for Rich VRP

Nadia Lahrichi, CIRRELT / Ecole des Sciences de la Gestion, UQAM, CP 8888, Succ. Centre-ville, Montreal, Canada, nadial@crt.umontreal.ca, Michel Gendreau, Walter Rei, Cerasela Crisan, Teodor Gabriel Crainic

In this paper, we address a rich VRP application, which considers basic duration and capacity constraints with additional dimensions such as time windows, multiple periods and multiple depots. We propose an effective solution approach based on a new multi-thread cooperative optimization framework that can simultaneously deal with multiple dimensions of a problem instead of the traditional methods that only address a few dimensions at a time.

4 - A Heuristic for the Pickup and Delivery TSP with LIFO Loading and Multiple Stacks

Michel Gendreau, CIRRELT/University of Montreal, C.P. 6128, Succ. Centre-ville, Montreal, QC, H3C 3J7, Canada, michel.gendreau@cirrelt.ca, Jean-Francois Coté, Jean-Yves Potvin

We propose an "Adaptive Large Neighborhood Search" heuristic for a routing problem in which a single vehicle must move objects subject to complex loading constraints. Each object is moved from a specified pickup point to a specified delivery location. Objects have a standard width and are placed in a given number of "stacks" in the vehicle. Computational results on special cases of the problem indicate that the proposed heuristic compares very favorably with existing ones for these cases.

SB02

Queens Quay I - CC Lev. 1

Combinatorial Optimization I

Contributed Session

Chair: Ruonan Zhang, Simon Fraser University, Department of Mathematics, SFU, 250-13450 102 Avenue, Surrey, BC, V3TOA3, Canada, rza1@sfu.ca

1 - A Lagrangian Relaxation Approach to Iterative Auctions for Procurement of Multiple Items

Bahareh Mansouri, McMaster University, 1280 Main St. W., Hamilton, ON, L8S 4K1, Canada, bahar.mansoori@yahoo.ca, Elkafi Hassini

Bidding on combinations of items in combinatorial auction brings in techniques from combinatorial optimization to answer the most fundamental question in economics: Who should get what goods and at what price. In this paper we design an iterative auction mechanism for procuring multiple items, give informative feedback at the end of each round, introduce an efficient method for incrementing the bids and also report on our computational study on the related integer programming problem.

2 - Coverage Models with Time Dependent Traveling Times

Verena Schmid, University of Vienna, Bruenner Strasse 72, Vienna, 1210, Austria, verena.schmid@univie.ac.at, Karl Doerner

For emergency service providers it is essential to locate and dispatch emergency vehicles while achieving adequate coverage. We extended the formulation of the double standard coverage model and emphasis locating more vehicles in densely populated areas. Furthermore we also take into account variations in travel times and reallocations. The goal of this approach is to ensure coverage all day long and keep reallocations at a decent level. The problem is solved using VNS.

3 - Construction of BIBDs Using MIP Solvers

Takeo Yamada, Professor, National Defense Academy, 1-10-20 Hashirimizu, Yokosuka, Ka, 239-8686, Japan, yamada@nda.ac.jp, Seiji Kataoka, Daisuke Yokoya

BIBD (balanced incomplete block design) is instrumental in design of experiments. This is usually constructed using algebraic approaches, but recently heuristic algorithms have also been tried. These include simulated annealing and local search methods. In this paper, we present a novel approach to construct BIBDs that makes use of MIP (mixed integer programming) solvers. Branch-and-bound and tabu search algorithms are given with some numerical experiments.

4 - Minimum Spanning Tree Problems with Conflict Constraints and Extensions

Ruonan Zhang, Simon Fraser University, Department of Mathematics, SFU, 250-13450 102 Avenue, Surrey, BC, V3TOA3, Canada, rza1@sfu.ca, Abraham Punnen, Santosh Kabadi

We consider the minimum spanning tree problem with conflict constraints. New polynomially solvable cases are identified and new complexity results are discussed. Also, efficient heuristic algorithms are developed for the problem and results of extensive computational experiments are reported. Finally several extensions of the problem and related algorithmic results are presented.

SB03

Queens Quay II - CC Lev. 1

Nonlinear Programming and Applications

Contributed Session

Chair: Yu-Ru Syau, Professor and Department Chair, National Formosa University, Department of Information Management, National Formosa University, Yunlin, 63201, Taiwan - ROC, yrsyau@nfu.edu.tw

1 - A Global Optimization Approach for Nonlinear Separation of Two Types of Data

Kwangsoo Kim, Korea University, 1, 5-Ka, Anam-Dong, Seongbuk-Ku, Seoul, Korea, Republic of, kksoo@korea.ac.kr

Abstract not available at this time.

2 - Scalarization Functions and Applications

Christiane Tammer, Professor, Martin-Luther-University Halle-Wittenberg, Theodor-Lieser-Str. 5, Halle, Germany, christiane.tammer@mathematik.uni-halle.de, Constantin Zalinescu

Scalarization functions were used in vector optimization for a long period. Similar functions were introduced and used in economics under the name of shortage function or in mathematical finance under the name of (convex or coherent) measures of risk. The main aim of this talk is to study algebraic and topological properties of such functions and to give some applications in vector optimization and mathematical finance.

3 - Optimal Waterflooding of Large Oil Reservoirs

Leon Lasdon, Professor, IROM Department, McCombs Business School, University of Texas, Austin, TX, 78731, United States of America, lasdon@mail.utexas.edu

A multiperiod NLP model used in optimal waterflooding of mature reservoirs has water injection rates into each injector as controls and oil production from each producer as outputs. We describe this model and its applications.

4 - E-B-Vex and E-B-Preivex Functions

Yu-Ru Syau, Professor and Department Chair, National Formosa University, Department of Information Management, National Formosa University, Yunlin, 63201, Taiwan - ROC, yrsyau@nfu.edu.tw, E. Stanley Lee, Lixing Jia

A class of functions called E-B-vex functions is defined as a generalization of E-convex and B-vex functions. Similarly, a class of E-B-preivex functions which are generalizations of preinvex and B-vex functions is introduced. Some properties of these classes are studied.

SB04

Bay Room - CC Lev. 1

Various Applications

Cluster: Optimization/Mixed Integer Nonlinear Programming and Conic Optimization
Invited Session

Chair: Imre Polik, Visiting Assistant Professor, Lehigh University, Department of Industrial and Systems Engineering, 200 West Packer Avenue, Bethlehem, PA, 18015, United States of America, imre.polik@gmail.com

1 - Ky Fan Convexity: Strong Duality and Application

Jiaping Zhu, PhD Student, McMaster University, 1280 Main St W, Hamilton, ON, L8S 4K1, Canada, zhujp102@gmail.com, Tamas Terlaky

We investigate the close relation of Ky Fan convexity and the so-called time-sharing property which is first studied by Yu and Lui in 2006, and present the first application of Ky Fan convex optimization problem. Then we study the convexity of the perturbation function of Ky Fan convex optimization problem and give a short and rigorous proof of the strong duality theorem of it.

2 - On the Discretize then Optimize Approach

Kimia Ghobadi, PhD Student, McMaster University, 1280 Main St W, Hamilton, ON, L8S 4K1, Canada, kimia.ghobadi@gmail.com, Tamas Terlaky, Ned Nedialkov

The "discretize then optimize" approach can be applied to PDE-based optimization problems. In this approach, the original continuous problem is discretized into a standard, but larger optimization problem. This technique is flexible to new/modified constraints and objective functions. Although, the challenge lies in the size and the stability of the discretized problem.

3 - Improving Solver Performance by Optimal Parameter Tuning

Imre Polik, Visiting Assistant Professor, Lehigh University, Department of Industrial and Systems Engineering, 200 West Packer Avenue, Bethlehem, PA, 18015, United States of America, imre.polik@gmail.com

Most optimization solvers use a default set of parameters. If a solver fails on a problem, it rarely tries again automatically with a new set of parameters. Even though changing only one parameter would make the solver succeed. We present techniques to tune the parameters both before and during the course of the algorithm. The methods are illustrated with the symmetric cone optimization solver SeDuMi. The approaches include global optimization, reinforcement learning and statistical analysis.

SB05

Yonge - CC Lev. 1

Airline Applications: Sloan Session I

Sponsor: Aviation Applications

Sponsored Session

Chair: Amy Cohn, University of Michigan, Ind & Operations Engineer, 1205 Beal Ave, Ann Arbor, MI, 48109, United States of America, amycohn@umich.edu

1 - Building Lines of Flight for Improved Maintenance Robustness

Amy Cohn, University of Michigan, Ind & Operations Engineer, 1205 Beal Ave, Ann Arbor, MI, 48109, United States of America, amycohn@umich.edu, Marcial Lapp, Alex Heinold

Airlines build lines-of-flight that dictate the sequence of flights an individual aircraft will fly over the course of a day. Lines-of-flight that terminate at a maintenance facility provide greater opportunity for recovering from unexpected maintenance requirements. We present methods for modifying existing lines-of-flight to create lines with an increased probability of being able to overnight at a maintenance station if needed.

2 - Stochastic Scheduling of Runway Operations

Senay Solak, University of Massachusetts, Isenberg School of Management, Amherst, MA, 01003, United States of America, solak@som.umass.edu, John-Paul Clarke, Gustaf Solveling, Ellis Johnson

Scheduling of arrival and departure operations is an important problem for effective capacity utilization at airports. Although deterministic sequencing models have been proposed for this problem, the uncertainty in the scheduled operation completion times, such as touch-down and push-back times, so far has not been considered. To remedy this shortcoming, we develop a stochastic model for this problem, and then investigate the value of a stochastic approach for runway operations scheduling.

3 - The Static Stochastic Ground Holding Problem with Demand Uncertainty

Thomas Vossen, University of Colorado, UCB0419, Boulder, CO, 80309, United States of America, Vossen@Colorado.EDU

A key problem when implementing Ground Delay Programs is the allocation of ground holding. There is a considerable amount of work in this area, which primarily considers the impact of uncertainty in airport capacities. Here, however, we focus on demand uncertainty, that is, uncertainties concerning aircraft arrival times. We present procedures to determine optimal ground holding levels when demand uncertainty is present, and investigate the potential of efforts to reduce demand uncertainty.

SB06

Wellington - CC Lev. 1

Process and Capacity Planning

Contributed Session

Chair: Ahmed Azab, Assistant Professor, University of Windsor, 401 Sunset Ave., Windsor, ON, N9B3P4, Canada, azab@uwindsor.ca

1 - Capacity Planning Method Selection Model

Amir Azizi, PhD Research Fellow, Science University of Malaysia (USM), Engineering Campus, Engineering Campus, Nibong Tebal, 14300, Malaysia, amirazizi@gmail.com

A method that is able to update current information based on the actual situation is necessary for capacity planning. The interests of this article are; to (1) identify capacity planning problems, (2) determine capacity planning methods, (3) classify the existing methods with respect to their advantages and disadvantages, (4) determine considerable and significant criteria in capacity planning, and (5) evaluate the applied methods with respect to the criteria using analytic hierarchy process.

2 - A Supplier's "Optimal" Quantity-Discount Schedule

Ginger Yi Ke, PhD Student, University of Waterloo, Department of Management Sciences, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, y3ke@uwaterloo.ca, Jim Bookbinder

The supplier's optimal quantity discount problem is investigated from the perspective of game theory, both noncooperative and cooperative. Taking into account the price elasticity of demand, this analysis aids a sole supplier in developing a discrete all-unit quantity discount policy for a single-buyer distribution channel. The proposed models are discussed in detail and compared to previous works. Following numerical studies, we conclude with some remarks and suggestions for future research.

3 - Evaluating Bucket Brigades in Nonlinear Storage Profiles

Yeming Gong, RSM, Erasmus University, Burg. Oudlaan 50, Rotterdam, Netherlands, ygong@rsm.nl, Donald Eisenstein

This paper gives closed-form analytic expressions for the main performance measure of bucket brigades models in order picking systems, and compare the performances in different storage profiles. We further compare them with zone order picking systems and identify different advantages.

4 - Mathematical Programming for Process Planning

Ahmed Azab, Assistant Professor, University of Windsor, 401 Sunset Ave., Windsor, ON, N9B3P4, Canada, azab@uwindsor.ca

Current approaches for process planning do not satisfactorily support current advances and evolution of manufacturing systems and product families. A semi-generative process planning system is developed, where at the core a model based on a QAP formulation is solved. The proposed model overcomes the complexity of the subtour elimination constraint in TSP and mathematically formulates the precedence constraints, which are a corner stone of the process planning problem.

SB07

Metro Grand West - CC Lev. 2

Tutorial: Exploring Best Practices in the Teaching of OR/MS

Cluster: Tutorials
Invited Session

Chair: Jill Hardin, Virginia Commonwealth University, 1001 W. Main Street, P.O. Box 843083, Richmond, VA, 23284-3083, United States of America, jrhardin@vcu.edu

1 - Exploring Best Practices in the Teaching of OR/MS

Jill Hardin, Virginia Commonwealth University, 1001 W. Main Street, P.O. Box 843083, Richmond, VA, 23284-3083, United States of America, jrhardin@vcu.edu

This tutorial explores pedagogical techniques in the teaching of operations research and management science. We begin with an overview of best practices presented in the OR/MS literature, and place them in the context of the broader literature on teaching and learning. Discussion and examples of effectively implementing such practices in the OR/MS classroom follow, and various resources will be presented.

SB08

Pier 2 - H Conv. Lev.

Emergent Care Operations

Contributed Session

Chair: Mohan Gopalakrishnan, Associate Professor, Arizona State University, Supply Chain Management, WPC Sch. of Bus., P.O. Box # 37100, Phoenix, AZ, 85069-7100, United States of America, mohan@asu.edu

1 - Dynamic Surgical Smoothing: Generating Meaningful Short-term Forecasts of Surgical Bed Requirements

Jason Goto, AnalysisWorks Inc, 1385 West 8th Ave, Suite 650, Vancouver, BC, V6H3V9, Canada, jgoto@analysisworks.net

The concept of surgical smoothing on inpatient beds has attracted much interest in health care, however a key challenge remains in translating the concept into practice in a meaningful way. We developed a purpose-built simulation engine that develops short-term forecasts of surgical bed requirements that combines the historical patterns with the planned surgical slate. This presentation outlines the model, and how it is used for operational decision-making.

2 - Systems Engineering Opportunities to Improve Traumatic Brain Injury Military Healthcare Processes

Hande Musdal, Northeastern University, 334 Snell Engineering Center, Boston, MA, 02115, United States of America, hande.musdal@gmail.com, James Benneyan

Traumatic brain injury (TBI) has been described as the signature injury and silent epidemic of the Afghanistan and Iraq wars, estimated to affect 19.6% of U.S. servicemen at a cost exceeding \$1 billion. The potential and need to optimize these processes is significant. We outline several operations research modeling opportunities to improve the military's TBI screening, detection, treatment, resource, capacity, and location planning processes, and discuss current progress towards these models.

3 - Locating Automated External Defibrillators in a University Community

Danny Myers, Bowling Green State University, Department of Applied Statistics and OR, Bowling Green, OH, 43403, United States of America, myers@bgsu.edu, Manoj Mohite

Automated external defibrillators (AEDs) use smart technology to determine whether a victim of cardiac arrest requires defibrillation and will deliver a shock only if one is needed. These portable devices are becoming increasingly more available in such places as airports and shopping malls. We report on a model for determining appropriate locations for AEDs in a university community. Also, we describe difficulties encountered when attempting to implement the results obtained from the model.

4 - Emergency Department Experiences of Senior Fallers: An Operations Research Analysis

John Woolcott, University of British Columbia, 716-828 West 10th Avenue, Vancouver, BC, V5Z 1L8, Canada, woolcott@interchange.ubc.ca, Riyadh Abu Laban, Karim Khan, Bonnie Lillies, Boris Sobolev, Carlo Marra

Data were collected on 100 fall related ED presentations. During their ED visit, 86 participants received x-ray or CT-scan and 67 had laboratory tests completed. During their time in the ED, 32 participants received physiotherapy assessment and 44 were seen by nurses specifically trained to care for seniors. The recommended wait time to see a physician and the total time in the ED were exceeded for 70 and 60 participants respectively.

5 - ED Crowding, Modeling and Analysis

Mohan Gopalakrishnan, Associate Professor, Arizona State University, Supply Chain Management, WPC Sch. of Bus, P.O. Box # 37100, Phoenix, AZ, 85069-7100, United States of America, mohan@asu.edu, Qing Li, Srimathy Mohan

This presentation focuses on emergency department crowding problem in a US hospital. ED crowding is a crisis that results from the practice of "boarding," or holding, emergency patients who have been admitted to the hospital in the emergency department. Throughput, bed availability, delays and staffing shortages are some of the critical factors. We develop a modeling framework to analyze these issues and suggest ways to improve the efficiency of the system to minimize the problem.

SB09

Pier 3 - H Conv. Lev.

Decentralized Supply Chains

Contributed Session

Chair: Salma Karray, Assistant Professor, UOIT, 2000 Simcoe Street North, Oshawa, Canada, salma.karray@uoit.ca

1 - Sampling Plans for Acceptance in a Supply Chain Model Based on the Bayesian Theory Following Economic Criteria

Rodrigo Barbosa Correa, Director Operations Research, Universidad del Norte, Barranquilla, Colombia, rbarbosa@uninorte.edu.co

In the industry, reducing inspection costs is not useless and contributes to the final price of the product satisfying both business and customer. In this investigation, a supply chain model is proposed, where the buying-selling relationship of both client and supplier are shown and sampling plans are designed using Bayesian schemes, both for acceptance of the final product by the client and for dispatching of goods by the supplier, where the total average costs per unit produced are calculated.

2 - The Effects of the Source of Policy Deviations in a Decentralized Supply Chain: A Simulation Study

Joong Son, Program Chair, Grant MacEwan College, 10700 - 104 Ave, Room 5-256K, Edmonton, AB, T6M0B1, Canada, sonj2@macewan.ca, Chwen Sheu

We study performance of a serial supply chain based on ordering policy deviations at different parties. The objective of the study is to investigate the impact of the source of policy deviations on global as well as local performance. Our simulation provides insights via results obtained from the comparisons of decentralized replenishment policies that deviate from the base stock policy. Results indicate that the supply chain performance is contingent on the types and the source of deviations.

3 - How to Improve the Effectiveness of SCM: A Multi-group Analysis-based Approach

Pietro De Giovanni, Phd Student, Essec Business School, Avenue Bernard Hirsch, B.P. 105, 95021, Cergy Pontoise, Paris, France, pietro.degiovanni@essec.fr, Fouad El Ouardighi

This research examines the relationship between Supply Chain Management (SCM) and economic performance. The effectiveness of SCM is empirically investigated on operational, customer and economic performance. Using a sample of French firms, Multi-group analysis distinguishes between firms having or not a dedicated structure for SCM, presence/absence of assistance mechanisms, and leadership in the down/up stream of the chain. The findings have both theoretical and practical implications.

4 - Supply Chain Competition and Disruption

June Dong, SUNY Oswego, School of Business, Oswego, NY, 13126, United States of America, dong@oswego.edu

Nowadays the business competition is supply chain versus supply chain competition. Moreover disruptions in one supply chain may affect the other supply chains. We will present a mathematical model to study the competition and coordination among supply chains. We then study the supply chain disruptions and the impacts on the other supply chains.

5 - Cooperative Promotions in Supply Chains

Salma Karray, Assistant Professor, UOIT, 2000 Simcoe Street North, Oshawa, Canada, salma.karray@uoit.ca

Many retailers are sharing the costs of their promotional programs not only with their suppliers but also with competing retailers. These different promotional programs could create conflict in the channel. We develop a game theoretic model and obtain Stackelberg equilibrium solutions in order to study the effects of such programs on the supply chain's strategies and profits.

SB10

Salon A - H Conv. Lev.

OM in Practice: Some Practical Operations Management Problems and Their Solutions

Sponsor: Manufacturing and Service Operations Management Sponsored Session

Chair: Opher Baron, Rotman School of Management, University of Toronto, 105 St George St, Toronto, ON, M5S 3E6, Canada, opher.baron@rotman.utoronto.ca

1 - Bargaining within the Supply Chain & its Implication to Coordination of Supply Chains in an Industry

Desheng Wu, Reykjavik University, Kringlunni 1, School of Science and Engineering, Reykjavik, IS-103, Iceland, dash@ru.is, Opher Baron, Oded Berman

We investigate the Nash Equilibrium of an industry with two supply chains. We model each chain with a single manufacturer and a single retailer and use a Nash Bargaining on the Wholesale (BW) price. We show that both the traditional Manufacturer Stackelberg (MS) and the Vertical Integration (VI) strategies are special cases of this contract. We propose two supply chain coordination mechanisms: bargaining on the wholesale price and coordinating using the wholesale price.

2 - Intertemporal Pricing in a Capacity Constrained Just-in-time Supply Chain

Dehui Tong, Rotman School of Management, University of Toronto, 105 St. George St., Toronto, ON, M5S 3E6, Canada, Dehui.Tong@rotman.utoronto.ca, Opher Baron, Joe Milner

We study a hierarchical planning model for a capacity constrained service system for multiple customer classes with heterogeneous schedule preferences. Strategic level prices are determined to regulate customers' preferences. Customers observe posted prices, arrive and are assigned capacity slots dynamically over a planning horizon. Extension to overbooking is discussed. Heuristic algorithms are proposed to solve the problem.

3 - DVD Allocation for a Multiple-location Rental Firm

Iman Hajizadeh, Rotman School of Management, 105 St. George Street, Toronto, ON, M5S 3E6, Canada, iman@rotman.utoronto.ca, Opher Baron, Joe Milner

We study the problem of purchasing and allocating copies of films to multiple stores of a movie rental chain. Using data from a large rental firm, we test various demand and return models and present a newsvendor-like formulation with multiple rental opportunities. Our model increases the average profit per title by 18% and 3% for revenue sharing and standard titles, respectively. We discuss the implications of revenue sharing contracts on the profitability of the rental firm and the studio.

4 - Channel Coordination Mechanisms for Basic Products and Ancillary Services

Ming Hu, Assistant Professor, Rotman School of Management, University of Toronto, 105 St. George Street, Toronto, ON, M5S 3E6, Canada, ming.hu@rotman.utoronto.ca, Guillermo Gallego, Julie Ward, Jose Luis Beltran, Shailendra Jain

We study a supply chain where a supplier sells a basic product and an ancillary service through a retailer. Random demands for both product and service are assumed to be influenceable by sales efforts by the retailer. To achieve channel coordination and arbitrarily share the gains of coordination, we propose a wholesale price schedule for the product and the service, and provide an alternative target rebate scheme that can be separately run by the supplier's production and service departments.

SB11

Salon C - H Conv. Lev.

Health Care System Modeling

Contributed Session

Chair: Christina Swindells-Nader, Health Systems Planning Advisor, Vancouver Coastal Health, 520 West 6th Avenue, Vancouver, BC, V5Z 4H5, Canada, christina.swindells-nader@vch.ca

1 - Specialty Surgical Hospitals: Focused Factories or Cream Skimmers? Evidence From Texas

Liam O'Neil, Associate Professor, University of North Texas, SPH / HMP Department, 3500 Camp Bowie Blvd, Fort Worth, TX, 76107, United States of America, loneill@hsc.unt.edu

The quality of care is examined at for-profit, niche hospitals for two cardiac procedures: PTCA and pacemaker implant. Strong evidence is provided that favorable patient selection accounts for quality differences, as measured by risk-adjusted mortality. Fixed-effect, logistic regression models are used to predict admission to specialty vs. community hospitals.

2 - Could Alexander Graham Bell Have Prevented the Spanish Flu?

David Wheeler, University of Wisconsin - Parkside, 4108
Washington Road, Apartment 202, Kenosha, WI, 53144,
United States of America, david.i.wheeler@gmail.com,
Corey Baumgardner, Abey Kuruvilla

The goal of this research is to see if 911 call data can be used to predict the onset of influenza. Initial tests have shown a strong correlation between historical Influenza data from the Centers for Disease Control and Prevention (CDC) and proprietary 911 call data from FirstWatch, a real-time data monitoring business. We attempt to develop a model with 911 call data that can be used by public health authorities to predict the outbreak of flu and thus be able to take mitigatory actions.

3 - An Empirical Analysis of the Value of IT-Based Services in the Health Care Sector

Tridas Mukhopadhyay, Professor, Carnegie Mellon University, 385
B Posner Hall, Tepper School of Business, Pittsburgh, PA, 15213,
United States of America, tridas@cmu.edu, Robert Schwartz,
Seung Hyun Kim

We study physician relationship management activities in the health care context. We show that IT-enabled patient discharge summaries sent to referring physicians may have a positive or negative effect on future referrals depending on whether they are sent through preferred or non-preferred channel (e.g., secure email or fax). The unexpected negative effect highlights that IT-based relationship management activities may even backfire if they do not fully satisfy physicians' preferences.

4 - A Modeling Approach for Managing Operating Theatre Resources in Multi-Specialty Hospitals

Devanath Tirupati, Professor, Melbourne Business School,
200 Leicester Street, Carlton, 3053, Australia, d.tirupati@mbs.edu,
Kannan Sethuraman

We consider the problem of managing operating theatres (OTs) in multi-specialty hospitals treating two classes of patients – emergency and elective. The “in-suite” time during which the OT is occupied by a patient corresponds to the service time and is assumed to have a general distribution. In this paper we develop a stochastic model to evaluate policy alternatives for managing OTs and to assess their implications. Limited simulation experiments suggest that the model is fairly robust and can provide a quick assessment of alternative strategies.

5 - Using System Dynamics to Project Demand and Plan Capacity for Community Health Care Services

Christina Swindells-Nader, Health Systems Planning Advisor,
Vancouver Coastal Health, 520 West 6th Avenue, Vancouver, BC,
V5Z 4H5, Canada, christina.swindells-nader@vch.ca, Yixin Chen

The system dynamics planning model explores community health care services provided by Vancouver Coastal Health as an integrated system. Its population-based approach uses clients characteristics (e.g. age profile, complexity of health status) and their probability of switching service to explore service interactions and future demand. The demand projections under various scenarios enable the organization to monitor service performance and to allocate resources over time across services.

SB12

Pier 4 - H Conv. Lev.

First Nations Negotiations in Canada: Action Research Using ESD and Smartsettle

Sponsor: Group Decision and Negotiation Section: GDN 2009
Sponsored Session

Chair: Ernest M. Thiessen, iCan Systems In., Smartsettle, 32182
Astoria Crescent, Abbotsford, BC, V2T 4P5, Canada,
ethiessen@smartsettle.com

1 - First Nations Negotiations in Canada: The Problems

June Quipp, Elder and former Chief, Cheam First Nation of BC,
juneq@cheamband.com

Time and money have been wasted with a tedious negotiation dance. Not enough progress has been made in spite of decades of negotiations. Complex negotiations that have focused on one issue at a time have too often resulted in an impasse, dashing hopes for a resolution that would be satisfactory to all parties. Something must be done to level the playing field and embrace a non-adversarial process that will build trust, enhance relationships and quickly lead to a fair and efficient outcome.

2 - First Nations Negotiations in Canada: Applying ESD

Melvin F. Shakun, New York University, New York, NY, 10012,
mshakun@stern.nyu.edu

Evolutionary Systems Design (ESD) is a game-theory based, general formal modeling/systems framework for problem solving and negotiation. With difficult negotiations, i.e., when a solution to a negotiation problem is not forthcoming,

problem restructuring (reframing) is a key approach. Restructuring may be supported using the ESD heuristic referral process. We will discuss how ESD can be applied in defining (designing) and solving specific First Nations negotiations involving multiple parties.

3 - First Nations Negotiations in Canada: Action Research Using Smartsettle

Ernest M. Thiessen, iCan Systems In., Smartsettle,
32182 Astoria Crescent, Abbotsford, BC, V2T 4P5, Canada,
ethiessen@smartsettle.com, Melvin F. Shakun

Show plans for a parallel action research project that will demonstrate the application of Smartsettle to First Nations negotiations in Canada. Describe background negotiation and game theory as related to the First Nations context. Engage the audience in a hypothetical simulation that illustrates how Smartsettle can be applied to virtually eliminate the traditional negotiation dance, uncover hidden value, and encourage important relationship building.

SB13

Pier 5 - H Conv. Lev.

Strategic Analysis of Brownfield Redevelopment Projects

Sponsor: Group Decision and Negotiation Section: GDN 2009
Sponsored Session

Chair: Keith Hipel, University Professor, University of Waterloo,
Department of Systems Design Engineering, 200 University Avenue
West, Waterloo, ON, N2L 3G1, Canada, kwhipel@engmail.uwaterloo.ca

1 - Solving the Private Risk Problem in Brownfield Redevelopment Using Fuzzy Real Options

Qian Wang, Doctoral Student, University of Waterloo,
200 University Ave., Waterloo, ON, N2L 3G1, Canada,
q4wang@uwaterloo.ca, Keith Hipel, Marc Kilgour

Private risk, which is not market-priced, affects any realistic evaluation of the profitability of brownfield redevelopment. Fuzzy arithmetic can be incorporated into real option models to represent private risk. Explicitly acknowledging various kinds of uncertainties, fuzzy real options provide appropriate assessments.

2 - Modeling the Epton Site Redevelopment Negotiations

Majid Sheikhmohammady, Doctoral Student, University of Waterloo,
200 University Ave., Waterloo, ON, N2L 3G1, Canada,
msheikhm@engmail.uwaterloo.ca, Keith Hipel, Marc Kilgour

A new methodology for analyzing multilateral negotiations is used to investigate strategies in negotiations over redevelopment of the Epton brownfield site in Kitchener, Ontario. The results are promising: in particular, the most likely outcome identified by the model matches the actual outcome of the negotiations.

3 - Combined Attitude-based Negotiation Decision Support System for Resolving Brownfield Disputes

Saied Yousefi, Doctoral Student, University of Waterloo,
200 University Ave., Waterloo, ON, N2L 3G1, Canada,
yousefi2001@hotmail.com, Keith W. Hipel, Tarek Hegazy

A negotiation methodology for strategic and tactical negotiation is proposed for resolving disputes in brownfield redevelopment. At the strategic level, the Graph Model for Conflict Resolution is employed to determine an overall agreement. At the tactical level, the overall agreement is studied in details using utility theory to determine concessions needed to reach a detailed solution. Also, the proposed negotiation methodology can take into account the negotiators' attitudes.

SB14

Pier 7 - H Conv. Lev.

Fuzzy Optimization

Contributed Session

Chair: Ankur Das, Lecturer, Dayalbagh Educational Institute,
DEI Technical College, Dayalbagh, Agra, Agra, UP, 282005, India,
das_ankur@yahoo.com

1 - Mixed Integer Probabilistic Vendor Selection: A Fuzzy Approach

Saroj Koul, Assistant Professor, Acadia University, 307,
Rhodes Hall, Acadia University, Wolfville, NS, B4P2R6, Canada,
saroj.koul@acadiau.ca, Rakesh Verma

We propose a mixed integer programming model to select vendors and determine the order quantities. The model considers: probabilistic nature of demand; lead time requirement for the parts; quality of supplied parts; cost of purchasing and transportation; fixed cost for establishing vendors; and the cost of receiving poor quality parts. The fuzzy approach is applied to solve problems and a numerical example considered to illustrate methodology.

2 - Portfolio Management: A Fuzzy Set Based Approach for Adjusting Trade Size to Meet Financial Goals for Return and Risk
Margaret Shipley, Professor of Management, University of Houston Downtown, 326 N Main Street, Houston, TX, 77002, United States of America, shipley@uhd.edu, Frederick Shipley

Fuzzy rules are developed where, depending on the antecedents, the sample trade size may be slightly or significantly decreased or increased to ensure that individual trades have limited risk and the sum of trades or portfolio have a different limited risk. Risk levels are adjusted to deliver desired rates of return.

3 - Optimal Adjustment of Competence Set with Step Functions and Piecewise Linear Membership Functions
Yvonne C.F. Hou, National Chiao Tung University, 1001 University Road, Hsinchu, Taiwan - ROC, yvonnehou@gmail.com, Po-Lung Yu

In order to maximize the value of the arriving opportunities, corporate usually need to fine tune their competence set. In this article we discuss how to locate the optimal adjustment of the competence set when the cost coefficients are of step function and the production rates are with piecewise linear membership functions. We formulate the problems into integer linear programming models and report the relevant results of modelling and management implications.

4 - An Adaptable Fuzzy Control Strategy for an SAFMS with Routing Flexibility

Ankur Das, Lecturer, Dayalbagh Educational Institute, DEI Technical College, Dayalbagh, Agra, Agra, UP, 282005, India, das_ankur@yahoo.com, Rahul Caprihan

This paper investigates the impact of information delays on the performance of a hypothetical SAFMS with routing flexibility in the presence of assumed design and control parameters through a simulation framework. A novel strategy is proposed to counter the impact of information delays that inherently manifest within SAFMSs. The performance of proposed strategy is compared with other conventional dispatching heuristics - NINQ & WINQ in combination with simple sequencing heuristics EDD & SPT.

SB15

Pier 8 - H Conv. Lev.

Graph and Network Optimization I

Contributed Session

Chair: Laleh Behjat, Assistant Professor, University of Calgary, 2500 University Drive, Calgary, AB, T2N1N4, Canada, laleh@ucalgary.ca

1 - Explicit Sensor Network Localization Using Semidefinite Programming and Clique Reductions

Nathan Krislock, University of Waterloo, Department of Combinatorics & Optimization, University of Waterloo, Waterloo, ON, N2L 3G1, Canada, ngbkrisl@math.uwaterloo.ca, Henry Wolkowicz

The sensor network localization, SNL, problem consists of locating the positions of sensors, given only the distances between sensors that are within radio range and the positions of some fixed sensors (called anchors). Using the theory of Euclidean Distance Matrices, we relax SNL to a semidefinite programming, SDP, problem. By finding explicit representations of the faces of the SDP cone corresponding to intersections of cliques, we derive a technique that solves SNL with exact data.

2 - Multi-grid Applications for Placement and Routing Stages of VLSI Physical Design

Laleh Behjat, Assistant Professor, University of Calgary, 2500 University Drive, Calgary, AB, T2N1N4, Canada, laleh@ucalgary.ca, Logan Rakai

VLSI physical design (PD) is the stage where the physical shape of an IC is determined. PD is usually performed in stages such as placement and routing. In these stages, a circuit is presented as a hypergraph. Because of the sizes of the circuits encountered today, many PD algorithms use clustering to reduce the complexity of circuits. Application of multigrid techniques for clustering during placement and clock routings of ICs is discussed in this talk.

SB18

Dockside 1 - H Lower Lev.

OR Applications in the Forest Products Sector

Cluster: Forestry

Invited Session

Chair: David Martell, University of Toronto, Faculty of Forestry, 33 Willcocks Street, Toronto, ON, M5S 3B3, Canada, martell@smokey.forestry.utoronto.ca

1 - Agent-based Simulation of a Lumber Supply Chain

Sebastien Lemieux, FORAC Research Consortium - Université Laval, Pavillon Adrien-Pouliot (Office 3514), 1065, Av. de La Medecine, Quebec, QC, G1V 0A6, Canada, Sebastien.Lemieux@forac.ulaval.ca, Sophie D'Amours, Jean-Marc Frayret, Luis Antonio de Santa-Eulalia, Jonathan Gaudreault

In this presentation, the architecture of an agent-based simulator will be presented. Specific agents have been designed to simulate the decisions and behaviors of the main business units of a lumber supply chain. Contract and spot customers are also modeled to permit a complete evaluation of different planning strategies.

2 - Ease of Implementation vs Value Maximization in the Forest Bucking Pattern Selection

Jean-Marc Frayret, Assistant Professor, Ecole Polytechnique de Montreal, Departement de Math. et Enie Industriel, 2500, Chemin de Polytechnique, Montreal, QC, H3T 1J4, Canada, jean-marc.frayret@polymtl.ca, Luc Label, Satyaveer S. Chauhan, Sophie D'Amours

The pattern selection problem for the forest is very complex in terms of implementation if the objective is solely to maximize the fiber value. However, in practice, a small trade-off is possible between the fiber value and the ease of implementation. In this work, we present two scenarios of reducing the number of patterns for ease of implementation and compare the results.

3 - Bootstrap Simulation and Response Surface Optimization in Forest Management

Jingjing Liang, Assistant Professor, University of Alaska Fairbanks, P.O.Box 757200, Department of Forest Sciences, Fairbanks, AK, 99775, United States of America, j.liang@uaf.edu, Robert Monserud, Joseph Buongiorno

A method was proposed to simulate economic and ecological objectives of forest management alternatives by bootstrapping and then optimize management controls by response surface analysis. The effects were described with response surfaces to determine the optimal management alternatives, and relationships between various economic and ecologic criteria could then be mapped.

4 - Harvesting Planning and Allocation of Products to Mills

Bernard Gendron, Université de Montreal (DIRO) and CIRRELT, C.P. 6128, Succursale Centre-Ville, Montreal, QC, H3C 3J7, Canada, Bernard.Gendron@cirrelt.ca, Geraldine Gemieux, Jacques Ferland

The problem we consider concerns annual harvesting planning. The main decision deals with the scheduling of the harvesting teams in order to satisfy demands at the mills. Harvesting areas and teams have their own characteristics, which have to be considered in the planning process. We develop a mixed-integer programming model to solve this problem.

SB19

Dockside 2 - H Lower Lev.

Technology Management and Applications

Contributed Session

Chair: John Angelis, Rochester Institute of Technology, 107 Lomb Memorial Drive, Rochester, NY, United States of America, jangelis@saunders.rit.edu

1 - On the Efficiency of Technologically Innovative Activities: A Case of SMEs in Korea

Moon-Soo Kim, Professor, Hankuk University of Foreign Studies, 89 Wangsanri Mohyunmyon Cheoingu, Yongin, 449-791, Korea, Republic of, kms@hufs.ac.kr

This paper assesses the SMEs technological innovativeness of Korean manufacturing, which is defined a ratio between input activities and their outputs such as product innovation, product improvement and process innovation, etc., on the 4 industry types classified by Pavitt (1984) using a DEA approach. In order to determine input variables of the DEA analysis, in particular, a logistic regression analysis between innovation outputs and various innovative activities is carried out.

2 - Making Small to Medium Sized Enterprises More Competitive

Majid Rad, Senior Lecturer, Edith Cowan University, 270 Joondalup Dr., Joondalup, WA, 6027, Australia, m.rad@ecu.edu.au

SMEs tend to have low overhead costs and high productivities. However, limited resources of SMEs in comparison with huge manufacturing firms make competition a difficult task in today's competitive markets. A low-cost virtual integration of SMEs could help improve competitiveness of SMEs. It allows local SMEs to share resources to form a large and resourceful organization. Thus SMEs become as resourceful as large manufacturing firms while maintaining low overhead costs and high productivities.

3 - Innovation and India International: An Individualistic Perspective on Innovation and Growth

Appa Rao Korukonda, Professor & Chairman, Department of MIS & CIS, College of Business, Bloomsburg University of PA, 400 East Second Street, Suttiff Hall, Room No. 224, Bloomsburg, PA, 17815, United States of America, arkorukonda@gmail.com

India has been steadily emerging as an economic giant to be reckoned with in the world economic scene. While part of it has been accomplished through policy measures, much of it can be attributed to the initiative, aggressiveness and sheer innovation of the educated youth to look beyond national borders to overcome problems of infrastructure and corruption at home. This paper argues for a focus on individual variables to understand innovation and learn from the Indian experience.

4 - Optimal Quality and Price-setting for a New Technologically-advanced Product

John Angelis, Rochester Institute of Technology, 107 Lomb Memorial Drive, Rochester, NY, United States of America, jangelis@saunders.rit.edu

When launching a new product, competing firms set price and quality levels to attract customers and thus maximize profits. However, if the product is technologically advanced, firms face a market in which customers are segmented by innovativeness and base purchase decisions on their preferences for quality and net value. We analyze a closed-loop Stackelberg game with perfect information to determine optimal strategies.

SB20

Dockside 3 - H Lower Lev.

Financial Engineering

Contributed Session

Chair: Timothy Flynn, President, Flynn Consulting Services, 1000 Brantwood Ave, Elk Grove V, IL, 60007, United States of America, tjfphd@aol.com

1 - A Dynamic MIP Approach to Multi-Objective Portfolio Optimization

Bartosz Sawik, AGH University of Science & Technology, Faculty of Management, Department of Applied Computer Science, al. Mickiewicza 30, Krakow, PL-30-059, Poland, B_Sawik@yahoo.com

Dynamic approach and MIP formulation is proposed for a multi-objective portfolio optimization over many investment periods. The objective is to allocate wealth on securities to maximize the portfolio expected return with the threshold of the probability that the return is not less than a required level. The auxiliary objective is the minimization of risk probability of portfolio loss. A real data from stock exchange with 3500 historical daily quotations were used for computational experiments.

2 - A Regime-switching Approach to Valuing Weather Options

Reaz-us salam Elias, PhD Student, Department of Mechanical and Industrial Engineering, Ryerson University, 350 Victoria Street, Toronto, ON, M5B 2K3, Canada, m3elias@ryerson.ca, Liping Fang, Mohamed Wahab Mohamed Ismail

A regime-switching approach is presented to value weather options. Historical data are used to model the seasonality and variability of temperature. Companies in energy, agriculture, construction, and entertainment sectors can hedge their risks associated with uncertain weather conditions using weather derivatives.

3 - Bias Reduction of the Least-squares Monte Carlo Estimators of American Option Values

Kin Hung Kan, PhD Student, The University of Western Ontario, 102 - 15, Jacksway Crescent, London, ON, N5X3T8, Canada, kkan8@uwo.ca, R. Mark Reesor

Whitehead, Davison and Reesor (2008) introduce a general bias reduction technique for pricing American options by Monte Carlo methods based on large sample theory that corrects the stochastic tree estimators. We apply this technique to the popular least-squares Monte Carlo estimators using well-known results about the large sample properties of least-squares estimators. We derive an expression for bias-corrected estimators. Numerical results show the effectiveness of this technique.

4 - Optimal Investment Strategy to Maximize Total Dollars Contributed to a 401(k) Savings Account

Timothy Flynn, President, Flynn Consulting Services, 1000 Brantwood Ave, Elk Grove V, IL, 60007, United States of America, tjfphd@aol.com, Jerry Slusiewicz

The amount of "company match" contributions made to a 401(k) retirement savings plan is a function of the investors personal contribution strategy as well as the company plan parameters. Sub-optimal contributions are especially costly to those who contribute the maximum amount allowed by the IRS. Proof of an optimal class of contribution strategies is given. Practical implications for the 401(k) or similar investor are discussed.

SB21

Dockside 4 - H Lower Lev.

Decision Support Systems

Contributed Session

Chair: Ada Barlatt, University of Michigan, 1205 Beal Avenue, Ann Arbor, MI, 48109, United States of America, abarlatt@umich.edu

1 - Recommendations for Increasing the Use of Resource Allocation Models in Public Health

Arielle Lasry, CDC, 1600 Clifton Road NS-E4B, Atlanta, GA, 30333, Canada, ftn9@cdc.gov, Anke Richter, Frithjof Lutscher

Resource allocation models have not had a substantial impact on public health funding decisions. We highlight several difficulties encountered in attempts to implement such models including: model complexity, data requirements, multiple stakeholders, funding issues and political and ethical considerations. We then make recommendations as to how these difficulties may be overcome.

2 - A Decision Support System for Personalized Advertisement

Kemal Kilic, Asst. Professor, Sabanci University, Orhanli, Tuzla, Istanbul, 34956, Turkey, kkilic@sabanciuniv.edu

A company develops an online virtual platform where users interact with others. The company's income is from the adds displayed at virtual locations. A personalized advertisement system is developed in order to increase revenues. A two phased framework is proposed. The first phase matches the viewers' profiles to the requirements of the advertisers. The second phase identifies the appropriate advertisement that will be displayed to the user at an advertisement location based on an index.

3 - A Linear Optimal Method Applies to Global Supply Chain Support System

Yao Huei Huang, PhD Student, National Chiao Tung University, Taiwan, #1001, Dashuei Rd., Hsinchu City, Hsinchu, Taiwan - ROC, yaohuei.huang@gmail.com, Han Li Li

The materials cost is increasing and sales profit is decreasing in recent years. For this reason, a lot of enterprises constantly utilize decision support system to solve their problems. This study proposes a linear mathematic model and takes the optimal solutions out by developing a decision support system. In here, this study embedded the Geographic Information Map (i.e. Google Map) technology in our system and exactly display the optimal information flows of the transportation and logistics.

4 - A Decision Support System for Health Care Based on Multi-Constraints 0-1 Integer Programming

Tomoko Kashima, Graduate School of Information Science and Technology, Osaka University, 2-1 Yamadaoka, Suita, Osaka, 565-0871, Japan, t-kashima@ist.osaka-u.ac.jp, Hiroaki Ishii

This paper focuses on everyday meals close to our life, and proposes a well-balanced menu planning system as a preventive measure of lifestyle-related diseases. The system works on Web server built by Apache, MySQL and PHP. For the menu planning, a genetic algorithm is applied by understanding this problem as a 0-1 integer programming. For the menu planning, a genetic algorithm is applied by understanding this problem as a multidimensional 0-1 integer programming.

5 - Models and Algorithms for Student Project Assignment

Ada Barlatt, University of Michigan, 1205 Beal Avenue, Ann Arbor, MI, 48109, United States of America, abarlatt@umich.edu

We discuss the problem of matching students to projects, where we must select projects to staff and assign students to projects. We consider a case where students have several characteristics and projects several have requirements. We consider multiple objectives simultaneously (e.g. minimize average ranking assigned and minimizing the number of projects staffed). We present a formulation and conclude with a discussion of the decision support tool developed to solve an instance of this problem.

Sunday, 12:30pm - 2:00pm

■ SC01

Frontenac - CC Lev. 1

Air Traffic Flow Management

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: David Lovell, Associate Professor, University of Maryland, 1173 Martin Hall, College Park, MD, 20742, United States of America, lovell@umd.edu

1 - Evaluating a New Formulation for Large-Scale Air Traffic Flow Management

Andrew Churchill, Graduate Research Assistant, University of Maryland, 1173 Martin Hall, College Park, MD, 20904, United States of America, churchil@umd.edu, David Lovell, Michael Ball

We introduce a new aggregate air traffic flow management model. Our integer program builds on the model proposed by Bertsimas, Lulli and Odoni. The new formulation employs a set of general airspace constructs that allow more complex elements to be represented. In addition, delay propagation effects are carefully modeled. We provide experimental results that indicate both the computational effectiveness of this model and its new features, as well as its potential for decision support.

2 - Strategic Scheduling and Fleet Selection

Megan Smirti, PhD Candidate, UC Berkeley, 109 McLaughlin Hall, Berkeley, CA, 94108, United States of America, msmirti@berkeley.edu

This research presents a methodology to select and schedule aircraft to minimize the sum of private and social costs. To select and schedule vehicles, individual models for each cost component dependent on vehicle type and frequency are combined into the total logistics cost. The contribution of this research is the development of a heterogeneous vehicle scheduling and fleet selection methodology to serve heterogeneous passengers based on the private and social total logistics cost function.

3 - Near Real-time Air Traffic Conflict Resolution through Speed and Flight Level Control

Senay Solak, University of Massachusetts, Isenberg School of Management, Amherst, MA, 01003, United States of America, solak@som.umass.edu, Adan Vela, William Singhose, John-Paul Clarke

There exist several conflict resolution algorithms that have been proposed in the literature. Most algorithms either consider the problem in two dimensions or require significant computational effort. To remedy this shortcoming, we propose a mixed integer programming based algorithm that considers multiple flight levels, and also runs in near real-time. Further, we investigate some stochastic aspects of the underlying problem.

■ SC02

Queens Quay I - CC Lev. 1

Combinatorial Optimization II

Contributed Session

Chair: Hacer Guner Goren, PhD Candidate- Research Assistant, Dokuz Eylul University, Department of Industrial Engineering, Tinaztepe Yerleskesi Buca, Izmir, 35160, Turkey, haker.guner@deu.edu.tr

1 - Experimental Analysis of Heuristics for Three Dimensional Assignment and Transportation Problems

Arman Kaveh, Mathematics Master's Candidate, Simon Fraser University, Central City, 250-13450 102nd Ave, Surrey, BC, V3T 0A3, Canada, akaveh@sfu.ca, Abraham Punnen

In this paper we discuss different formulations of the Three Dimensional Assignment Problem (3AP) and the related Three Dimensional Transportation Problem (3TP). 3AP and 3TP are known to be NP-hard. A comparative study of the current heuristics and approximation algorithms is presented as well as proposed methods by the authors. We apply our algorithms to the benchmark instances and provide computational results.

2 - A Strategy for Tabu Search Using Vocabulary Building Applied to the SONET Ring Assignment Problem

Werner Kleyson da Silva Soares, MSc, UFPE, Av. Blumenau, 2926, conj. Sta. Catarina, Natal, RN, 59112410, Brazil, werner_soares@hotmail.com, Dario Jose Aloise, Wagner Oliveira

The SONET Ring Assignment Problem deals with grouping localities in the shape of rings to minimize total net cost. This is a NP-hard Class problem. It can be solved through Metaheuristics. We used Tabu Search while keeping a set of elite solutions that is used in a Vocabulary Building process. Approaches had been implemented considering the use of vocabulary parts deriving from that set or not. It was verified that the one which used only vocabulary parts from the set presented better results.

3 - An Evolutionary Algorithm to the One-dimensional Cutting Stock Problem with Multiple Stock Lengths

Adriano Heis, CEFET-SC Centro Federal de Educacao Tecnologica de Santa Catarina, Av. Mauro Ramos, no950, Centro, Florianopolis, 88020-300, Brazil, adriano.heis@gmail.com, Silvio A. de Araujo, Ademir Aparecid Constantino

This paper deals with the one-dimensional integer cutting stock problem, which consists of cutting a set of available bars in stock in order to produce ordered smaller items in such a way as to optimize a given objective function. We studied the case in which there are several types of bars in stock available in limited quantities. A new heuristic method based on the evolutionary algorithms concepts was proposed. The results this heuristic are compared with other methods from the literature.

4 - A Genetic Algorithm Approach for the Capacitated Lot Sizing Problem with Set-up Carryover

Hacer Guner Goren, PhD Candidate- Research Assistant, Dokuz Eylul University, Department of Industrial Engineering, Tinaztepe Yerleskesi Buca, Izmir, 35160, Turkey, haker.guner@deu.edu.tr, Raf Jans, Semra Tunali

This production planning problem deals with multiple products produced on a single machine. A setup is assumed to be carried over from one period to the next and the partial sequencing of the first and last product is incorporated. A genetic algorithm approach is proposed to search over the binary variables of set-up and carry-over variables. Each solution visited is treated as sub-problem and the corresponding values of the inventory and lot size variables are determined by linear programming.

■ SC03

Queens Quay II - CC Lev. 1

Graph and Network Optimization II

Contributed Session

Chair: Brad Woods, Simon Fraser University, 250-13450 102 Avenue, Surrey, BC, Canada, bdw2@sfu.ca

1 - Computational Study of Heuristics for Asymmetric and Constrained Bottleneck TSP

John LaRusic, Graduate Student, Simon Fraser University Surrey, 250 - 13450 102 Avenue, Surrey, BC, V3T0A3, Canada, jal21@sfu.ca, Abraham Punnen

The bottleneck traveling salesman problem (BTSP) seeks the Hamiltonian tour whose maximal edge cost is minimized. We propose lower bound algorithms and heuristics for the asymmetric BTSP, as well as BTSP with an additional constraint on the tour length. A summary of computational results is also presented.

2 - Coloring Graphs to Avoid Monochromatic Cycles

Fabrice Talla Nobibon, Student, KU Leuven, Naamsestraat 69, Leuven, 3000, Belgium, Fabrice.TallaNobibon@econ.kuleuven.be, Roel Leus, Frits Spijckma

We consider the problem of deciding whether a given directed graph can be vertices partitioned into two acyclic subgraphs. We prove that this problem is difficult even to find an approximate solution. We present an exact branch-and-check algorithm able to solve the problem of considerable size.

3 - Coloured Petri Nets for Steel Plant

Piotr Lebkowski, Professor, AGH University of Science and Technology, Mickiewicza 30, Krakow, 30-059, Poland, kamieniccka@poczta.fm

A Petri coloured net applied to the modeling of the material flow at the production plant in steelworks is a effective research tool. This paper presents a Petri net expanded with the attribute vectors of places and transitions, as well as the logical rules of transition firing and the procedures that update the attribute values. Owing to such expansion, we can observe the properties of the streams that flow through the system, e.g. the cost and the project completion time.

4 - Optimization Problems on Extensions of Halin Graphs

Brad Woods, Simon Fraser University, 250-13450 102 Avenue, Surrey, BC, Canada, bdw2@sfu.ca, Nabil Belacel, Abraham Punnen

We define several classes of generalized Halin graphs. We discuss the structural properties of these graphs and present results of combinatorial optimization problems when restricted to these graphs. In particular, we give a linear time algorithm which solves the optimal matching problem.

■ SC04

Bay Room - CC Lev. 1

Modeling and Computation in Stochastic Programming

Cluster: Optimization/Stochastic Programming

Invited Session

Chair: Alan King, IBM, P.O. Box 218, Yorktown Heights, NY, 10598, United States of America, kingaj@us.ibm.com

1 - Recent Changes to the Optimization Services Project to Support Stochastic Programming

Horand Gassmann, Dalhousie University, Faculty of Management, 6100 University Avenue, Halifax, NS, B3H 3J5, Canada, Horand.Gassmann@DAL.CA, Jun Ma, Kipp Martin

Optimization Services (OS) is a COIN-OR project to support the modelling and solution of a wide range of optimization problems both via local servers and over a network. This talk describes recent additions to the system, particularly as they relate to supporting stochastic programming and the representation of uncertainty.

2 - New Stochastic Programming Enhancements for the MPL Modeling Language

Bjarni Kristjánsson, President, Maximal Software, Inc., 2111 Wilson Boulevard, Suite 700, Arlington, VA, 22201, United States of America, bjarni@maximalsoftware.com

Formulating stochastic models in a modeling language and deploying it to end-users has long been a challenge in practice. In this presentation we will review how both scenario-based and independent variables stochastic models can be effectively formulated in a modeling language, such as MPL. Several formulations of SP models will be demonstrated.

3 - COIN-OR Experiment on Distributed Stochastic Programming Solver

Michael Chen, Post Doc Researcher, IBM T.J. Watson Research Center, 1101 Kitchwan Road, Yorktown Heights, NY, 10598, United States of America, sychen@us.ibm.com, Alan King

We present progress on a distributed stochastic programming solver based on Benders' decomposition. The distributed solver couples with FlopC++ and SMI so as to generate and solve subproblems "locally" on each processor. Also there are no optimality cuts generated in this interior point method solver, hence the communication cost is very low.

4 - A Stochastic Programming Approach for Planning Horizons of Infinite Horizon Capacity Planning

Kai Huang, Assistant Professor, Binghamton University, State University of New York, School of Management, Binghamton University, Binghamton, NY, 13902, United States of America, huang@binghamton.edu, Shabbir Ahmed

Planning horizon is a key issue in production planning. We study the planning horizon of capacity planning problems within the framework of stochastic programming. We consider an infinite horizon stochastic capacity planning model involving a single resource, linear cost structure, and discrete distributions for general stochastic cost and demand data (non-markovian and non-stationary). We give sufficient conditions for the existence of an optimal solution.

■ SC05

Yonge - CC Lev. 1

Airline Applications: Sloan Session II

Sponsor: Aviation Applications

Sponsored Session

Chair: Amy Cohn, University of Michigan, Ind & Operations Engineer, 1205 Beal Ave, Ann Arbor, MI, 48109, United States of America, amycohn@umich.edu

1 - Novel Methods for Reducing Passenger On-Aircraft Ground Delays

Marcial Lapp, University of Michigan, Industrial & Operation Engineering Department, 1205 Beal Ave, Ann Arbor, MI, 48109, United States of America, mlapp@umich.edu, Amy Cohn

Lengthy delays in which boarded passengers remain on the ground but away from the gate have led to much scrutiny and potential legislation in the U.S. In this student-based research, we seek "out of the box" methods to reduce the occurrence of such events by intelligently using gates, staging areas, and "parking positions." Simulation is used to compare and contrast different heuristic policies.

2 - Network Design for Code Sharing

Diego Klabjan, Associate Professor, Northwestern University, 2145 Sheridan Road, Evanston, IL, 60208, United States of America, d-klabjan@northwestern.edu, Milind Sohoni, Sumit Kunnunkal, Sergey Shebalov

An airline from an alliance faces the daunting task of code sharing its flights. The challenge mainly lies in the sheer size of the itineraries that can be sold on the entire network of all alliance partners. We present a network design approach based on discrete choice modeling of passengers' utilities.

3 - Dynamic Constraint Aggregation for Crew Pairing Problem

Issmail Elhallaoui, GERAD, C.P. 6079, Succ. Centre-Ville, Montreal, Qc, H3C 3A7, Canada, issmail.Elhallaoui@gerad.ca, Francois Soumis, Guy Desaulniers, Hatem Ben Amor

Dynamic constraint aggregation is a new approach introduced to speed up the column generation method when solving degenerate set partitioning problems. This approach profits from degeneracy to reduce significantly the size of the master problem and the number of iterations. Starting from a good heuristic solution leads to big savings in solution time. Preliminary tests on some hard crew pairing problems are very encouraging even if we used the trivial initial solution: "follow the aircraft".

4 - Aircrew Pairings with Possible Repetitions of the Same Flight Number

Mohammed Saddoune, PhD Student, Ecole Polytechnique and GERAD, C.P. 6079, Succ. Centre-Ville, Montreal, H3C 3A7, Canada, mohammed.saddoune@gerad.ca, Guy Desaulniers, Francois Soumis

In the industry, the crew pairing problem is usually solved by the traditional three-phase approach: daily, weekly, and monthly problems. Based on real data, the first contribution is to show that this approach is less efficient compared to rolling horizon approach when the data are not regular. The second one is to show even if the data are completely regular then a direct optimization on the weekly problem without exploiting the daily solution produces better solutions.

■ SC06

Wellington - CC Lev. 1

Timetabling and Scheduling

Contributed Session

Chair: Jaime Mora, Head, Graduate Program in Industrial Engineering, Tecnológico de Monterrey, Campus Estado de Mexico, Carr. Lago de Guadalupe, km 3.5, Atizapón, 52926, Mexico, jmora@itesm.mx

1 - Development of Genetic-based Machine Learning for Network Intrusion Detection (GBML-NID)

Wafa' Al-Sharafat, Al al-Bayt University, Jordan-Zarqa-dulai P.O 13136 Box 180, Zarqa, 13136, Jordan, wafa@aabu.edu.jo

This paper will incorporate different techniques to detect intrusion from normal packet. Among several techniques, Steady State Genetic-based Machine Learning Algorithm (SSGBML) will be used. Steady State Genetic Algorithm (SSGA) is used as a discovery mechanism where ZCS plays the role of detector by matching incoming message with classifiers to determine if the message normal then receiving feedback from environment. Within SSGA, Fuzzy Logic will be implemented on crossover and mutation.

2 - Integrated Berth and Quay Crane Allocation to Container Vessels

Jiyin Liu, Professor of Operations Management, Loughborough University, Business School, Loughborough, LE11 3TU, United Kingdom, j.y.liu@lboro.ac.uk, Zheng Tong

We formulate an integer programming model for the integrated berth and quay crane allocation problem at container terminals with multiple berth areas. The model considers remaining services carried over from the previous planning period as well as the vessels to arrive. The service time of a vessel is dependent on its workload, the berth area it is allocated to and the number of quay cranes assigned to it. Numerical examples are provided to demonstrate the model effectiveness.

3 - Incorporating the Competition Effects on an Airline Itinerary Design

Jenny Diaz Ramirez, Assistant Professor, ITESM Campus Toluca, Eduardo Monroy Cardenas 2000 San Antonio, Toluca, 50110, Mexico, jenny.diaz@itesm.mx, Yaneth Garzon Sanchez

Starting with an airplane routing algorithm that selects routes satisfying maintenance constraints and defines the airline itinerary, we include a dynamic utility function that incorporates the effects of the competition produced by the flights already selected in previous routes. This function is penalized by another function that considers the changes of the market's demand within related time windows.

4 - The Logic of Multiple Shifts in K-12 Public Schools and the Optimal Reassignment of Teachers to Improve Process Quality: The Case of the Dominican Republic

S Claudina Vargas, Complex Systems Optimization Lab, Northampton, MA, scvargas@cosola.org

This work deals with the design of a simulation and optimization model to study optimal reassignment of teachers within and between public K-12 school centres in the Dominican Republic. Public primary and secondary education in the DR are organized in shifts to accommodate increasing demand. A teacher generally works multiple shifts within a school or between schools and may teach different subjects at/or different levels per shift. This strategy reduces the effective school day to less than three hours per shift without reducing class size. In addition, it practically eliminates time for class preparation and individualized student attention. Thus, it limits quality improvement. The purpose of this work is to develop tools to evaluate virtual scheduling alternatives and teacher reassignments that can improve process quality while also minimizing cost.

5 - A Hybrid Simulated Annealing-genetic Algorithm for Course Time Tabling Problem

Jaime Mora, Head, Graduate Program in Industrial Engineering, Tecnologico de Monterrey, Campus Estado de Mexico, Carr. Lago de Guadalupe, km 3.5, Atizapon, 52926, Mexico, jmora@itesm.mx, Juan Frausto-Solis, Miguel Gonzalez Mendoza

Course timetabling problem (CTP) consists on assigning a set of courses into a limited group of timeslots. Among the huge variety of algorithms proposed to solve it, Simulated Annealing (SA) is one with the best performance, even though not always find the optimal solution. In this paper a new hybrid algorithm named SA-GA is presented, it uses SA with Genetic Algorithms. This hybridization uses a Markov tuning approach with a good exploration feature given by the genetic method.

■ SC07

Metro Grand West - CC Lev. 2

Tutorial: Trajectory-based Methods

Cluster: Tutorials

Invited Session

Chair: Michel Gendreau, CIRRELT/University of Montreal, C.P. 6128, succ. Centre-ville, Montreal, QC, H3C 3J7, Canada, michel.gendreau@cirrelt.ca

1 - An Introduction to Trajectory-based Heuristics

Michel Gendreau, CIRRELT/University of Montreal, C.P. 6128, succ. Centre-ville, Montreal, QC, H3C 3J7, Canada, michel.gendreau@cirrelt.ca

We present an overview of the main heuristic methods that rely on the local search paradigm and follow a trajectory to explore the solution space of problems: classical Local Search, Simulated Annealing, Tabu Search, Variable Neighborhood Descent, etc. Applications of these approaches in the fields of location and vehicle routing will also be presented and discussed.

■ SC08

Pier 2 - H Conv. Lev.

Health Care Applications

Contributed Session

Chair: Nima Behkami, Portland State University, Dept Engineering, Portland, United States of America, behkamin@hotmail.com

1 - Real Options Models for Research Resource Planning in the Pharmaceutical Industry

Jiun-Yu Yu, Dr., Department of Business Administration, National Taiwan University, 9F, Building 1, College of Management, No. 1, Section 4, Roosevelt Road, Taipei, Taiwan - ROC, jyyu@ntu.edu.tw

This paper aims to contribute to the task of improving the efficiency of pre-clinical research by building stochastic models with nonlinear optimization and Real Options Analysis. The models investigate the numbers of scientists to be allocated to the successive, and where appropriate repeated, stages of a pre-clinical new drug discovery project so as to increase its profitability. The number of distinct series of compounds to be explored in the search for candidate drugs is also investigated.

2 - Eliciting Patient Preferences: An Inverse MDP Approach

Lisa Maillart, Assistant Professor, University of Pittsburgh, 1030 Benedum Hall, Pittsburgh, PA, 15261, United States of America, maillart@pitt.edu

We propose a new approach for estimating patient preferences over health states. The goal is to find the set of health values "closest" to the non-quality adjusted estimates such that the patient's observed behavior is optimal. An application involving the optimal timing of a living-donor liver transplant is used to illustrate the proposed methods.

3 - Measuring Health, Life Style and Stress as Latent Variables

Fredrik Odegaard, Ivey School of Business, University of Western Ontario, 1151 Richmond Street, London, ON, N6A 3K7, Canada, fodegaard@ivey.uwo.ca, Pontus Roos

In this paper we present a methodology based on Structural Equation Models to study the interaction between health, life style and stress of an individual. Health refers to the physical and mental condition, life style refers to an individuals ability and desire to perform daily life activities, and stress refers to the persons environment. We illustrate the methodology with results from a co-hort study of 2000 Swedish manufacturing workers.

4 - Modeling Healthcare Information Technology (HIT) Adoption Using Systems Dynamics

Nima Behkami, Portland State University, Department Engineering, Portland, United States of America, behkamin@hotmail.com, Tugrul Daim, David Dorr

Healthcare organizations face barriers to learning in complex systems. Successful approaches to learning require formal models & simulation methods. Using Systems Dynamics we have developed a series of insightful adoption & dissemination models for a HIT Care Management application. These models allow us to influence potential adopters and facilitate them through the persuasion, decision, implementation and confirmation stages of the innovation decision process.

■ SC09

Pier 3 - H Conv. Lev.

Supply Chain Performance I

Contributed Session

Chair: Yavuz Acar, Bogazici University, Istanbul Turkey, Istanbul, Turkey, yavuz.acar@boun.edu.tr

1 - Empirical Study of Profitability and Firm-specific, Macro-economic Factors of Food Sector in Pakistan

Nousheen Tariq Bhutt, International Islamic University, Islamabad, SECTOR H/10, Islamabad, Pakistan, imaantariq@gmail.com

The aim of this study is to examine the effect of macroeconomic factors on profitability of food sector in Pakistan. In this research, I have selected a sample of 12 Pakistani food sector firms listed on Karachi Stock Exchange for a period of 5 years from 2002-2006. I have studied the effect of different variables including debt to equity, tangibility, growth, size and food inflation the on the profitability of Pakistani firms. Correlation, and regression method was used for analysis. I found that there is a significant negative relationship between size and profitability. I also found that there is a positive relationship between tangibility and growth of the firm and its profitability but is insignificant relationship. There is also an insignificant negative relationship between debt to equity ratio of firm and its profitability. I found that there is an insignificant positive relationship between macroeconomic factors and profitability.

2 - Impact of Forecasting Method Selection on Supply Chain Performance

Youqin Pan, Student, University of North Texas, 1155 Union Circle #305249, Denton, TX, 76203, United States of America, Youqin.Pan@unt.edu, Robert Pavur

This paper investigates the impact of forecasting method selection on a supply chain consisting of one supplier and one retailer under different demand patterns via simulation. The findings can help supply chain managers select proper forecasting methods to improve supply chain performance.

3 - Coordination Among Producer, Distributor, and 3PL Provider in a Fresh Product Supply Chain

Jian Chen, Professor, Tsinghua University, School of Economics and Management, Beijing, 100084, China, jchen@tsinghua.edu.cn, Xiaoqiang Cai, Yongbo Xiao, Xiaolin Xu

We consider a supply chain in which a producer supplies a fresh product to a distributor at a distant export market, with the product transported through a 3PL provider. The transportation time is uncertain and the product may decay and deteriorate during the transportation. The transportation cost and loss are to be borne by the producer. Incentive schemes are proposed to motivate the coordination of the chain members. We show that the contracts proposed are incentive compatible.

4 - Forecasting Model Selection Based on Operational Benefits for a Global Specialty Chemicals Supply Chains

Yavuz Acar, Bogazici University, Istanbul Turkey, Istanbul, Turkey, yavuz.acar@boun.edu.tr, Everette Gardner, Sukran Kadipasaoglu

This paper evaluated alternative forecasting models based on operational performance in a global specialty chemicals supply chain. The forecasting models included in this study are simple exponential smoothing, additive trend, damped additive trend, and damped multiplicative trend. Our results underscore the importance of incorporating all relevant cost and customer service measures into the forecasting model selection process.

SC10

Salon A - H Conv. Lev.

Inventory Control and Management

Sponsor: Manufacturing and Service Operations Management
Sponsored Session

Chair: Hong Chen, Alumni Professor in Supply Chain Management, Sauder School of Business, 2053 Main Mall, Vancouver, BC, V6T 1Z2, Canada, Hong.Chen@sauder.ubc.ca

1 - Joint Replenishment and Re-distribution in Supply Networks

David D. Yao, Professor, Columbia University, IEOR Dept, New York, NY, 10027, United States of America, yao@columbia.edu

We demonstrate that two decisions in a wide range of supply networks, the initial replenishment quantities and the in-period redistribution necessitated by supply-demand imbalance, contribute to the overall value function in qualitatively different ways, with a separation of scales: the contribution of the former is in the order of the demand rate; whereas that of the latter is in the lesser, square-root order of the demand rate.

2 - Demand Shaping through Bundling: A Dynamic Multiproduct Inventory-pricing Model

Jeannette Song, Professor, Duke University, Fuqua School of Business, Duke University, Durham, NC, 27708, United States of America, jingsheng.song@duke.edu, Zhengliang Xue

We study joint optimal inventory, pricing and bundling decisions over a finite horizon. We show that component complementarity, cost structure, initial inventory and demand uncertainty all drive the bundling strategy. For vertically differentiated products, the desired bundling composition depends on the ratio of cost gap to quality gap.

3 - The Impact of the Transfer Pricing Method for Tax Purposes on the Operational Decisions of a Firm

Kun Soo Park, Columbia University, IEOR Department, 500 West 120th Street, New York, United States of America, kp2143@columbia.edu, Woonghee Tim Huh

Since the transfer price of intra-firm transactions affects the profits of the subdivisions of a firm, the accounting of transfer pricing is regulated by tax authorities. We consider two popular transfer pricing methods for tax purposes, and compare their impacts on the operational decisions of a firm.

4 - Joint Pricing and Inventory Decision in an Inventory System with General Demand Function

Hong Chen, Alumni Professor in Supply Chain Management, Sauder School of Business, 2053 Main Mall, Vancouver, BC, V6T 1Z2, Canada, Hong.Chen@sauder.ubc.ca, Zhan Zhang

We consider the optimal pricing and inventory replenishment decision in an inventory system with the random demand dependent on price. The objective is to maximize the total expected discounted profit. When the demand is concave in price, a base-stock list-price policy has been shown optimal. However, many theoretic and empirical models suggest demand not be concave in price. In this talk, we explore to what extent BSLs policy is still optimal without the concave assumption.

SC11

Salon C - H Conv. Lev.

Health Care Operations and Analysis

Sponsor: Health Applications Section
Sponsored Session

Chair: John Blake, Dalhousie University, Halifax, NS, B3J 2X4, Canada, john.blake@ns.sympatico.ca

1 - Platelet Ordering: A Random Walk with Ponce de Leon

John Blake, Dalhousie University, Halifax, NS, Canada, john.blake@dal.ca, Nancy Heddle

The platelet ordering problem is difficult to solve because of the computational complexity created by the short shelf life of platelets. A number of approaches have been advanced based on cost minimization. However, in practice, cost

minimization is questionable, since it is difficult to evaluate the cost of a shortage or an outdate. In this talk we suggest a simple, analytical approach based on finding acceptable outdate and shortage rates.

2 - A Reusable Framework for Modelling Diagnostic Waitlists in Nova Scotia

Sean Sangster, Dalhousie University, 112-456 Parkland Drive, Halifax, NS, B3S1P8, Canada, sean.sangster@dal.ca

A reusable framework has been created to model diagnostic waitlists in Nova Scotia. This framework will be implemented as part of a desktop forecasting tool for clinic managers. The tool will predict waitlist size, informing managers of potential capacity shortages in time to respond.

3 - Evaluating Diagnostic Tests

Steve Gallivan, s.gallivan@ucl.ac.uk, Martin Utley

Diagnostic tests that rely on a biochemical assay measurement being above a critical value are often evaluated using ROC curves. Using a range of potential critical values, one plots sensitivity versus (1 - specificity) to summarise diagnostic characteristics of the test. Statistics can also be carried out by analysing the area under the curve (AUC), the assumption being that the greater the AUC, the better the test. We discuss potential flaws in this apparently reasonable method of analysis.

4 - Modelling to Test Assumptions Concerning the Benefit of Thoracic Surgery

Martin Utley, University College London, Gower Street, London, United Kingdom, m.utley@ucl.ac.uk, Tom Treasure, Francesca Fiorentino

As part of a programme of research to explore and, as appropriate, challenge the evidence-base for thoracic surgery, simple mathematical models have been developed to assess assumptions made about the benefit conferred by surgery on two groups of cancer patients. The presentation will draw on work concerning radical surgery for malignant pleural mesothelioma and the resection of pulmonary metastases in colorectal cancer patients. In both cases, our findings undermine the presumption of efficacy.

SC12

Pier 4 - H Conv. Lev.

Perspectives on Electronic Negotiation Support

Sponsor: Group Decision and Negotiation Section: GDN 2009
Sponsored Session

Chair: Sabine Koeszegi, Professor, Vienna University of Technology, Theresianumgasse 27, Vienna, 1040, Austria, Koeszegi@imw.tuwien.ac.at

1 - What Are You Looking For? Information Presentation in Electronic Negotiation Support

Johannes Gettinger, Vienna University of Technology, Theresianumgasse 27, Vienna, 10400, Austria, Gettinger@imw.tuwien.ac.at, Sabine Koeszegi

An element of utter importance in the human-machine interface is to assist decision makers not only to overcome mental resource limitations and to extend human processing abilities, but also to retrieve the most relevant information efficiently. The aim of this paper is to develop a conceptual model of how information presentation, task type, user characteristics and task complexity affect human decision making and to discuss implications of these findings for the development of an effective eNS.

2 - Antecedents and Effects of Communication Quality in Electronic Business Negotiations

Katja Ostertag, University of Hohenheim, 70593 Stuttgart, Schloss, Osthof-Nord, 70599, Germany, katja.ostertag@wi1.uni-hohenheim.de, Mareike Schoop

Due to reduced social and personal cues in electronic interaction, the way people communicate plays a crucial role. Based on empirical data, we describe what shapes the level of communication quality in electronic business negotiations (coherence, negotiators' predispositions etc.). Further, we analyse the effects of different communication quality levels on negotiation outcome measures. This research aims at improving communication-oriented electronic negotiation support.

3 - Perspectives on Electronic Negotiation Support

Sabine Koeszegi, Professor, Vienna University of Technology, Theresianumgasse 27, Vienna, 1040, Austria, Koeszegi@imw.tuwien.ac.at, Michael Filzmoser, Johannes Gettinger, Rudolf Vetschera

In order to provide the foundation for effective eNS Design, we develop in this paper a broad perspective on negotiations since potential benefits of eNS are closely related to their effectiveness in orchestrating the interplay of: the specific support approach or philosophy (system), its actual implementation in support features (technology), and the particular characteristics of users, i.e. their cognitive restrictions, their socio-emotional states and their preferences and goals (human).

■ SC13

Pier 5 - H Conv. Lev.

Strategic Analysis of Group Decisions

Sponsor: Group Decision and Negotiation Section: GDN 2009
Sponsored Session

Chair: Kevin Li, Assistant Professor, University of Windsor,
Odette School of Business, Windsor, ON, Canada, kwli@uwindsor.ca

1 - A Perspective on Fuzzy Preferences in Conflict Resolution

M Abul Bashar, Doctoral Student, University of Waterloo,
200 University Ave. West, Waterloo, ON, N2L 3G1, Canada,
mabashar@engmail.uwaterloo.ca, Marc Kilgour, Keith Hipel

The literature on fuzzy preferences is surveyed and compared in order to suggest effective designs for modeling fuzzy preferences for use in conflict resolution. Fuzzy preference is defined via a fuzzy relation in an attempt to capture more realistic realizations over the alternatives or states. The usefulness of fuzzy preferences for describing uncertain preferences in conflict resolution is investigated through examples.

2 - A Quasi-Newton Approach for Learning in the Context of Electronic Negotiation

Rangaraja Sundarraj, Professor, Qatar University, College of
Business and Economics, P.O. Box 2713, Doha, 2713, Qatar,
rsundarraj@qu.edu.qa, Paul Meloche

In this paper, we consider the problem of learning the parameters of a decision-function that has recently obtained significant interest in the electronic negotiation literature. We evaluate several nonlinear optimization methods in order to provide an improvement over previous results obtained. The methods are evaluated by generating random negotiation replications and compared in terms of their ability to accurately estimate the learning parameters under consideration.

3 - Matrix Representation of Conflict Resolution in the Graph Model with Strength of Preferences

Haiyan Xu, Doctoral Student, University of Waterloo,
200 University Ave., Waterloo, ON, N2L 3G1, Canada,
xuhaiyan63@hotmail.com, Keith W. Hipel, Marc Kilgour

Several stability definitions in the graph model with strength of preferences are presented using explicit matrix formulations instead of graphical or logical representations. The matrix representation of solution concepts facilitates the development of improved algorithms to assess the stabilities of states and to implement new stability concepts.

■ SC14

Pier 7 - H Conv. Lev.

Online Social Networks

Sponsor: Information Systems
Sponsored Session

Chair: Param Singh, Assistant Professor, Carnegie Mellon University,
5000 Forbes Avenue, Pittsburgh, PA, 15213, United States of America,
psidhu@cmu.edu

1 - Value of Software Innovations: The Influence of Quality, Structure and Diversity of Ties

Harpreet Singh, University of Connecticut, 2100 Hillside Road,
Unit 1041, Storrs, CT, 06269-10, United States of America,
Harpreet.Singh@business.uconn.edu, Xinxin Li, Ram Gopal

In this study, we use software patent data to investigate the impact of social capital accrued by inventors from collaboration networks in which they are embedded on value of software innovation. We find that quality of a team's external direct contacts, regional diversity of external ties of a team and external cohesion has significant positive influence, technical diversity has negative influence and the quality of indirect contacts has no significant impact on value of software innovation.

2 - Review Social Networks and the Generation of Review: A Case of Epinions.com

Yingda Lu, Student, Carnegie Mellon University, Carnegie Mellon
University, 5000 Forbes Avenue, Pittsburgh, PA, 15213,
United States of America, yingdal@andrew.cmu.edu, Param Singh,
Kinshuk Jerath, Ramayya Krishnan

In this study, we investigate the relationship between social networks and the creation of user-generated content on Epinions.com by modeling the co-evolution of the "webs of trust" of reviewers and their review behavior. The modeling framework and results from this study contribute to the understanding of how social structures affect the generation of user-generated content and vice versa.

3 - Do I Follow My Friends or Crowds? Examining Informational Cascades in Online Movie Reviews

Young-Jin Lee, University of Washington, Box 353200, Seattle,
WA, 98195-3200, United States of America,
younglee@u.washington.edu, Yong Tan

Online product reviews can be regarded as an intrinsic quality expression of each individual consumer's product evaluation. There are two distinct sources of information beside a reviewer's own signal in writing a product review: other reviewers' quality consensus and social conformity in online friend environment. Examining informational cascade in online reviews, we study closely how predecessors' ratings influence a subsequent reviewer's quality evaluation with respect to these information.

■ SC15

Pier 8 - H Conv. Lev.

IT Value in Organizations

Sponsor: Information Systems
Sponsored Session

Chair: Barrie R Nault, Haskayne School of Business, University of
Calgary, Calgary, AB, T1W 2L6, Canada, nault@ucalgary.ca

1 - Capturing IT Value as Illusory Correlation

Victoria L Mitchell, Associate Professor, Haskayne School of
Business, University of Calgary, Calgary, AB, Canada,
mitchelv@ucalgary.ca

IT value in organizations is often a subjective measure. An impediment to accurately measuring IT value is illusory correlation among different organizational users. This study examines illusory correlation among project managers, IT managers, and system users in capturing satisfaction as a measure of IT value. Implications for research are addressed.

2 - Moderated Online Communities

Jianqing Chen, Haskayne School of Business, University of
Calgary, Calgary, AB, Canada, jiachen@ucalgary.ca, Hong Xu,
Andrew Whinston

To induce quality content for online communities, we introduce moderation into reputation systems. We show that under moderation commentators may display a pattern of reputation oscillation—they generate useful content to build up high reputation and then exploit it. The expected performance from high reputations can thus be inferior to that from low reputations. We then discuss the optimal moderation resource allocation, and conclude that reputation oscillation may arise as an optimal result.

3 - Economic Study of Software Reuse

Yonghua Ji, Assistant Professor of MIS, School of Business,
University of Alberta, Edmonton, AB, T6G2R6, Canada,
yji@ualberta.ca

Software reuse has the advantages of increasing the productivity of software teams, and enhancing the reliability of future software projects. However, the benefit of software reuse might not always realize due to several reasons, one of which is the lack of managerial incentive. This work studies the incentive issues in software reuse and highlights managerial implications from this work.

4 - The Monologue of the Group: Wiki Affordances and Organizational Work

Ofer Arazy, School of Business, University of Alberta, Edmonton,
AB, Canada, ofer.arazy@ualberta.ca, Esther Brainin, Stan Ruecker

IT has the potential to shape organizations in various ways, among them is mass collaboration. A primary IT supporting mass collaboration is wiki. Wikis have several affordances and this paper examines the work processes enabled by these wiki affordances. The objective of this paper is to chart the emerging domain of wiki-enabled mass collaboration: identify the primary wiki affordances, point to relevant theoretical foundation, and discuss principal predictor and criterion variables.

■ SC18

Dockside 1 - H Lower Lev.

OR Applications in Forest Management

Cluster: Forestry
Invited Session

Chair: Eldon Gunn, Dalhousie University, 5269 Morris St, Halifax, NS,
B3H 4R2, Canada, eldon.gunn@dal.ca

1 - Choosing Among Surface Erosion Monitoring Schemes

David Tomberlin, Economist, NOAA Fisheries, 1315 East-West
Highway, Silver Spring, MD, 20901, United States of America,
David.Tomberlin@noaa.gov

This paper presents a framework for choosing among different protocols for monitoring sediment loading from logging roads when the protocols differ in cost and in the quality of the information they provide. A partially observable Markov decision process approach identifies the conditions under which each protocol is preferred, taking into account the expected costs and benefits of available management actions, as well as the cost and quality of information provided by each monitoring protocol.

2 - Strategic Facility Location in a Wood Products Supply Chain: An Agent Based Approach

Saba Vahid, PhD Candidate, Faculty of Forestry, UBC, #4219, 2424 Main Mall, Vancouver, BC, V6T1Z4, Canada, saba_v@interchange.ubc.ca, Thomas Maness

To regain competitiveness, British Columbia (BC) wood products industry can greatly benefit from the concept of Supply Chain Management. Agent-based modelling has been used frequently in recent years to model complex supply chains (SC). Using agents offers more flexibility compared to traditional simulation and optimization models. We modify and extend an existing agent-based model in our research, in order to determine optimal location and product type for possible new mills in the BC coast.

3 - Very Large Scale Models for Strategic Forest Planning: Why and How?

Eldon Gunn, Dalhousie University, 5269 Morris St, Halifax, NS, B3H 4R2, Canada, eldon.gunn@dal.ca

The current emphasis on both ecosystem management and the forest products supply chain argues for highly spatial strategic models designed for interactive analysis. Formulated as an LP, these models can easily exceed a million variables. To be effective, we need to be able to solve them quickly, initially, and after making modifications to constraints. This paper discusses why we need these models and indicates how we can obtain the rapid solution using ideas from Forrest sprint approach.

■ **SC19**

Dockside 2 - H Lower Lev.

Innovation

Contributed Session

Chair: Ray Fung, Harvard Business School, Soldiers Field Park Campus, Morris F156, Boston, MA, 02134, United States of America, rfung@hbs.edu

1 - Cultural Distance and New Product Development in MNCs

Masoomah Moharrer, Politecnico di Milano, Dipartimento di Ingegneria Gestionale, Via Giuseppe Colombo, 40, 20133 Milano, Milan, Italy, negar602001@yahoo.com

We propose how cultural heterogeneity is expected to increase innovative performance in MNCs. By diversification firms can have access to the opportunities that don't exist in their own situation. The more distant the clusters are the more different the existing opportunity would be so MNC can benefit from a pool of idea that is created as the result of the heterogeneity of culture. We used the theories of strategy and organizational learning to show that cultural heterogeneity can benefit MNCs.

2 - Does IPO Foster Profitability Rather Than Innovation

Moren Levesque, Associate Professor, University of Waterloo, Department of Management Sciences, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, levesque@uwaterloo.ca, Nitin Joglekar

We use the concept of growth equilibrium to derive prescriptions on the growth of new business enterprises, considering the law of motion of their revenues and R&D expenses. We use a sample of enterprises that went public between 1992 and 2002 to test these prescriptions 5 years after their respective initial public offering.

3 - Whither Innovation Strategy? A Conceptual Framework

Ray Fung, Harvard Business School, Soldiers Field Park Campus, Morris F156, Boston, MA, 02134, United States of America, rfung@hbs.edu

I review both the innovation and strategy literature to attempt to see if the two can be integrated into a combined innovation strategy literature. I then propose a theoretical framework of four different methods with which both literatures could be merged, the preconditions in which those methods would hold, and the predictions of each method. Future researchers may then test the predictions to see which of the methods is most apt to describe real-world innovation strategy.

■ **SC20**

Dockside 3 - H Lower Lev.

Risk Management I

Contributed Session

Chair: Isabel Cordeiro, Dr., Universidade do Minho and CEMAPRE/ISEG, EEG, Universidade do Minho, Gualtar, Braga, 4710-057, Portugal, icordeiro@eeg.uminho.pt

1 - Regime Switch of Financial Time Series - Problems and Evidence

Tibor Kis, Professor, Faculty of Economics, 9-11, Segedinski put, Subotica, Vo, 24000, Serbia-Montenegro, tbkis@yahoo.com, Marija Cileg

Historical financial data often perform behavior that indicates severe alterations in some periods compared to that exhibited formerly. In this paper we investigate possibilities of finding out shifts in financial time series, causes of changes, track historical evidence and try to trace signals in data that could give short term prediction of unexpected shifts.

2 - Dynamic Pricing of one Seasonal Product with Demand Learning Using Aggregating Algorithm

Weihong Jin, Queen's School of Business, Room 401, 143 Union St., Goodes Hall, Kingston, ON, K7L3N6, Canada, wjin@business.queensu.ca

We consider a pricing problem faced by a retailer who sells one seasonal product over a limited horizon. The demand for the product is completely unknown before the sales season. The goal is to make decisions on three-stage markdown prices and the timing of price changes. We formulate the pricing problem as a dynamic program, in which parameters are learned using Aggregating algorithm. The numerical experiments show the effectiveness of the algorithm in learning.

3 - Portfolio Optimization with Transaction Costs: Solving Mixed Integer Quadratic Programs

Bharath Rangarajan, Assistant Professor, University of Minnesota, 111 Church Street SE, Mechanical Engineering Department, Minneapolis, MN, 55414, United States of America, ranga013@umn.edu

We propose use of polyhedral approximations to quadratic programs as well as column/constraint generation ideas to solve large-scale portfolio optimization problems with fixed transaction costs. The work shows that even without column/constraint generation the method works very well. We propose maintaining a library of constraints that will be used to generate a select set of constraint cuts, implemented along with a branch and bound method.

4 - Sensitivity Analysis of the Moments of the Profit on an Income Protection Policy

Isabel Cordeiro, Dr., Universidade do Minho and CEMAPRE/ISEG, EEG, Universidade do Minho, Gualtar, Braga, 4710-057, Portugal, icordeiro@eeg.uminho.pt, Pedro Magalhães

Income Protection (IP) is a class of long-term sickness insurance which provides cover against the risk of loss of income due to disability. The main purpose of this paper is to carry out a sensitivity analysis where we analyse the effects on the mean of the profit on a policy and two risk measures of changing the values of the transition intensities defined for a multiple state (semi-Markov) model for the analysis of IP data.

■ **SC21**

Dockside 4 - H Lower Lev.

Decision Support Applications I

Contributed Session

Chair: Pranil Prasad, Assistant Lecturer, The University of the South Pacific, Laucala Bay Rd., Suva, Fiji, prasad_pn@usp.ac.fj

1 - Real-time Planning and Scheduling System for Industrial Minerals Production

Zhehui Hugh Zhong, Simulation Consultant, Visual8 Corporation, 1505 Hurontario St., Mississauga, ON, L5G3H7, Canada, hugh.z@visual8.com, Christopher Milligan

Simul8-Planner is an event-based scheduling tool used in a wide variety of process environments. Here we present a real-time application at an industrial minerals plant. In addition to meeting production constraints, the solution supports variances in demand, product quality, and inventory via blending. Solution elements use MIP, asymmetric TSP and adaptive scheduling heuristics. These are combined under a web-based interface to create a flexible system that coordinates all plant activities.

2 - On the Usage of PLS Versus SEM in Technology Adoption Research: A Comparative Simulation

Alan Brandberry, Kent State University, Management & Information Systems Department, Kent, OH, 44236, United States of America, abrandyb@kent.edu, Murali Shanker, Marvin Troutt

Information systems research has seen a widespread but somewhat controversial application of Partial Least Squares (PLS) or component-based methods in the analysis of path models (as opposed to covariance-based SEM). As much of this research has been in the area of technology adoption, it is this study's objective to analyze the conditions where PLS may be both useful and problematic within this particular domain by employing classic adoption studies as the basis for a comparative simulation.

3 - A Parallel Simulated Annealing for a Multi-objective Maintenance Workforce Scheduling Problem

Nima Safaei, Postdoctoral Fellow, University of Toronto, 5 King's College Rd, Toronto ON M5S 3G8, Canada, safaei@mie.utoronto.ca

A parallel Simulated Annealing algorithm with multi-threaded architecture is proposed to solve a multi-objective maintenance workforce scheduling problem. The conflicting objectives are the minimization of the equipment downtime caused by the maintenance tasks and minimization of the requirements of the skilled workforce.

4 - Information Systems and Fraud Detection

Pranil Prasad, Assistant Lecturer, The University of the South Pacific, Laucala Bay Rd., Suva, Fiji, prasad_pn@usp.ac.fj, Arvind Patel

This research paper will look at the impact of information systems on the detection of fraud in organizations. The use of computers in organizations has led to many new risks for businesses. This in turn has an impact on the audit of a client and the detection of fraud committed with use of computer information systems.

Sunday, 3:30pm - 5:00pm

SD01

Frontenac - CC Lev. 1

Dynamic Traffic Assignment - Recent Progress

Sponsor: Transportation Science & Logistics

Sponsored Session

Chair: Michael Florian, Professor Emeritus, University of Montreal, P.O. Box 6128, Station, Montreal, QC, H3C 3J7, Canada, mike@crt.umontreal.ca

1 - Factors Affecting Convergence and Stability in Simulation-based Dynamic Traffic Assignment

Michael Mahut, INRO, 5160 Decarie Boulevard, Suite 610, Montreal, QC, H3X 2H9, Canada, michaelm@inro.ca, Nicolas Tremblay, Michael Florian

A number of factors can have a significant impact on convergence and stability of a simulation-based DTA model, such as the size and complexity of the network, overall level of congestion, level of detail of the embedded traffic model, temporal discretization and stochastic effects. We present some insights into these factors obtained through numerical experiments on actual networks, and also compare the performance of different assignment algorithms in the presence of these factors.

2 - Model-based Data Fusion Framework for Real-time Traffic Prediction

Moshe Ben-Akiva, Massachusetts Institute of Technology, 77 Massachusetts Ave, Cambridge, MA, 02139, United States of America, miba@mit.edu, Constantinos Antoniou, Eric Huang, Jorge Lopes, Yang Wen

A model-based data fusion framework for real-time traffic state prediction is presented. The framework is validated on the Brisa A5 Motorway, a 25-km inter-urban highway in Portugal, equipped with a number of traffic detectors including inductive loop sensors, automatic video processing cameras, electronic tolling and point-to-point sensors. The data is collected and fused in real-time within the DTA system DYNAMIT. Scalability issues and next research steps are also discussed.

3 - Dual Approximation and a MSA-based Heuristic for Dynamic Congestion Pricing

Travis Waller, University of Texas at Austin, 1 University Station C1761, Austin, TX, 78712, United States of America, stw@mail.utexas.edu, Avinash Unnikrishnan, Dung-Ying Lin

Techniques to determine the time-varying tolls in a traffic network will be presented. The dual-based methods exploit the LP structure of the network

problem which uses Cell Transmission Theory for propagation. Solutions for both the first best and second best time-varying tolls are sought in a computationally efficient manner. Numerical experiments are conducted on two networks to show the efficacy of the heuristic. A maximum optimality gap of 2.03% is obtained for the examined cases.

SD02

Queens Quay I - CC Lev. 1

Optimization and Networks

Cluster: Optimization/Combinatorial Optimization

Invited Session

Chair: Monica Cojocaru, Assoc. Professor, University of Guelph, 50 Stone Road East, Guelph, ON, N1G 2W1, Canada, mcojocar@uoguelph.ca

1 - On the Curvature of the Central Path in Linear Programming

Chris Voicu, McMaster University, Canada, chisv@math.mcmaster.ca

We present recent results regarding the curvature of the central path in Linear Programming in analogy with the geometric diameter.

2 - Cone Programming Relaxations for Complementarity Constraints

Juan Vera, University of Waterloo, juancavera@gmail.com, Jay Hu

We present new theoretical results on new relaxations schemes for polynomial programming. These relaxations are specially suited to be applied on problems with complementarity constraints. These relaxations can be casted as second-order cone programming problems or semidefinite programming problems, and are shown to be exact, i.e. to provide the global optimum, in some cases.

3 - Network Equilibrium Problems and Hybrid Dynamical Systems

Scott Greenhalgh, University of Guelph, Guelph, N1G 2W1, Canada, greenhas@uoguelph.ca, Monica Cojocaru

We present a numerical scheme for describing the time evolution of a class of network equilibrium problems. Our method is based on an approach from hybrid dynamical systems and blends in with previous approaches for studying equilibrium problems, coming from optimization and/or variational inequalities. This is joint work with Monica Cojocaru, University of Guelph.

4 - Dynamic Competition in Electricity Markets: Hydropower and Thermal Generation

Henry Thille, Assoc. Prof. Economics, University of Guelph, hthille@uoguelph.ca, Talat Genc

We study dynamic competition between hydro and thermal electricity generators in a stochastic environment. We examine settings in which either demand is uncertain or the reservoir replenishment of the hydro producer is uncertain. Each producer is constrained: the thermal generator by capacity and the hydro generator by water availability. We use collocation methods to solve the hydro producer' dynamic programming problem, providing an approximation to the value function.

SD03

Queens Quay II - CC Lev. 1

Network Design

Contributed Session

Chair: M. Eugenia Captivo, Associate Professor, University of Lisbon, Faculty of Sciences, Campo Grande, Bloco C6, Piso 4, Lisboa, 1749-016, Portugal, mecaptivo@fc.ul.pt

1 - Refinery and Petrochemical Network Integration

Khalid Alqahtani, University of Waterloo, 431 Beaver Creek Rd, Waterloo, On, N2V 2J8, Canada, qahtanky@yahoo.com, Abdunnaser Younes, Ali Elkamel

This work addresses the design of integration and coordination between petroleum refinery and petrochemical networks. The refinery and petrochemical systems were modeled as a MILP problem. The performance of the proposed model was tested on industrial-scale examples of multiple refineries and a polyvinyl chloride (PVC) complex to illustrate the economic potential and trade-offs involved in the optimization of the network.

2 - A Node Rooted Flow-based Model for the Local Access Network Expansion Problem

Luis Gouveia, University Lisbon, Faculty of Sciences, DEIO - CIO, Cidade Universitaria, Bloco C6, Lisbon, Portugal, legouveia@fc.ul.pt, Margarida Goncalves

In the local access expansion problem, we need to expand a given tree network by increasing the capacity of the edges or by installing concentrating devices in some nodes of the network, in order to satisfy the increase in node demands. We review two flow-based models and present a new three indexed flow-based model. We test and compare the new and old models for instances with 100, 200 and 500 nodes in order to show the advantages of the new proposed model.

3 - Fast Converging Global Solution for Continuous Network Design Problem Using Radial Basis Functions

Joseph Chow, University of California, Irvine, 4000 Anteater Instruction and Research B, Irvine, CA, 92697, United States of America, ychow@uci.edu, Amelia Regan, Dmitri Arkhipov

A faster converging global optimization method is needed to integrate continuous network design solutions with hierarchical network models. The radial basis function method was shown to converge faster than genetic algorithm or simulated annealing for high-dimensional constrained objective functions. Such an algorithm is proposed for the continuous network design problem with promising results.

4 - A MILP Formulation for the Minimum Labeling Spanning Tree Problem

M. Eugenia Captivo, Associate Professor, University of Lisbon, Faculty of Sciences, Campo Grande, Bloco C6, Piso 4, Lisboa, 1749-016, Portugal, mecaptive@fc.ul.pt, Marta Pascoal, Joao Climaco

The minimum label spanning tree problem is a relevant problem, with applications in telecommunication or transportation networks, where each edge is assigned with a label (such as a color) and it is intended to determine a spanning tree with the minimum number of different labels. We introduce some mixed integer formulations for this problem and prove that one of their relaxations always gives the optimal value. Finally we present and discuss the results of computational experiments.

■ SD04

Bay Room - CC Lev. 1

Stochastic Programming: Computational Aspects and Applications in Finance

Cluster: Optimization/Stochastic Programming
Invited Session

Chair: Guzin Bayraksan, University of Arizona, 1127 E James E. Rogers Way, Tucson, AZ, 85721, guzinb@sie.arizona.edu

1 - Optimal Capital Growth with Convex Loss Penalties

Leonard MacLean, Herbert Lamb Chair in Business, Dalhousie University, 6100 University Avenue, Halifax, NS, B3H 3J5, Canada, l.c.macleam@dal.ca, Yonggan Zhao, William Ziemba

In this paper the traditional capital growth model and modifications to control risk are developed. A mixture model based on Markov transitions between market regimes is used for the dynamics of asset prices. Decisions on investment in assets are based on a constrained growth model, where the trajectory of wealth is required to exceed a specified path over time, and the path violations are penalized in a convex utility.

2 - Asset Allocation Based on Enhanced Indexation

Diana Roman, Lecturer, Brunel University, Kingston Lane, Uxbridge, UB83PH, United Kingdom, Diana.Roman@brunel.ac.uk

Enhanced indexation models are strategies for asset allocation with the intention of outperforming an index. Usually, the enhancement of the index is specified as excess return. Second order stochastic dominance (SSD) is a recognised choice criterion among random (portfolio) returns. We propose an enhanced indexation model based on SSD: the chosen portfolio improves on the index's return distribution until SSD efficiency is obtained. A numerical study illustrates the effectiveness of the method.

3 - Disjunctive Decomposition for Two-Stage Stochastic Mixed-Integer Programs with GUB Constraints

Guzin Bayraksan, University of Arizona, 1127 E James E. Rogers Way, Tucson, AZ, 85721, guzinb@sie.arizona.edu, Brian Keller

The disjunctive decomposition algorithm for stochastic integer programs uses disjunctive cuts based on knowledge that a variable is equal to 0 or 1. We examine stochastic integer programs with generalized upper bound (GUB) constraints in the second stage and exploit this structure to generate cuts based on alternative disjunctions. We show that the strength of the alternative cuts forms a hierarchy, and we explore the performance of the hierarchy on a scheduling problem.

■ SD05

Yonge - CC Lev. 1

Topics in Aviation OR

Sponsor: Aviation Applications
Sponsored Session

Chair: Thomas Vossen, University of Colorado, UCB0419, Boulder, CO, 80309, United States of America, Vossen@Colorado.EDU

1 - Air Traffic Controller Workload: Estimating Look-ahead Conflict Detection Counts

Nastaran Coleman, Sr. OR Analyst, U.S. Federal Aviation Administration, 800 Independence Ave, SW, Washington, DC, 20591, United States of America, nastaran.coleman@faa.gov, Ellis Feldman

Potential conflict detection and resolution are components of air-traffic controller workload contributing to sector complexity in the enroute environment. A linear programming model was developed to detect possible conflicts between any 2 aircraft, accounting for positional uncertainties. Optimizations reduced processing time, including eliminating aircraft pairs with no potential for conflict and preventing memory leaks.

2 - The FAA's System Wide Information Management (SWIM) Program

Eric (Rick) Helfers, Project Lead, BAE Systems, 7619 Lake Glen Dr, Glenn Dale, MD, 20769, United States of America, eric.helfers@baesystems.com

The SWIM Program is an integral part of the US National Airspace System (NAS) Enterprise Architecture Roadmap. SWIM will close performance gaps by developing a set of NAS services based on common standards and tools, using a Service-Oriented Architecture. SWIM will leverage existing systems and networks and will be based on technologies that have been proven in operational and demonstrations. The program has an incremental development plan to fit cost, schedule, and risk thresholds. SWIM provides the basis for information exchange between systems. Segment 1 is ongoing and Segment 2 is expected to initiate in June 2010.

■ SD06

Wellington - CC Lev. 1

Scheduling I

Contributed Session

Chair: Quentin Lequy, GERAD, 3000 Chemin de la Côté-Sainte-Catherine, Montreal, QC, H3T2A7, Canada, quentin.lequy@gerad.ca

1 - On a Scheduling Problem in the Packaging Industry

Jan van Vuuren, Professor, Stellenbosch University, South Africa, Department of Logistics, Private Bag X1, Matieland, WC, 7602, South Africa, vuuren@sun.ac.za, Alewyn Burger, Neil Jacobs, Stephan Visagie

Foil wrappers used for packaging snacks require multiple colour overlay printing. If consecutively scheduled print jobs require significantly different colour overlays, substantial (sequence-dependent) tear-down times (and fixed setup times) are incurred. Print schedules should therefore minimize the number of colour pallets required per printer and sequence them to minimize pallet wash times. This scheduling problem is solved exactly for small instances and heuristically for larger instances.

2 - Solving a Dock Assignment Problem as a Three-stage Flexible Flow-shop Problem

Lotte Berghman, KULEUVEN, Naamsestraat 69, Leuven, 3000, Belgium, lotte.berghman@econ.kuleuven.be, Roel Leus

We study a dock assignment problem based on a practical case. Trailers are scheduled on gates for loading or unloading; a parking lot is used as a buffer zone. Transportation between the parking lot and the gates is performed by additional resources called terminal tractors. The problem is modeled as a three-stage flexible flow shop, where the first and third stage consist of the same identical parallel machines and the gates constitute identical parallel machines in the second stage.

3 - The Refurbishing Flowshop Scheduling Problem

Yamei Tian, National ChiaoTung University, 1001 Tahsue Rd, Hsinchu, Taiwan - ROC, yamei.tian@gmail.com, Bertrand M.T. Lin, T. C. Edwin Cheng

We study a refurbishing flowshop that dismantles products into parts in stage one and refurbishes the parts on dedicated machines in stage two. The objective is to minimize the weighted sum of the completion times. Lower bounds are designed based on a disaggregation technique and the minimum assignment problem. We also analyze the performance ratio of an LP-relaxed heuristic approach. ILS- and ACO- based metaheuristic algorithms are developed for approximate solutions.

4 - A Large Neighborhood Search Algorithm for Activity Assignment Considering Flexible Shifts

Mahsa Elahipanah, GERAD research center, HEC Montreal, 3000, Chemin de la Coté-Sainte-Catherine, Montreal, QC, H3T 2A7, Canada, mahsa.elahipanah@gerad.ca, Guy Desaulniers

Given primary shifts containing one break each, the activity assignment problem with flexible shifts consists of assigning activities to the shifts so as to minimize activity undercoverage while allowing to slightly extend the shifts or move the breaks. A column generation formulation is proposed and used within a large neighborhood search algorithm to produce good quality solutions in fast computational times for large-sized instances.

5 - A Large Neighborhood Search Algorithm for Assigning Multiple Activities to Work Shifts

Quentin Lequy, GERAD, 3000 Chemin de la Coté-Sainte-Catherine, Montreal, QC, H3T2A7, Canada, quentin.lequy@gerad.ca, Francois Soumis, Mathieu Bouchard, Guy Desaulniers

The multi-activity assignment problem consists of assigning activities to fixed work shifts so as to minimize activities undercoverage. In order to tackle large-size instances, our search algorithm improves an initial solution by defining large neighborhoods over which the current solution is reoptimized using a column generation heuristic. Computational results will be presented.

■ SD07

Metro Grand West - CC Lev. 2

Tutorial: Queueing Systems with Flexibility

Cluster: Tutorials

Invited Session

Chair: Douglas Down, Associate Professor, McMaster University, Department of Computing and Software, 1280 Main Street West, Hamilton, ON, L8S 4L7, Canada, downd@mcmaster.ca

1 - Queueing Systems with Flexibility

Douglas Down, Associate Professor, McMaster University, Department of Computing and Software, 1280 Main Street, West, Hamilton, ON, L8S 4L7, Canada, downd@mcmaster.ca

Queueing systems with flexible servers arise as models applicable to service and production systems with cross-trained workers, as well as in computer service provisioning. In this tutorial, planning (which servers should be capable of doing which tasks) and operational issues (where servers should be assigned in real-time) will be discussed. Important insights and methodologies will be highlighted, as well as current open problems of interest.

■ SD08

Pier 2 - H Conv. Lev.

Queueing and Networks

Contributed Session

Chair: Laszlo Lakatos, Professor, Eotvos Lorand University, Pazmany Peter s. 1/C, Budapest, H-1117, Hungary, lakatos@compalg.inf.elte.hu

1 - Performance Analysis of Guard Channel Based CAC Scheme in a 3G-WLAN Integrated Network

Jae Man Park, KAIST, 2208 ho E2 KAIST gusung-dong yusung-gu, Daejeon, Korea, Republic of, jaeman31@kaist.ac.kr, Gang Uk Hwang

We consider a guard channel based call admission control (CAC) scheme to support quality of service (QoS) in a 3G-WLAN integrated network. We develop and analyze a performance model for the scheme where the Gauss-Markov movement model and PH distributions are used for mobility model. We introduce a non-homogeneous QBD process to model the channel state and get some QoS metrics. We show the simulation to validate our analysis and find that guard channels are not effective when WLAN area is large.

2 - Computing the Blocking Probability of Networks Under QoS and Budget Constraints

Hsing Luh, Professor, National Chengchi University, Department of Mathematical Sciences, Taipei, 116, Taiwan - ROC, sluh@nccu.edu.tw, Chia-Hung Wang

We study the blocking probability of an end-to-end communication system. The blocking is due to the limit budget when setting up the number of end-to-end paths and allocated bandwidth in the planning stage. We present two queueing models of the predetermined bandwidth allocations under two general network scenarios. In this presentation, we analyze the relationship between the bandwidth allocations and the blocking probability.

3 - Cyclic-waiting Systems: Waiting Time and Number of Customers

Laszlo Lakatos, Professor, Eotvos Lorand University, Pazmany Peter s. 1/C, Budapest, H-1117, Hungary, lakatos@compalg.inf.elte.hu

We consider a single-server queueing system without losses, FCFS discipline, in which the refused customers may repeat their requests for service only at moments differing from the arrival by the multiples of a given cycle time T . The model describes the process of landing of airplanes or the functioning of fiber delay lines. We find the generating functions for the number of present customers and waiting time, show that they meet at the stability condition.

■ SD09

Pier 3 - H Conv. Lev.

Supply Chain Performance II

Contributed Session

Chair: Jin Wang, Professor, Valdosta State University, Department of Math & CS, 1500 N Patterson St, Valdosta, GA, 31698-0040, United States of America, jwang@valdosta.edu

1 - An Economic Model for Supply Chain Delivery Performance

Alfred Guifrida, Assistant Professor, Kent State University, Business Administration A411, P. O. Box 5190, Kent, OH, 44242, United States of America, aguifri@kent.edu, Lihua Chen

In this paper we present an economic model for evaluating time-based delivery performance to the final customer in a supply chain. The model is generalized to accommodate delivery performance under both make-to-order and make-to-stock operating plans. Expressions are presented for the mean and variance of the expected delivery time as well as the expected cost due to untimely delivery performance.

2 - Impact of Incentives and Coordination Mechanisms on Stability and Equilibrium of Network Economies

Devanath Tirupati, Professor, Indian Institute of Management Ahmedabad, Vastrapur, Ahmedabad, India, devanath@iimahd.ernet.in, Pankaj Chandra, Omkar Palsule-Desai

We develop and analyze a game theoretic model to understand the player dynamics in network economies and examine the impact of alternative price and profit-sharing driven mechanisms on stability and equilibrium of the network. The objective is to examine the role of coordination mechanisms on sustainability of the network.

3 - The Influence of Relational Structures on Supplier Commitment

Christina Wong, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong - ROC, tcchris@polyu.edu.hk, T. C. Edwin Cheng, Kee-Hung Lai, Y.H. Venus Lun

Based on three theoretical perspectives, namely transaction cost analysis, social network, and institutional pressures, this study investigates the structural links between three exchange arrangements and their influences on relational development and supplier commitment in a buyer-supplier relationship (BSR). We find empirical support with data collected from 358 suppliers of a multinational firm.

4 - Simulation Optimization Approach of Designing Multi-Point Push-Pull Supply Chains

Seunghwan Kim, Visiting Assistant Professor, University of Illinois at Urbana-Champaign, Department of Business Administration, Champaign, IL, 61820, United States of America, ethankim@illinois.edu, John Fowler, Dan Shunk

Despite the well-known benefits, the push-pull supply chain strategy often results in an inability to minimize the impact of lead time variability. We present a new hybrid push-pull strategy that incorporates multiple pulling points, which strengthens the order fulfillment capability of the push-pull strategy. Numerical experiments show that our new strategy generates more robust and cost-effective supply chain designs than those based on the conventional push-pull strategy.

5 - Interactive Particle Models in Supply Chain Management

Jin Wang, Professor, Valdosta State University, Department of Math & CS, 1500 N Patterson St, Valdosta, GA, 31698-0040, United States of America, jwang@valdosta.edu, Guifen Mao, Abhijit Deshmukh

We study on stochastic models of emergent enterprise systems. Our focus is on developing and investigating efficient analytical and numerical methodologies to evaluate the overall performance of emergent enterprise systems. As a multi-stage supply chains, an emergent enterprise system can be modeled as an interacting particle system.

■ SD10

Salon A - H Conv. Lev.

Tutorial: Global Supply Chain Finance

Sponsor: Manufacturing and Service Operations Management Sponsored Session

Chair: Panos Kouvelis, Professor, Washington University, Olin School of Business Campus Box 1133, 1 Brookings Drive, Saint Louis, MO, 63130, United States of America, Kouvelis@wustl.edu

1 - Global Supply Chain Finance

Panos Kouvelis, Professor, Washington University, Olin School of Business Campus Box 1133, 1 Brookings Drive, Saint Louis, MO, 63130, United States of America, Kouvelis@wustl.edu

We will discuss research that advocates a tighter integration of the operations and finance functions within and across enterprises for higher value creation and for global supply chain risk management purposes. We place emphasis on better understanding of: (a) interfaces of financing and supply chain decisions; (b) integrated risk management of commodity and currency risks through the combined use of operational flexibilities and financial hedges.

■ SD11

Salon C - H Conv. Lev.

Stochastic Models in Health Care

Sponsor: Health Applications Section Sponsored Session

Chair: Steven Shechter, University of British Columbia, Vancouver, BC, Canada, steven.shechter@sauder.ubc.ca

1 - Long Term Home Care Planning for the Vancouver Island Health Authority

Martin Puterman, University of British Columbia, 2053 Main Mall, Vancouver, BC, V6T 1Z2, Canada, Martin.Puterman@sauder.ubc.ca, Matthew Nelson, Derek Atkins, Steve Atkinson

We developed an approach for forecasting complex care and assisted living requirements to year 2020. Arrival rates derived from demographic analysis coupled with length of stay estimates derived from censored data models provided inputs into a simulation based planning model. Simulation optimization was used to determine capacity levels by region and year. Results of this study impact both resource planning and resource allocation decisions.

2 - Pricing Strategies for Combination Pediatric Vaccines

Sheldon Jacobson, University of Illinois, 201 N. Goodwin Avenue, Urbana, IL, United States of America, shj@illinois.edu, Edward Sewell, Matthew Robbins

Combination vaccines have become the backbone of the US Recommended Childhood Immunization Schedule. As more combination vaccines gain FDA approval, vaccine manufacturers are strategically pricing such products to optimally managed and enhance their market share. This presentation shows how optimization models can be used to reveal such strategies.

3 - Should the New British Columbia Children's Hospital Have an Express Surgical Suite?

Candice Chan, University of British Columbia, 2053 Main Mall, Vancouver, BC, Canada, candice.chan@coe.ubc.ca, Derek Atkins, Stuart Donald, Steven Shechter, Anjali Aswathi

In planning of a new hospital to accommodate increased demand, BC Children's Hospital proposed the idea of an Ambulatory Surgical Unit designed specifically to handle relatively simple and less resource dependent "express" surgeries. The hope was that such configuration could help increase throughputs and reduce wait list. Through the use of discrete event simulation, we evaluated various surgical suite designs for their impacts on throughputs, wait times, and pre- and post-surgical resource utilizations.

4 - A Simulation Optimization Model for Long Term Residential Care Capacity Planning

Yue Zhang, Post-Doctoral Fellow, Sauder School of Business, UBC, Vancouver, BC, V6T 1Z2, Canada, yue.zhang@sauder.ubc.ca, Martin Puterman, Matthew Nelson, Derek Atkins

This talk concerns optimizing capacity levels in our study of residential capacity planning for the Vancouver Island Health Authority (VIHA) for a long time period. The problem is described in a parallel talk, in this talk we focus on how we used the simulation to determine capacity levels that meet service criteria.

■ SD12

Pier 4 - H Conv. Lev.

Negotiation Support and the Law

Sponsor: Group Decision and Negotiation Section: GDN 2009 Sponsored Session

Chair: John Zeleznikow, Full Professor, Victoria University, P.O. Box 14428, Melbourne, Melbourne, VI, 8001, Australia, john.zeleznikow@vu.edu.au

1 - Resolving Family Law Disputes with a Multi-agent Based Negotiation Support System

Brooke Abrahams, Postdoctoral Research Fellow, Victoria University, P.O. Box 14428, Melbourne, 8001, Australia, brooke.abrahams@vu.edu.au, John Zeleznikow

The paper describes the development of a multi-agent based NSS designed to assist disputants to achieve legally fairer negotiated outcomes. The system uses a Bayesian Belief Network and Artificial Intelligence (AI) techniques to incorporate Best Alternatives to Negotiated Agreements (BATNAs) into an integrative bargaining process.

2 - Risks To Consider When Negotiating IT Outsourcing Agreements

Subha Chandar, Victoria University, P.O. Box 14428, Melbourne, VI 8001, Australia, subha.chandar@research.vu.edu.au, John Zeleznikow

Outsourcing IT can deliver substantial business benefits. However, it also carries significant risks and costs. Current industry practices in negotiating IT outsourcing agreements are based on ideology, fashion and personal expectations rather than structured techniques. Subsequently, a large proportion of IT outsourcing agreements either fail to deliver expected results or terminate abruptly, with severe consequences to the organisation. An Outsourced IT environment is complex. It is also exposed to many internal and external pressures. The long-term nature of an IT Outsourcing agreement also poses additional challenges, as the agreement needs to withstand numerous changes. These include changes not only affecting the outsourced IT department directly, but changes to client's or supplier's business priorities, and economic or global influences. Research shows that poorly crafted agreements factor significantly in the eventual failure of such agreements. The following paper explores the risks that need to be considered when negotiating IT Outsourcing Agreements.

3 - Preferences and Justice in Alternative Dispute Resolution

Peter Condliffe, Barrister/Research Scholar, Victorian Bar/Victoria University, 205 William Street, Melbourne, V, 3000, Australia, pc@vicbar.com.au

This paper will describe and explore the relationship between disputant preferences and justice and the impact this may have on choice of interventions in dispute systems. It will draw on the author's research into disputes in condominiums and the development of dispute management systems related to them.

4 - Beyond Interest Based Bargaining - Incorporating Interests and Fairness in Developing NSS

John Zeleznikow, Full Professor, Victoria University, P.O. Box 14428, Melbourne, Melbourne, VI, 8001, Australia, john.zeleznikow@vu.edu.au

Individuals undertake negotiation to derive better outcomes. Thus they often engage in interest based negotiation, which focuses upon the interests of disputants rather than upon objective measures. It is thus vital to develop measures for the development of fair NSS. We suggest principles which encourage fairness in the development of NSS, including transparency, bargaining in the shadow of the law and the need for discovery. We also illustrate the pitfalls of using such principles.

■ SD13

Pier 5 - H Conv. Lev.

E-negotiation Simulation and Assessment

Sponsor: Group Decision and Negotiation Section: GDN 2009 Sponsored Session

Chair: Gregory Kersten, Concordia University, Montreal, PQ, Canada, gregory@jmsb.concordia.ca

1 - The Negotiation Process for Transportation Services: A Simulation Analysis

Pierpaolo Pontrandolfo, Politecnico di Bari, Bari, Italy, pontrandolfo@poliba.it, Nicola Bellantuono

This paper aims at investigating the negotiation process between the buyer (e.g. a manufacturing firm) and the logistics provider, by adopting agent-based simulation, according to an approach already adopted for similar purposes. The simulation model takes into account the main variables that influence the actors' behaviour during the negotiation so as to identify which context scenarios are more favourable to the contract adoption.

2 - Satisfaction of E-negotiation System Users

Shikui Wu, Concordia University, Montreal, PQ, Canada,
w_shikui@jmsb.concordia.ca, Bo Yu, Gregory Kersten

Two series of experiments were conducted to study three categories of user satisfaction: satisfaction with outcome, self-performance and relationship. The results indicate that the categories are highly correlated but they are theoretically different. The correlation between satisfaction with outcome and relationship is stronger than that between the other two combinations. Satisfaction with self-performance affects satisfaction with outcome and relationship but it is not affected by them.

3 - Review on Assessment of Negotiation Systems

Eva Chen, John Molson School of Business, Concordia University,
1455 de Maisonneuve GM-903-09, Montreal, PQ, Canada,
eh_chen@jmsb.concordia.ca

Twenty two publications discuss the influence of negotiation systems on process and outcome variables. The studies showed that over the years research has centered on: the cost-benefit framework to compare negotiation support technology with face-to-face exchange, (2) media richness theory to examine different media of electronic communication, and (3) modeling ENS usage following an IS perspective. The advantages and disadvantages are highlighted as well as suggestions for future research.

4 - Parametric Modeling of Preferences

Jamshid Etezadi, Concordia University, Dept of Ds & M,
1455 De Maisonneuve Blvd W, Montreal, QC, H3G 1M8, Canada,
etezadi@jmsb.concordia.ca

A new parametric function for modeling preferences is introduced. Using the least squares procedure, an algorithm for estimation of parameters and their standard deviations is developed which requires only a few assessment of preferences. Simulation studies show that the function is flexible and can represent a variety of known utility models.

SD14

Pier 7 - H Conv. Lev.

Economics of IS - Analytical and Empirical Approaches

Sponsor: Information Systems
Sponsored Session

Chair: Yonghua Ji, Assistant Professor of MIS, School of Business,
University of Alberta, Edmonton, AB, T6G2R6, Canada,
yji@ualberta.ca

1 - On the Relationship of Information Technology with Other Inputs

Dawei Zhang, PhD Student in MIS, University of Calgary,
437 3111 34AVE NW, Calgary, AB, T2L 0Y2, Canada,
dzhang@ucalgary.ca, Barrie R Nault, Zhuo Cheng,
Hasan Mohammad

In order to examine substitution of IT capital for other inputs, we adopt the less-well-known Morishima Elasticity of Substitution (MES), and calibrate our estimates from regression by using Bayesian techniques to impose regularities. Our MES results show that IT capital and non-IT capital are Morishima complements when the price of IT capital changes. Our Bayesian analysis showed consistent results yet yielding some interesting questions regarding the fundamental production forms.

2 - Revisiting Measurement of the Transaction and Information Sectors in the US Economy: 1971-2004

Tracey Stock, PhD candidate in MIS, University of Calgary,
1757 College Lane SW, Calgary, AB, T2S 2G9, Canada,
tdstock@ucalgary.ca

This paper is a longitudinal study of costs in the transaction and information sectors of the US economy. We extend the seminal work of Wallis and North that reported labor costs in the transaction sector between 1870 and 1970. We develop a research methodology that extends this work to 2004 and identifies information costs for the period. We interpret the relative proportion of labor cost in the transaction sector and information sector and provide a framework for study.

3 - When and How Should Service Providers Adopt Internet Infomediaries?

Mohammad Rahman, Assistant Professor of MIS, Haskayne
School of Business, University of Calgary, 2500 University Drive
NW, Calgary, AB, T2N 1N4, Canada,
mohammad.rahman@haskayne.ucalgary.ca, Tolga Akcura,
Zafer Ozdemir

This research analyzes the motivational differences and pricing strategies in adopting Internet infomediaries for quality differentiated service providers. Why does a high quality service provider adopt a Shopbot or an infomediary and how

does the motivation differ compared to a low quality service provider? What are the implications of adopting such services on pricing strategies, service differentiation, and consumer welfare?

SD15

Pier 8 - H Conv. Lev.

Group Decision Making

Contributed Session

Chair: Christopher Manning, Operations Analyst, Defence Science and
Technology Organisation, DSTO - LOD 205 Labs, P.O. Box 1500,
Edinburgh, SA, 5111, Australia,
christopher.manning@dsto.defence.gov.au

1 - Measuring the Impact of Emotions on Decision Making in Electronic Markets: A Physio-economic Approach

Christof Weinhardt, Universitaet Karlsruhe, Institute of
Information Systems and Management, Karlsruhe, Germany,
christof.weinhardt@iw.uni-karlsruhe.de, T.P Marc Adam,
Matthias Gamer, Stefan Hey

We propose physio-economics as a promising methodology for the design of electronic markets comprising strategic interaction, e.g. auctions and negotiations. The dynamic process of decision-making induces a complex interaction of both rational and emotional components. In order to better understand the emotional components, we extend the methodology of experimental economics by applying physiological parameters and provide a framework for analyzing electronic auctions. Further, first promising, empirical results emphasize the future potential of physio-economics.

2 - The Impact of Group Composition in Reaching a Global Optimum

Luis Arturo Pinzon-Salcedo, Universidad de los Andes, Cra 1a Este
No.18A-10, Bogota, Colombia, lpinzon@uniandes.edu.co,
Adriana Matilde Vargas-Zapata, Ricardo Barros

Groups composed of individuals with an outstanding ability are usually expected to outperform other groups of less skilled persons in trying to solve problems. However, diversity may trump ability. School students participated in an experiment where they had to solve complex math problems. Groups composed of individuals who managed a wider set of heuristics were better at solving difficult problems than groups of more skillful students who had a better knowledge of a reduced set of heuristics.

3 - Contextual Clustering

Christopher Manning, Operations Analyst, Defence Science and
Technology Organisation, DSTO - LOD 205 Labs,
P.O. Box 1500, Edinburgh, SA, 5111, Australia,
christopher.manning@dsto.defence.gov.au, Fred Bowden

The Contextual Clustering technique is a grouping method designed to provide an auditable trail and logical path to the final grouping, with statistical confidence provided by the ability to change variables and compare the results. It is particularly suited to analysis of new concepts or future contexts, especially during the problem definition and prioritisation stages of a larger problem. It also allows the analysis of the dependence of particular characteristics of a given concept/context.

SD17

Regatta - H Main Lev.

Software Tutorial

Cluster: Software Tutorials
Invited Session

1 - Maximal Software, Inc. - Recent News and Trends in Optimization and Modeling

Bjarni Kristjansson, President, Maximal Software, Inc., 2111
Wilson Boulevard, Suite 700, Arlington VA 22201, USA,
bjarni@maximalsoftware.com

In this software tutorial presentation, we will cover several major news and noteworthy trends in optimization that occurred during the past year, including: current state-of-the-art in optimization and modeling. The new MPL FREE Development and Academic Programs. New solvers from GUROBI and Microsoft. Purchase of ILOG and DASH by IBM and Fair Isaac. Emergence of grids, clouds and virtual machines.

■ SD18

Dockside 1 - H Lower Lev.

Sustainability and Profitability

Cluster: Forestry
Invited Session

Chair: Glen Armstrong, University of Alberta, Renewable Resources, Edmonton, AB, T6G 2H1, Canada, gwa@ualberta.ca

1 - Optimal Harvest Decision Considering Carbon Storage and Secondary Emissions

Patrick Asante, University of Alberta, Renewable Resources, Edmonton, AB, T6G 2H1, Canada, pasante@ualberta.ca,
Glen Armstrong, Wiktor Adamowicz

We present the results from a discrete dynamic programming model used to determine the optimal harvest decision for a forest stand that provides benefits from timber harvest, carbon sequestered in forest and carbon storage in wood products.

2 - Sustainability of Old-Forest Retention Targets with Stochastic Fire Disturbance

Matt Conrod, University of Alberta, Renewable Resources, Edmonton, AB, T6G 2H1, Canada, matt.conrod@gov.sk.ca,
Glen Armstrong

We use a system comprised of an optimizing forest estate model and a Monte Carlo simulation model to examine the relationship between harvest levels and the probability of achieving old-forest retention targets with the inclusion of stochastic fire disturbance.

3 - Unintended Consequences of Reforestation Policy: A Forest Level Analysis

Glen Armstrong, University of Alberta, Renewable Resources, Edmonton, AB, T6G 2H1, Canada, gwa@ualberta.ca

I examine the consequences of reforestation policies in boreal mixedwoods using proportional development type transitions in a forest estate model.

■ SD19

Dockside 2 - H Lower Lev.

OR in Sports and the Public Sector

Contributed Session

Chair: Keith Willoughby, Associate Professor, University of Saskatchewan, 25 Campus Drive, Saskatoon, SK, S7N 5A7, Canada, willoughby@edwards.usask.ca

1 - Optimal Multi-level Allocation of HIV Prevention Resources

Monali Malvankar, PhD Candidate, Ivey School of Business, 1151 Richmond St N, London, ON, N6A3K7, Canada, mmalvankar@ivey.uwo.ca, Greg Zaric, Xinghao(Shaun) Yan

HIV prevention funds normally traverse through multiple-levels of distribution and decision making. Decision makers at each level use equity-based heuristics that may lead to sub-optimal allocation of HIV prevention resources. We model multiple incentive schemes for multiple-region multi-level HIV resource allocation process to promote optimal allocation of HIV prevention funds.

2 - Allocation Policies for DRE Voting Machines to Maximize Voter Equity

Muer Yang, University of Cincinnati, 501 Lindner Hall, University of Cincinnati, Cincinnati, OH, 45221, United States of America, yangmr@email.uc.edu, Mike Fry

We examine policies for allocating direct-recording electronic voting machines to maximize voter wait time equity. Equity refers to the belief that all voters should receive approximately equivalent wait time experiences so that no groups of voters are disadvantaged or disenfranchised. We consider multiple modeling approaches and solution methodologies including closed-form queueing approximations and simulation-based heuristics.

3 - Using Dynamic Programming to Determine an Optimal Strategy in a Contract Bridge Tournament

Nicholas Beaumont, Dr, Monash University, Department of Management, P.O. Box 197, Caulfield East, 3124, Australia, nicholas.beaumont@buseco.monash.edu.au

We demonstrate that, in some kinds of bridge (a card game) tournaments and in some circumstances, players can profit by deliberately throwing matches thereby drawing weaker opponents in the next round. Optimal strategies depend on the relative rewards for winning individual matches and finishing well, players' abilities, placings at the end of each round, and the round. Dynamic programming is used to obtain optimal strategies. We stress that "throwing" is unethical and illegal albeit tempting.

4 - On Bended Knee: Conceding a Safety in Canadian Football

Keith Willoughby, Associate Professor, University of Saskatchewan, 25 Campus Drive, Saskatoon, SK, S7N 5A7, Canada, willoughby@edwards.usask.ca, Trevor Hardy, Butch Kamena

When punting deep from one's end of the field, a popular strategy in Canadian football is to "concede a safety". This gives two points to the opponent but may allow the punting team to gain a field position advantage. Using data from a recent Canadian Football League season, we explore the merit of this strategy and show cases in which punting the football is preferred over conceding a safety. Our analysis provides useful advice to Canadian football enthusiasts.

■ SD20

Dockside 3 - H Lower Lev.

Risk Management II

Contributed Session

Chair: Roque Zim, Professor, Universidade de Caxias do Sul, Rua Francisco G. Vargas, 1130, Caxias do Sul, RS, 95070560, Brazil, roque@majorem.com.br

1 - Optimizing Credit Risk

Helmut Mausser, Algorithmics Inc., 185 Spadina Ave, Toronto, Canada, hmausser@algorithmics.com, Ian Iscoe, Alex Kreinin, Oleksandr Romanko

We describe and compare several optimization models that derive from a structural, or Merton-type, model for credit risk. In particular, we consider formulations that combine simulation with analytic approximations.

2 - Dynamic Risk Minimization in Pension Planning

Sona Kilianova, Comenius University, FMFI UK, Mlynska dolina, Bratislava, 84248, Slovakia, sona.kilianova@fmph.uniba.sk

In many countries, a part of the pension system is based on a funded pillar, in which future pensioners save for their old-age pension by regular contributions to one or more pension funds. The pension funds differ in their risk profiles. We present a model for finding an optimal strategy of switching between the funds in time. The objective is to minimize the risk associated with the investment, measured by the static and dynamic conditional value-at-risk measure. The model leads to a large-scale linear program, which we solve on a scenario tree. We focus on implementation aspects of the problem.

3 - Optionality in Hedge Fund Returns

Luis Seco, Professor, University of Toronto, Department of Mathematics, Toronto, On, M5S3G3, Canada, seco@math.utoronto.ca

In this talk we review a mathematical model of a hedge fund as a credit derivative. This model is consistent with the optionality that hedge funds exhibit at the prime broker level, and it has the property that it is able to produce non-normal returns for the fund return distribution. In this context, calibration of the model parameters is the analog of the implied volatility approach for option pricing, which is obtained through optimization algorithms.

4 - The Effects of Disclosure on Risk Management

Roque Zim, Professor, Universidade de Caxias do Sul, Rua Francisco G. Vargas, 1130, Caxias do Sul, RS, 95070560, Brazil, roque@majorem.com.br, Eric Dorion, Luciana Ribeiro Chalela

Company data have assumed each time a more important role for the financial environment. The increase in disclosure level has an effect in raising agent's confidence; reducing informational asymmetry and ventures capital costs. This theoretical essay reviews the literature on the main disclosures models and its effect on the reduction of the information and agency problems; as well as the relations between the information and the accounting of the derivatives in a risk management process.

■ SD21

Dockside 4 - H Lower Lev.

Decision Support Applications II

Contributed Session

Chair: Sylvain Ganter, University of Ottawa, Telfer School of Management, 55 Laurier Ave E, Ottawa, ON, K1N 6N5, Canada, sgant069@uottawa.ca

1 - The Extent of ERP Implementation and Practical Difficulties Within Organizations in an Emerging Economy

Dharmendra Naidu, Tutor, The University of the South Pacific, School of Accounting and Finance, Suva, 679, Fiji, naidu_d@usp.ac.fj, Arvind Patel

This paper explores the extent of ERP implementation in companies in an emerging economy. The paper employs an experimental approach to seek responses to queries in relation to ERP implementations, its benefits, resulted changes and practical difficulties faced by companies in Fiji. Major emphasis is placed on the practical difficulties faced by companies. In conclusion the paper explains various ways to overcome practical difficulties faced by companies in emerging economies.

2 - Operations Planning of the Columbia River System: A Reinforcement Learning Approach

Nazanin Shabani, UBC, 6335 Thunderbird Crescent, Vancouver, Canada, nshabani@interchange.ubc.ca, Ziad Shawwash, Alaa Abdalla, Thomas Siu

Operation planning of the Columbia River system is complicated because of uncertainty in its inflows, electricity prices and complex treaty operation. To overcome the curse of dimensionality, we developed a reinforcement learning (RL) algorithm that interacts with a model of the environment. The model uncertainty is considered by a set of scenarios for inflows and electricity market prices in Alberta and the US. We present results of our research on using RL for hydro system operations planning.

3 - Fisheries Systems Strategy Evaluation

Dan Lane, Professor, University of Ottawa, Telfer School of Management, 55 Laurier Av E, Ottawa, ON, K1N 6N5, Canada, dlane@uottawa.ca

This paper presents a decision support system for the multicriteria evaluation of strategies for effective management of marine resources. The fishery system is described along multiple dimensions with targets for resource sustainability, economic viability, social stability, and administrative efficiency. Experimental analysis and results are illustrated for Atlantic commercial fisheries.

4 - Modelling the Grand Banks Fishing Fleet Configuration for Economic Viability

Sylvain Ganter, University of Ottawa, Telfer School of Management, 55 Laurier Ave E, Ottawa, ON, K1N 6N5, Canada, sgant069@uottawa.ca

The Grand Banks fishing industry has been faced with several crises. Using a linear programming model we derive optimal configurations of the Grand Banks commercial fishing fleet under a variety of scenarios. We then define a configuration that aims to improve the economic viability of the fishing fleet.

Monday, 8:00am - 9:30am

■ MA01

Frontenac - CC Lev. 1

Sustainable Transport Planning and Assessment I

Sponsor: Transportation Science & Logistics

Sponsored Session

Chair: Anjali Awasthi, Assistant Professor, Concordia University, EV 6.221, 1515, Ste Catherine Street West, Montreal, QC, H3G2W1, Canada, awasthi@ciise.concordia.ca

1 - OR and MS Inputs to Decisions about Sustainable Transport Practices

Barry Wellar, Professor Emeritus, University of Ottawa, Department of Geography, Ottawa, ON, K1N 6N5, Canada, wellarb@uottawa.ca, William Garrison

This presentation discusses the results of a 2008-2009 Transport Canada project. Methodologies for Identifying and Ranking Sustainable Transport Practices in Urban Regions, and discusses project findings about whether and how operations research and management science methods and techniques are used and could be used in making decisions to identify, adopt, or implement sustainable transport practices.

2 - Strategic Planning of National/Regional Freight Transportation Systems: An Analysis

Rajeev Namboothiri, CIRRELT - CRT, C.P. 6128, succ. Centre-ville, Montreal, Canada, rajeev@crt.umontreal.ca, Jean Damay, Michel Gendreau, Teodor Gabriel Crainic

This talk presents an evaluation platform dedicated to multimodal, multi-product freight transportation systems within the context of strategic national/regional planning, and preliminary results examining planned scenarios and policies. A comprehensive and realistic representation of the current state of such a system was developed, and the results provide detailed analysis of the impact of policy-level and technological advancement initiatives on the day-to-day operations of the system.

3 - Determinants of Carsharing Usage: The Case of La Rochelle, France

Anjali Awasthi, Assistant Professor, Concordia University, EV 6.221, 1515, Ste Catherine Street West, Montreal, QC, H3G2W1, Canada, awasthi@ciise.concordia.ca, Satyaveer S Chauhan

Carsharing is an alternative form of vehicle ownership. Assessment of user needs and preferences is vital to promote its usage and make the service viable. This talk presents the results obtained from a pre-implementation questionnaire study on carsharing in La Rochelle, France.

■ MA02

Queens Quay I - CC Lev. 1

Combinatorial Optimization

Cluster: Optimization/Combinatorial Optimization

Invited Session

Chair: Antoine Deza, Associate Professor, McMaster University, Department of Computing and Software, 1280 Main Street, West, Hamilton, ON, L8S 4K1, Canada, deza@mcmaster.ca

1 - Flexible Isomorphism Pruning

Jim Ostrowski, University of Waterloo, 200 University Avenue West, Waterloo, Canada, jao204@gmail.com, Jeff Linderth

Isomorphism Pruning is an extremely powerful symmetry breaking tool when applied to integer programs. However, Isomorphism Pruning has the limitation that the algorithm must use a restricted choice of branching variables during the search. In this talk, we show how remove this limitation – modifying isomorphism pruning to allow for complete flexibility in the choice of branching variable. Computational results showing the benefit of this flexibility will be given.

2 - A Model of All Directed Cycles Neither Covered By a Graph Nor its Complement

Steve Gismondi, Assistant Professor, University of Guelph, 2 College Avenue West, Guelph, ON, gismondi@uoguelph.ca

A polynomial sized extended formulation of the set of directed Hamilton tours that use at least one edge in a graph and at least one edge not in a graph, is presented. Projection and lifting techniques, combined with the novel idea of interpreting tours as permutations i.e. extrema of the Birkhoff polytope, are illustrated. The talk concludes with a discussion of the problem of deciding Hamiltonicity as the problem of deciding non-equivalence of solution sets of pairs of systems of equations.

3 - Parallelization of Constraint Programming Based Scheduling Using MPI

Feng Xie, McMaster University, Department of Computing and Software, 1280 Main Street West, Hamilton, Canada, xief@mcmaster.ca, Andrew Davenport

In constraint-programming based scheduling, a tree is searched in order to find a solution. The searching of different subtrees are highly independent. Our goal is to develop a simple and light-weight parallelization scheme that is based on Message Passing Interface (MPI) paradigm, and is able to partition the search tree evenly among the processes. A dynamic load balancing scheme is developed at the cost of communication overhead.

■ MA03

Queens Quay II - CC Lev. 1

Optimization I

Contributed Session

Chair: Mona Asudegi, Graduate Student, Civil and Environmental Engineering Department, University of Maryland at College Park, 4307 Rowalt Drive, Apt 302, College Park, MD, 20740, United States of America, asudegi@umd.edu

1 - An Optimization Assembly Method Based on Selection

Zhekun Li, Professor, KUST, School of ME Engineering, Kunming, 650093, China, zhekunli@public.km.yn.cn

This paper analyzes the problems in traditional manufacturing and assembly, puts forward the Estimation Indication for Cost of Quality Losing in an optimization assembly which will be based on RFID. Though this assembly is a kind of selective one, the whole production will be according to the law of interchangeability. The quality of assembly will be raised, but the cost of manufacturing will be decreased or not increased.

2 - Minimizing Production Costs when Incorporating Existing Cutting Stock Solutions into Companies

Jure Erjavec, PhD Student, University of Ljubljana, Faculty of Economics, Kardeljeva ploscad 17, Ljubljana, 1000, Slovenia, jure.erjavec@ef.uni-lj.si, Miro Gradisar

Some companies do not have the resources to develop their own cutting stock (CS) optimization solutions. Therefore already existing ones have to be used and treated as 'black boxes'. In our model we treat factors such as warehouse size, available stock lengths and associated costs as inputs for CS solution. These factors are a result of company's business policy and need to be taken into consideration and optimized together with CS solution itself to achieve minimal overall production costs.

3 - Multiple Objective Transportation Problem with Fractional Cost, Lexicographic Time and Impurities

Prem Saxena, Professor, Dayalbagh Educational Institute, Dept of Mechanical Engg, Faculty of Engg., Agra, UP, 282 005, India, premkumarsaxena@yahoo.co.in

A multiple objective transportation problem with fractional cost, lexicographic time and impurities is formulated. By means of the proposed primal MOFCBTPTPI Algorithm, the vector of partial flows is minimized in a lexicographic sense on the feasible set. The MOFCBTPTPI Algorithm is based on special structure due to impurity constraints.

4 - Mixed Integer Programming for Optimal Airspace Partitioning

Arash Yousefi, Metron Aviation Inc., 43500 Catalina Ct., Dulles, VA, 20166, United States of America, yousefi@metronaviation.com

We present a methodology for partitioning a volume of airspace into sectors. Airspace is decomposed into hexagonal cells and for each cell we define metrics to capture traffic load and structure. Using these metrics we apply optimization techniques to cluster cells into optimum sectors. For a given traffic pattern, the objective is to minimize the number of sectors and total air traffic controller workload. We use detailed simulation to evaluate the new designs and estimate the benefits.

5 - Optimal Bluetooth Sensor Location for Collecting Travel Times in Urban Networks

Mona Asudegi, Graduate Student, Civil and Environmental Engineering Department, University of Maryland at College Park, 4307 Rowalt Drive, Apt 302, College Park, MD, 20740, United States of America, asudegi@umd.edu, Ali Haghani

Recently, the Bluetooth technology is introduced to Intelligent Transportation Systems for collecting traffic data in urban and rural areas. This study aims at finding the optimal locations for Bluetooth sensors which results in maximum travel time reliability and link coverage as well as the minimum cost.

■ MA04

Bay Room - CC Lev. 1

CORS Student Paper Competition I

Cluster: Competitions

Invited Session

Chair: Manish Verma, Assistant Professor, Memorial University, Faculty of Business Administration, St. John's, NL, A1B3X5, Canada, mverma@mun.ca

1 - Production Facility Optimization

Maxine Cunningham, School of Business, University of Alberta, John Schmidt, Jonathon Braamms

An Edmonton based company approached us to look at their production location in order to minimize delivery costs. We developed a model that could calculate total delivery costs associated with closing existing plants and opening new facilities in various "candidate locations". In addition, the client was provided with a graphical user interface to easily manipulate the model.

2 - Disabled Adult Transit Service - Optimal Shift Design and Demand Forecasting

Mike Clay, School of Business, University of Alberta, Yvan Fortier, Chris Samuel

With the Disabled Adult Transit Service (DATS) collective agreement coming to an end in December 2009, it is useful for DATS to analyze the current labour workforce. A shift scheduling model to analyze the current schedule with other potential schedules that met a series of supply constraints is developed, and further analyzed for insights.

3 - Robust Portfolio Selection for Index Tracking

Chen Chen, Student, MIE University of Toronto, 5 King's College Road, Toronto, ON, N2L 3G1, Canada, chenche7@ecf.utoronto.ca, Roy Kwon

We develop a robust portfolio selection model for tracking a market index using a subset of its assets. The model is a 0-1 integer program that seeks to maximize similarity between selected assets and the assets of the target index. This has several advantages over other models, as it uses neither expected returns nor tracking error.

■ MA06

Wellington - CC Lev. 1

Scheduling II

Contributed Session

Chair: Wen-Hung Kuo, Associate Professor, National Formosa University, No. 64 Wen-Hua Road, Huwei, Yunlin, Taiwan - ROC, whkuo@nfu.edu.tw

1 - A Note on Scheduling Deteriorating Jobs in an M-Machine Flowshop

Jeffrey B. Sidney, Professor, Telfer School of Management, University of Ottawa, Ottawa, ON, K1N 6N5, Canada, jbsidney@hotmail.com, Gur Mosheiov, Assaf Sarig

Minimum makespan in an m-machine n-job flow-shop with linear deterioration of processing times is known to be NP-hard. In this note we study a special case, in which the deterioration parameters are machine-independent. We show that this special case is, indeed, polynomially solvable.

2 - Order Acceptance and Scheduling on a Single Machine

Roel Leus, Professor, KULEuven, Naamsestraat 69, Leuven, 3000, Belgium, Roel.Leus@econ.kuleuven.be, Fabrice Talla Nobibon, Jade Herbots

We develop two exact branch-and-bound algorithms and six heuristics for solving the order acceptance and scheduling problem in a single-machine environment in the case where a pool consisting of firm planned orders as well as potential orders is available from which an over-demanded company can select.

3 - Coordinated Scheduling of Single Machine with Sequence Dependent Setups and Time Windows Constraints

Payman Jula, Assistant Professor, Simon Fraser University, 8888 University Drive, Burnaby, BC, V5A 1S6, Canada, pjula@sfu.ca

Motivated by scheduling challenges in complex manufacturing environments, we propose a network-based approach to schedule a single machine, which must be coordinated with other areas. Jobs must be started within strictly defined time windows, and there is a sequence dependent setup time associated with each job. The efficiency, effectiveness and robustness of proposed method are discussed.

4 - Batch Delivery Scheduling with Job Deadlines

Guoqing Wang, Jinan University, School of Management, Guangzhou, 510632, China, tgqwang@hotmail.com

We study two single machine batch delivery scheduling problems with job deadlines. There are n jobs to be processed by a single machine. Finished jobs can be delivered in batches, but must be delivered before their deadlines. The cost of each delivery is fixed. The objective is to minimize the sum of delivery cost and scheduling cost. We develop efficient algorithms to solve the problems.

5 - A Single-machine Makespan Minimization Scheduling Problem with a General Learning Effect

Wen-Hung Kuo, Associate Professor, National Formosa University, No. 64 Wen-Hua Road, Huwei, Yunlin, Taiwan - ROC, whkuo@nfu.edu.tw, Dar-Li Yang

In this paper we introduce a general learning effect model into a single-machine scheduling problem. The general learning effect model combines two learning factors. One is the job-independent learning model. The other is the total weighted time-dependent learning model. Some useful properties are provided to find the optimal job-sequence in the single-machine scheduling problems.

MA07

Metro Grand West - CC Lev. 2

Tutorial: OR Applications in Forestry

Cluster: Tutorials

Invited Session

Chair: Taraneh Sowlati, Assistant Professor, University of British Columbia, 2931-2424 Main Mall, Vancouver, Canada, Taraneh.Sowlati@ubc.ca

1 - OR Applications in Forestry

Taraneh Sowlati, Assistant Professor, University of British Columbia, 2931-2424 Main Mall, Vancouver, Canada, Taraneh.Sowlati@ubc.ca

The forest industry is one of the important sectors in many countries. Forests provide different types of products and services. Decision making and planning in forestry covers a broad range of problems from strategic problems such as forest management to short term operational problems such as log break down problem. Operations research methods have been widely used for planning and managing complex systems in forestry. This tutorial provides an overview of OR applications in forestry.

MA08

Pier 2 - H Conv. Lev.

Joint Session APS/Health: Stochastic Models in Health Care

Sponsor: Applied Probability Society & Healthcare

Sponsored Session

Chair: Armann Ingolfsson, University of Alberta, School of Business, Edmonton, AB, T6G 2R6, Canada, Armann.Ingolfsson@ualberta.ca

1 - A Model of ICU Bumping

Edieal Pinker, Associate Professor, University of Rochester, Simon Graduate School of Business, Rochester, NY, 14627, United States of America, ed.pinker@simon.rochester.edu, Greg Dobson, Hsiao-Hui Lee

One response to ICU crowding is to bump patients to other beds, potentially reducing quality of care. We develop a stochastic model of an ICU with patient bumping to predict performance under differing arrival patterns and capacity. We develop a new aggregation-disaggregation algorithm that keeps track of the patient system time despite the high dimensionality of the problem. Our approach is more accurate than others and is more efficient than traditional Gaussian Elimination.

2 - A Decision Process for Resolving Location Uncertainty in Laproscopic Surgery

Farhad Ghassemi, University of British Columbia, 2053 Main Mall, Vancouver, BC, V6T 1Z2, Canada, farhad.ghassemi@chcm.ubc.ca, Steven Shechter, Christopher Nguan, Martin Puterman

While an analysis of pre-operative data in laproscopic surgery may suggest possible locations of critical structures, there is still considerable uncertainty of their locations during the surgery. In this talk, we employ the theory of Markov decision processes to facilitate decision making in this type of surgery. We consider one and two-dimensional models of the problem, and provide analytical and numerical results on the structure of the optimal policies.

3 - Modelling Queues in Healthcare

David Worthington, Senior Lecturer, Lancaster University, Department of Management Science, Bailrigg, Lancaster, LA1 4YX, United Kingdom, d.worthington@lancaster.ac.uk

Queueing systems in healthcare are many and varied. They include queues of patients in waiting rooms, people on waiting lists, specimens and Xrays to be tested and interpreted, plus emergency services where one hopes that queues never form. Each of these situations has characteristics for which classical queueing models are not well-suited. This paper identifies these characteristics, outlining examples that have been tackled in the past, and highlighting foci for ongoing and future work.

4 - Exact and Sampling-based Methods for Appointment Scheduling with Discrete Random Durations

Mehmet Begen, Sauder School of Business, University of British Columbia, 2053 Main Mall, Vancouver, BC, V6T1Z2, Canada, mehmet.begen@sauder.ubc.ca, Maurice Queyranne, Retsef Levi

We determine optimal appointment times in polynomial time for a given sequence of jobs (medical procedures) on a single processor (an operating room) to minimize the expected total underage and overage costs when job durations are given by a joint discrete probability distribution. In the case of unknown duration distribution, we determine the number of independent samples required to obtain a provably near-optimal solution with high probability.

MA09

Pier 3 - H Conv. Lev.

Supply Chain Relationships

Contributed Session

Chair: Ozan Ozcan, PhD Student, University of South Florida, 4202 E. Fowler Avenue, ENB118, Tampa, FL, 33620, United States of America, ozan79@gmail.com

1 - Analytical Model for VMI implementation with Single Manufacturer and Two Heterogeneous Retailers

Richard Cho, Assoc. Professor, University of New Brunswick, Saint John, P.O.Box 5050, Saint John, NB, E2L4L5, Canada, rcho@unbsj.ca

Although VMI is effective to increase the supply chain performance in many cases, the failure of VMI in a certain country requires the in-depth analysis to figure out the conditions for the successful VMI. We assume one manufacturer (M) with two retailers (R), where R use different inventory policies. The solution is optimized by nonlinear programming. When one R changes to VMI, we will look for the change in M's profit. We also analyze the result under the capacity constraint.

2 - Supplier Selection and Order Allocation in Make to Order Environment

Tadeusz Sawik, Professor, AGH University of Science & Technology, Department of OR & IT, Krakow, 30059, Poland, ghsawik@cyf-kr.edu.pl

The problem of allocation of orders for custom parts among suppliers in make to order manufacturing is formulated as a multi-objective mixed integer program. Given a set of customer orders for products, the decision maker needs to decide from which supplier to purchase custom parts required for each customer order and when to order the parts. The selection of suppliers and the allocation of orders over time is based on price and quality of purchased parts and reliability of on time delivery.

3 - Supplier Selection: A Joint QFD-Fuzzy and AHP Approach

Rakesh Raut, PhD Scholar, NITIE, NITIE, Mumbai, Mumbai, MA, 400087, India, rautrakesh@rediffmail.com, Saroj Koul

Getting high-quality products to customers in a timely manner is vital for the success of any organization. While the QFD process determines the importance weights; the AHP obtains the relative importance of each of the evaluation criteria. A fuzzy-AHP with an extent analysis approach is proposed to determine the importance weights for the customer requirements. This new approach is easy to implement to prioritize customer requirements in the QFD process.

4 - A Social Network Analysis Study to Promote Cumulative Innovation

Ozan Ozcan, PhD Student, University of South Florida, 4202 E. Fowler Avenue, ENB118, Tampa, FL, 33620, United States of America, ozan79@gmail.com, Kingsley Reeves, Fethullah Caliskan

In this study, we will survey the existing types of social capital and application of these social capital types on "promoting cumulative innovation" in the literature. In addition to literature review, we will identify network actors for whole I4-Corridor, the regional cluster of medical devices producers, network analysis to map physical social network of this I4-corridor.

■ MA10

Salon A - H Conv. Lev.

Behavioral Studies in Operations Management

Sponsor: Manufacturing and Service Operations Management
Sponsored Session

Chair: Srinagesh Gavirneni, Cornell University, Johnson Graduate School of Management, 325 Sage Hall, Ithaca, NY, 14853, sg337@cornell.edu

1 - Transactions or Relationships - Understanding the Factors that Decouple Consecutive Negotiations

Shweta Oza, University of Miami, 5250 University Drive, Miami, FL, 33146, soza@miami.edu, Haresh Gurnani, Mahesh Nagarajan

In this research we present a Nash Bargaining framework identifying factors that can couple or decouple consecutive negotiations between two players. Then, we examine the factors in an experimental setup and demonstrate how the said factors influence the negotiation behavior in a given transaction. We conclude by elaborating on the results.

2 - Personal Factors, Behavior, and Supplier Decision Making

Julie Niederhoff, Assistant Professor, Syracuse University, 721 University Avenue, Syracuse, NY, 13244, United States of America, jniederh@syr.edu, Panos Kouvelis

We employ experimental studies to investigate how some key behavioral biases influence decision making when subjects are asked to make pricing decisions as a supplier in a two-party newsvendor setting.

3 - Assessing Customers' Ability to Detect Service Scripts Using a Video Experiment

Liana Victorino, University of Victoria, P.O. Box 1700 STN CSC, Victoria, BC, V8W 2Y2, Canada, lianav@uvic.ca, Rohit Verma, Bryan L. Bonner, Don Wardell

This study used a video experiment to assess whether customers are able to detect if a script was used for service design. We found that customers can distinguish when an interaction is scripted and allude to the potential implications this has for customers' perceptions of the service experience.

■ MA11

Salon C - H Conv. Lev.

Operating Room Scheduling

Sponsor: Health Applications Section
Sponsored Session

Chair: Michael Carter, Professor, University of Toronto, Department of Mechanical and Industrial Engineering, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, carter@mie.utoronto.ca

1 - Turnover Times Between Surgeries: A Comparison of the Normal and Lognormal Models

David Strum, Hospital University of Pennsylvania, 680 Dulles, 3400 Spruce Street, Philadelphia, PA, 19104, United States of America, strumdp@uphs.upenn.edu, Luis Vargas

Surgical schedules are complicated by variability inherent in turnover times (TT) between surgeries. We investigate and survey TT with a goal to compare the fit of the normal and lognormal model. Our results help to legitimize the use of log transforms to normalize surgical TT prior to hypothesis testing using linear statistical models used to investigate factors affecting the duration of surgical turnovers.

2 - Allocating Surgeries to a Block Time: Averages vs. Probability Distribution of the Schedule Duration

Rene Alvarez, Patient Flow Specialist, St. Michael's Hospital, 30 Bond Street, Toronto, ON, M5B 1W8, Canada, renealvarez@gmail.com, Adalsteinn Brown, Michael Carter, Richard Bowry, Guillermo Sandoval

A widely used technique to allocate surgeries is based on historical averages. Another technique estimates the probability distribution of the whole schedule duration. During 4 months both techniques were applied in the Cardio-Vascular program of St. Michael's Hospital, in Toronto, Canada. In this study we report and analyze the results using the following indicators: OR utilization, difference between actual duration and estimated duration, and number of cancellations due to lack of time.

3 - Demand Management in Health Care: Protection Levels with Random Requirement of Resources

Luis Vargas, Professor, KGSB/University of Pittsburgh, 314 Mervis Hall, Pittsburgh, PA, 15260, United States of America, lgvargas@pitt.edu, Alia Stanciu, Jerrold May

We consider how to set protection levels in a system with groups of customers when the resource demands of the customers are random variables. This is particularly true in surgical units. We show how the calculation of the protection level changes when one of the groups' demand always exceeds system capacity, and the relationship of the formulas in the random case to those in the traditional case of deterministic resource requirements.

■ MA12

Pier 4 - H Conv. Lev.

Bidding and Bargaining in E-market Systems

Sponsor: Group Decision and Negotiation Section: GDN 2009
Sponsored Session

Chair: Rustam Vahidov, Concordia University, Montreal, PQ, Canada, rvahidov@jmsb.concordia.ca

1 - The Impact of Mechanism and Technology on E-market Systems

Gregory Kersten, Concordia University, Montreal, PQ, Canada, gregory@jmsb.concordia.ca, Rustam Vahidov, Dirk Neumann, Eva Chen

The TIMES framework is constructed to assess and compare multi-user information systems, and in which the implemented mechanism plays an important decision support role. This work reports the use of TIMES to experimentally contrast two systems with different interfaces, and two exchange mechanisms. The results indicate technology affecting economic outcome and user assessment of the system, and mechanism influencing behavioural outcomes. Cognitive effort moderates these impacts.

2 - A Framework for Facilitation Service Quality Assessment

Aida Azadegan, PhD Student, Manchester Business School, Booth Street West, Manchester, M15 6PB, United Kingdom, Aida.Azadegan@postgrad.manchester.ac.uk, Linda Macaulay

The call to support teams with a facilitation service is addressed frequently in the literature. There are criteria to measure the quality of collaborations and to categorize the facilitator's competences but there is much less attention paid to the quality assessment of the facilitated collaborations. We introduce a framework for facilitation service quality assessment and to compare the services and understand the shortcomings and improvement strategies. The framework is evaluated in three cases.

3 - User Satisfaction in E-market Exchanges

Bo Yu, Concordia University, Montreal, PQ, Canada, bo_yu@jmsb.concordia.ca, Shikui Wu

Satisfaction of information system's users has been used in the assessment of e-markets. Although e-marketplaces are examples of ISs, their capabilities may differ. Therefore, e-market assessment requires the consideration of different satisfaction constructs. Literature review identifies eight categories of user's satisfaction. Their relevance to the assessment of e-market systems is discussed and an instrument to study users' attitude towards different e-markets is proposed.

4 - A Situated Decision Support System for Managing Bidding Process in Supply Chain

Rustam Vahidov, Concordia University, Montreal, PQ, Canada, rvahidov@jmsb.concordia.ca, Bahareh Amini

Today's volatile business environment imposes uncertainty in supply chain management. Agility is the capability of fast adaptation to unpredicted changes, market fluctuations, and new customer requirements. This research presents a model of situated DSS to enable SC agility and improve the performance. The system assists users in managing bidding and ordering processes through the use of active components. The results indicate a significant increase in SC performance in volatile markets.

■ MA13

Pier 5 - H Conv. Lev.

Game Theory in Group Decision and Negotiation

Sponsor: Group Decision and Negotiation Section: GDN 2009
Sponsored Session

Chair: Ozgur Kibris, Sabanci University, Faculty of Arts and Social Sciences, Orhanli, Tuzla 34956, Istanbul, 34956, Turkey, ozgur@sabanciuniv.edu

1 - On the Investment Implications of Bankruptcy Laws

Ozgur Kibris, Sabanci University, Faculty of Arts and Social Sciences, Orhanli, Tuzla 34956, Istanbul, 34956, Turkey, ozgur@sabanciuniv.edu, Arzu Kibris

We study investment implications of alternative bankruptcy rules as a possible explanation as to why most societies choose a "proportional rule".

2 - Uncertainty and Ratification Failure

Arzu Kibris, PhD Candidate, Sabanci University, Orhanli, Tuzla, Istanbul, 34956, Turkey, arzukibris@su.sabanciuniv.edu

I develop a game theoretical model that explains how an international agreement signed by representatives of two countries can fail parliamentary ratification.

MA14

Pier 7 - H Conv. Lev.

Emerging Research Issues in Digital Media and Markets

Sponsor: Information Systems
Sponsored Session

Chair: Sudip Bhattacharjee, University of Connecticut, 2100 Hillside Road, U-1041, Storrs, CT, United States of America, sbhattacharjee@business.uconn.edu

1 - Data-driven Prediction of Consumer Choice

Dmitry Zhdanov, University of Connecticut, 2100 Hillside Rd, Unit 1041, Storrs, CT, 06269, United States of America, dmitry.zhdanov@business.uconn.edu, Sudip Bhattacharjee, Mikhail Bragin

In many applications such as online movie rentals, it is important to understand consumer preferences prior to suggesting particular products. This activity is at the core of recommendation systems. Traditional approach of collaborative filtering relies on the similarity of ratings between different users. We complement this approach with the analysis of precedence events, seeking to predict user tastes at a particular moment based on prior ratings.

2 - An Empirical Study of Firm Capabilities, Competitive Actions and Survival in the Software Industry

Shanling Li, Professor, McGill University, 1001 Sherbrooke Street, Montreal, PQ, H3G1A5, Canada, shanling.li@mcgill.ca, Jennifer Shang, Sandra Slaughter

The goal of this paper is to understand the dynamics of firm survival in the volatile software industry. Specifically, we try to understand what leads software firms to survive or fail in this industry. Firm survival is theorized to depend both on the level of a firm's internal capabilities (relative to other firms in the industry) as well as the intensity of the firm's competitive actions in the market.

3 - A Network Perspective of Digital Competition in Online Advertising Industries

Ray Chang, Research Associate, McGill University, 1001 Sherbrooke, Montreal, Canada, myong.chang@mcgill.ca, Wonseok Oh, Alain Pinsonneault

Drawing upon the network perspective, we explore how the influence networks affect the outcomes of strategic alliances in online search advertising industry. An agent-based simulation model has been developed in which advertisers are assumed to adjust their marketing activities based on two factors, network influence and individual preference. We provide several implications that could be useful to major search engine companies in their strategic decision-making.

MA15

Pier 8 - H Conv. Lev.

Hybrid Models and Tools

Sponsor: Computing Society: Constraint Programming
Sponsored Session

Chair: Louis-Martin Rousseau, Associate Professor, Polytechnique Montreal, CP 6079 succ Centre-ville, Montreal, QC, H3C 3A8, Canada, louis-martin.rousseau@polymtl.ca

1 - Keep it SIMPL: Latest Developments in a General Purpose System for Integrated Optimization

Tallys Yunes, University of Miami, 5250 University Drive, Room KE405, Coral Gables, FL, 33146, United States of America, tallys@miami.edu, John Hooker, Ionut Aron

We combine integer programming, constraint programming, and global optimization in a single system, called SIMPL. We apply SIMPL to planning, configuration, scheduling, and design problems on which customized integrated methods have shown significant advantage. We obtain results that either match or surpass the original codes at a fraction of the implementation effort. A demo version of SIMPL has been recently made available for download from the first author's website.

2 - Hybrid Modeling and Problem Solving with COMET

Laurent Michel, University of Connecticut, 2100 Hillside Road, Storrs, CT, 06269, United States of America, ldm@enr.uconn.edu, Pascal Van Hentenryck

This talk will discuss the facilities for integrating CBL, CP and LP techniques within a single COMET program to tackle challenging combinatorial optimization problem. A particular emphasis will be based on the support of hybridization techniques and large neighborhood search.

3 - Biased Binary Search

Meinolf Sellmann, Brown University, Department of Computer Science, P.O. Box 1910, Providence, RI, 02912, sello@cs.brown.edu, Serdar Kadioglu

We devise a theoretical model for binary search algorithms for constrained optimization. We show that, within our model, a certain way of choosing the balance minimizes both expected as well as worst case performance in a skewed binary search. Furthermore, we show that our protocol is optimal in the expected and in the worst case.

MA16

Pier 9 - Convention Level

Military Applications I

Sponsor: Military Applications
Sponsored Session

Chair: Bill Simms, Professor, Royal Military College of Canada, Department of Business Administration, P.O. Box 17000, Stn Forces, Kingston, ON, K7K 7 B4, Canada, simms-b@rmc.ca

1 - Modeling the Stand-Up of a Specialized Military Occupation

Francois Larochelle, Defence Scientist, Director General Military Personnel Research and Analysis / DND, 285 Coventry Road, 5th floor, Ottawa, ON, K1A 0K2, Canada, francois.larochelle@drdc-rddc.gc.ca

The Chief of Air Staff is currently planning the creation of a military occupation that will gradually assume, as it grows in size, a specific function which is currently performed by members of a larger organization. In this paper, we highlight the human resource management challenges involved in this organizational change. We describe the model that was built to help managers proactively address these issues and to estimate the time it will take until the new occupation is fully operational.

2 - Civilian Workforce Modelling

Mira Halbrohr, DGMPPRA, 101 Colonel By Drive, Ottawa, ON, K1A0K2, Canada, mira.halbrohr@drdc-rddc.gc.ca, Manchun Fang, Stan Isbrandt

The Department of National Defence is developing a civilian workforce modelling capability in order to help it address the challenges that it, like other organizations, is facing in the recruitment and retention of a sustainable civilian workforce over the next decade. A discrete event simulation, developed as a proof of concept using Rockwell's Arena simulation software, is presented.

3 - Operational Support Aircraft Routing Problem

Ahmed Ghanmi, DRDC CORA, DND Canada, 101 Colby Drive, Ottawa, ON, K1A0K2, Canada, ahmed.ghanmi@forces.gc.ca

This paper presents an aircraft routing model developed to analyze a hub-based support concept for the Canadian Forces. The model would be used for planning sustainment flights to determine cost effective aircraft routes for the movement of cargo from various hubs to a theatre of operation. The model was formulated as a vehicle routing problem and was implemented using mixed integer nonlinear programming. An example using historical data was presented to illustrate the methodology.

4 - Canadian Forces Logistics Support For Domestic Operations

Bill Simms, Professor, Royal Military College of Canada, Department of Business Administration, PO Box 17000, Stn Forces, Kingston, ON, K7K 7 B4, Canada, simms-b@rmc.ca, A.J. Hesford

Recently it was announced that the Canadian Forces Reserves will be the first, and possibly only, responders to Domestic Operations. The logistics support for these critical events is currently undergoing analysis by the Canadian Forces. This paper will introduce a macro model of the requirements problem with the aim of proposing and analyzing solutions to this problem.

■ MA17

Regatta - H Main Lev.

Software Tutorial

Cluster: Software Tutorials
Invited Session

1 - SAS - Operations Research with SAS: What's New, What's Next

Ed Hughes, Product Manager, SAS, SAS Campus Dr, Cary NC 27513, ed.hughes@sas.com

More and more organizations worldwide are turning to SAS for OR-related products and solutions. We'll explore recent and upcoming offerings in optimization (OPTMODEL) and simulation (SAS Simulation Studio) and review optimization-oriented SAS solutions for the marketing, retail, and service industries. We'll also look at some recent OR consulting engagements.

■ MA18

Dockside 1 - H Lower Lev.

Modeling in Forest Management

Cluster: Forestry
Invited Session

Chair: Justin Podur, Assistant Professor, York University FES, 109 HNES Building, 4700 Keele St, Toronto, ON, M3J 1P3, Canada, jpodur@yorku.ca

1 - Climate Change, Fire Suppression, and Future Area Burned in Ontario

Justin Podur, Assistant Professor, York University FES, 109 HNES Building, 4700 Keele St, Toronto, ON, M3J 1P3, Canada, jpodur@yorku.ca

I use anomalies calculated from General Circulation Model (GCM) climate predictions, scenarios of future fire weather, and a large fire growth and suppression simulation model for Ontario, Canada to investigate the Ontario fire agency's adaptation potential in mitigating the projected increases in fire activity. I investigate the effects of a 25% increase, 50% increase, and a doubling of fire suppression resources (airtankers, firefighters, and helicopters) on future area burned.

2 - Managing for Non-timber Forest Values under Uncertainty

David Savage, University of Toronto, 33 Willcocks St., Toronto, ON, M5S 3B3, Canada, david.savage@utoronto.ca, David Martell

Linear programming (LP) models that deterministically account for fire losses have been used extensively to manage timber supply, however, their effectiveness for managing non-timber values has not been proven. An LP forest management planning model was embedded in a stochastic simulation model and used to evaluate strategies for dealing with non-timber values under uncertainty. The results showed that minimum areas of non-timber values may need to be increased to account for fire losses.

3 - A Perturbed Markov Modulated Fluid Flow Model with Application to Uncontrolled Fire Perimeter

David Stanford, Professor, University of Western Ontario, Department of Statistical & Actuarial Sciences, 1151 Richmond St. N, London, ON, N6A 5B7, Canada, stanford@stats.uwo.ca, Douglas Woolford, Jiandong Ren, Kaiqi Yu

An efficient method to halt the progress of a fire is to remove the fuel around its perimeter by building a fire line. The fire line can be thought of as "controlled" perimeter. Woolford et al. (2008) described a Markov modulated fluid flow model to quantify the time-evolution of the uncontrolled fire perimeter. In the present paper, we generalize this model by adding a perturbation component. Numerical examples will be presented and alternatives discussed.

4 - Allocation of Forest Fuel Treatments Using Simulation-optimization

Adam Rytwinski, Graduate Student, Lakehead University, 1201-30 Lake Crest Rd, Winnipeg, MB, R3T5J8, Canada, arytwins@lakeheadu.ca, Kevin Crowe

In this study, the problem of how to optimally place fuel treatments across a forest is formulated as a combinatorial simulation optimization problem with the objective of minimizing fire risk under a budget constraint. The simulation optimization formulation is tested on a 220,000 ha forested area in northern Ontario. The optimization problem is solved using the OptQuest optimization engine and the resulting solutions are shown to be better than arrived at through a greedy algorithm.

■ MA19

Dockside 2 - H Lower Lev.

Applications in Transportation and Logistics

Sponsor: CPMS, The Practice Section of INFORMS
Sponsored Session

Chair: Rich Wong, UPS, 55 Glenlake Parkway, NE, Atlanta, GA, United States of America, RTWong@UPS.COM.

1 - Routing and Scheduling for Inter-city Movement of Small Packages

Richard Wong, Lead Operations Research Analyst, United Parcel Service, 2311 York Road, Timonium, MD, 21230, United States of America, rtwong@ups.com

Between every pair of nodes a given number of packages must be transported, via tractor trailer or rail, through a network while satisfying service time constraints. In addition, drivers must be scheduled to drive the tractor trailers according to union work rules. We discuss models and formulations for this package transportation problem and implementation complications.

2 - Improved Load Plan Design Through Integer Programming Based Local Search

Alan Erera, Georgia Institute of Technology, School of Industrial and Systems Eng, Atlanta, GA, 30332, United States of America, alan.erera@isye.gatech.edu, Mike Hewitt, Martin Savelsbergh, Yang Zhang

We consider a service network design problem known as load planning for consolidation carriers, such as less-than-truckload trucking companies. We use a time-space model with service time constraints that integrates empty trailer balancing with freight routing, and produces day-differentiated plans. We develop a heuristic local search that solves a sequence of integer programs to find best-improving neighbors. The technology generates solutions offering cost savings of 5-10% in practice.

■ MA20

Dockside 3 - H Lower Lev.

Dynamic Pricing and Inventory Control

Sponsor: Revenue Management and Pricing Section
Sponsored Session

Chair: Rongbing Huang, Assistant Professor, School of Administrative Studies, York University, Toronto, ON, M3J 1P3, Canada, rhuang@yorku.ca

1 - Impact of Investment Decision Sequence in a Two-Echelon Assembly Manufacture System

Ann Chan, United States of America, lapmuichan@gmail.com, Chengbin Zhu, Mustafa Karakul

The decisions of component suppliers and a manufacturer are divided into two stages: simultaneous or sequential product quality decision in the first stage followed by component suppliers' simultaneous wholesale price decision before the manufacturer's market price decision in the second stage. We identify the existence of Nash equilibrium in each stage. Moreover, in the investment decision, competition with a leader can always benefit the whole system compared with simultaneous competition.

2 - Suppliers' Pricing Game in a Dual Sourcing System with Stochastic Demand and Reliability

Mustafa Karakul, Associate Professor, York University, Canada, mkarakul@yorku.ca, Chengbin Zhu, Ann Chan

Two competitive unreliable suppliers first announce their wholesale price simultaneously. Based on suppliers' reliability and wholesale price, the manufacturer decides on the order quantity from each supplier to satisfy the stochastic demand. We find that the existence of Nash Equilibrium in the suppliers' price competition depends on the family of demand distribution. Furthermore, we analyze the manufacturer's beneficence from the suppliers' competition compared with their coordination.

3 - Choice Based DP for Opaque Pricing

Chris Anderson, Cornell University, School of Hotel Administration, Ithaca, NY, 14853, canderson@cornell.edu

In this talk I will discuss the development of a choice based dynamic program for setting prices on Hotwire.com The study uses data from Hotwire as well as a DC based hotel.

4 - A Continuous Approximation Approach for a Dynamic Pricing Problem

Abdullah Dasci, Associate Professor, York University, Toronto, ON, M3J 1P3, Canada, dasci@yorku.ca, Rongbing Huang

We consider a problem of pricing a single product over a finite time period. The objective is to find the timing of price changes and the prices to maximize the total profit. Solving such problems to optimality is extremely difficult partly due to the nonlinearity introduced by the pricing decisions. We introduce a reformulation via continuous approximation, which is substantially easier to solve. Results of a numerical study are also presented to show the effectiveness of the approach.

MA21

Dockside 4 - H Lower Lev.

Normative Models of Beliefs and Preferences

Sponsor: Decision Analysis Society

Sponsored Session

Chair: Ali Abbas, Assistant Professor, University of Illinois, Urbana-Champaign, 104 S. Mathews Ave, Urbana, IL, 61821, United States of America, aliabbas@uiuc.edu

1 - Multiattribute Utility Functions with Partial Utility Independence

Ali Abbas, Assistant Professor, University of Illinois Urbana-Champaign, 104 S. Mathews Ave, Urbana, IL, 61821, United States of America, aliabbas@uiuc.edu

We present a graphical representation of utility independence relations in multiattribute utility functions, which we call the bidirectional utility diagram. We show how this representation facilitates the elicitation of multiattribute utility functions and enables their decomposition into lower order terms that are easier to elicit. We also present new functional forms of utility functions that incorporate utility dependence using multiattribute utility and multiattribute value copulas.

2 - Subjective Probabilities in a World Defined Using Different Partitions

Robert Bordley, General Motors Research Labs, 30500 Mound Road, Warren, Mi, 48090, United States of America, Robert.bordley@gm.com

An individual might get information about whether it's hot or cold. The same individual might then get information about whether it's rainy or not rainy. Thus the information is defined over different partitions. Given certain plausible modeling assumption, this paper shows that the subjective probability describes the individual's beliefs given this kind of information is the mean of an extended Dirichlet distribution.

3 - Bayesian Acquisition of Project-specific Assets Under Incomplete Information

Dharma Kwon, University of Illinois at Urbana-Champaign, 1206 S. Sixth, Champaign, IL, 61820, United States of America, dhkwon@illinois.edu, Steven Lippman

A firm with incomplete information continuously observes its cumulative profit from a new pilot project, Bayesianly updates its estimate of the profitability, and makes one of three decisions: continue operations, stop the project, or expand the project by acquiring project specific assets. The optimal policy is to expand if the probability that the profitability is high hits the upper threshold and to exit if it hits the lower threshold.

Monday, 11:00am - 12:30pm

MB01

Frontenac - CC Lev. 1

Sustainable Transport Planning and Assessment II

Sponsor: Transportation Science & Logistics

Sponsored Session

Chair: Anjali Awasthi, Assistant Professor, Concordia University, EV 6.221, 1515, Ste Catherine Street West, Montreal, QC, H3G2W1, Canada, awasthi@ciise.concordia.ca

1 - Public Cars and Private Transit: Are We Ready Yet?

Kevin McLaughlin, President, Autosshare, 24 Mercer St., Toronto, M5V1H3, Canada, kevin@autosshare.com

Shared-use public cars ('car sharing') have been a growing form of transit for over 20 years, but they are just the tip of a massive wave of 'Private Transit' that is a result of technological developments and environmental and energy

concerns. While this means great potential benefit to the consumer, and opportunity to the entrepreneur, there is still considerable government 'green tape', and often, our cities still are not being planned for this very real transportation of the future.

2 - Energy Use of Subway Networks in the Sustainability Era?

Sybil Derrille, PhD Candidate, University of Toronto, Department of Civil Engineering, 35 St George St., Toronto, ON, M5S 1A4, Canada, sybil.derrille@utoronto.ca, Christopher Kennedy

While it is widely accepted that transit is more environmentally-friendly than the automobile, not much work has been done on the impact of network growth on energy. Here we look at 19 subway systems in the world; the main indicator is energy use per ride. Although energy use of networks seems to decrease with expansion, the determining factor here is ridership. Overall, we actually find energy use per ride tends to remain fairly constant relative to network size.

3 - Improving the Service Quality of the Montreal Subway System

Ciprian Alecsandru, Assistant Professor, Concordia University, 1515 Ste-Catherine, EV 6.166, Montreal, QC, H3G2W1, Canada, ciprian@bcee.concordia.ca, Ali Khan

This study investigates the application of computer models for long-range transit planning. A computer model for the Montreal Metro is developed using VISUM. Ridership for the Montreal Metro system is estimated using four step forecasting model. Estimated ridership is used as an input in the computer model. Results from the model are used to identify congested stations and to suggest optimization techniques for reliable train operations during peak hours.

MB02

Queens Quay I - CC Lev. 1

Polyhedral Optimization

Cluster: Optimization/Combinatorial Optimization

Invited Session

Chair: Antoine Deza, Associate Professor, McMaster University, Department of Computing and Software, 1280 Main Street West, Hamilton, ON, L8S 4K1, Canada, deza@mcmaster.ca

1 - Feasibility and Constraint Analysis of Sets of Linear Matrix Inequalities

Richard J. Caron, Professor of Mathematics and Statistics, University of Windsor, 401 Sunset Avenue, Windsor, Ontario, N9B 3P4, Canada, rcaron@uwindsor.ca, Tim Traynor, Shafiu Jibrin

We present a constraint analysis methodology for LMI constraints that seeks either a minimal representation (feasible case) or an irreducible infeasible system (infeasible case). The work is based on the solution of a set covering problem where each row corresponds to a sample point and is determined by constraint satisfaction. We develop a hit and run sampler that provides information for constraint analysis, and that find a feasible point, if one exists, with probability one.

2 - Hyperplane Arrangements with Large Average Diameter

Antoine Deza, Associate Professor, McMaster University, Department of Computing and Software, 1280 Main Street West, Hamilton, ON, L8S 4K1, Canada, deza@mcmaster.ca, Feng Xie

The largest possible average diameter of a bounded cell of a simple hyperplane arrangement is conjectured to be not greater than the dimension. We prove that this conjecture holds in dimension 2, and is asymptotically tight in fixed dimension. We give the exact value of the largest possible average diameter for all simple arrangements in dimension 2, and, in dimension 3, lower and upper bounds which are both asymptotically equal to the dimension.

3 - Face Lattice Computation Under Symmetry

Jonathan Li, University of Toronto, Toronto, ON, Canada, jli@mie.utoronto.ca, Antoine Deza

The last 15 years have seen a significant progress in the development of general purpose algorithms for polyhedral computation. Many polytopes of practical interest have enormous output complexity and are often highly degenerate, posing severe difficulties for known general purpose algorithms. They are, however, highly structured and attention has turned to exploiting this structure. We study the metric polytope associated with the maxcut and multicommodity flow problems.

■ MB03

Queens Quay II - CC Lev. 1

Optimization II

Contributed Session

Chair: Chandrasekhar Putcha, Professor, California State University, 800 N. State College Blvd., Fullerton, CA, 92834, United States of America, cputcha@fullerton.edu

1 - Recursive Algorithms to Solve Homogeneous Self-Dual Linear Programming Systems

Paul Wang, Lead Engineer, The MITRE Corporation, 7515 Colshire Drive, Mail Stop N590, McLean, VA, 22102 7539, United States of America, pwang@mitre.org,
William P. Niedringhaus, Francisco Mendoza Diaz

We present three recursive algorithms for solving large sparse systems of linear inequalities. The first algorithm reduces maximum system infeasibility, the second reduces the sum of total infeasibility, and the third decreases the number of constraints with the same worst-case infeasibility. Successive application of these algorithms minimizes total system infeasibility. This technique is effective for all linear systems of linear inequalities, including linear programming problems.

2 - Accelerated Life Testing Plan for Type-I Censored Experiments

Nasser Fard, Associate Professor, Northeastern University, 334 Snell Engineering Center, Boston, MA, 02115, United States of America, n.fard@neu.edu, Chenhua Li

A step-stress accelerated life testing model is developed to test units at a specified stress level and time αn . The stress level is then changed to a higher level and the test is continued until the predetermined test termination time or until all test units fail. Optimum hold time is obtained by minimizing the asymptotic variance of the MLE of the life at normal operating conditions.

3 - Development and Application of New Initial Basic Feasible Solution Method for Optimization Problems

Chandrasekhar Putcha, Professor, California State University, 800 N. State College Blvd., Fullerton, CA, 92834, United States of America, cputcha@fullerton.edu, Ali Shekaramiz

Arriving at Initial Basic Feasible solution (IBF) in transportation problems is very important. The method used to arrive at IBF should be such that it gives required number of entries to start transportation simplex algorithm without violating the supply and demand constraints. The existing methods lack some important aspects in this regard. A new method is developed in this paper which gives exact number of entries needed to initiate the transportation algorithm.

■ MB04

Bay Room - CC Lev. 1

CORS Student Paper Competition II

Cluster: Competitions

Invited Session

Chair: Manish Verma, Assistant Professor, Memorial University, Faculty of Business Administration, St. John's, NL, A1B3X5, Canada, mverma@mun.ca

1 - Fuzzy Hierarchical Production Planning

Mahmood Ebadian, University of British Columbia, Department of Wood Science, 2424, Main Mall, Vancouver, BC, V6T1Z4, Canada, mebadian@interchange.ubc.ca, Seyed Ali Torabi, Reza Tanha

In practice, most of the critical input parameters for modeling of production planning problems are often imprecise/fuzzy in nature due to incompleteness and/or unavailability of required data over the given decision horizon. We incorporate the fuzzy set theory into the HPP structure as an appropriate approach to handle these uncertainty and infeasibility issues.

2 - Appointment Scheduling with Discrete Random Durations

Mehmet Begen, Sauder School of Business, University of British Columbia, 2053 Main Mall, Vancouver, BC, V6T1Z2, Canada, mehmet.begen@sauder.ubc.ca, Maurice Queyranne

We determine optimal appointment times for a given sequence of jobs (medical procedures) on a single processor (operating room, examination facility), to minimize the expected total underage and overage costs when each job has a random duration given by its discrete probability distribution. A simple condition on the cost rates implies that the objective function is submodular and L-convex. Then there exists an optimal appointment schedule which is integer and can be found in polynomial time.

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3 - Product Differentiation and Operations Strategy in a Competitive Market

Sachin Jayaswal, Department of Management Sciences, University of Waterloo, Saibal Ray, Elizabeth Jewkes

We study a competitive market comprising two firms, each of which sells a menu of differentiated products/services. Customers are heterogeneous in their sensitivity to price and leadtime, and are segmented as price or time sensitive. Our results suggest that the firm with a larger market base should always maintain a larger price and leadtime differentiation between the two market segments.

■ MB05

Yonge - CC Lev. 1

Innovations in OR at AD OPT

Sponsor: Aviation Applications

Sponsored Session

Chair: Carl Mitchelson, OR Software Architect, AD OPT, 3535 Queen Mary Road, Suite 650, Montreal, QC, H3V1H8, Canada, Carl.Mitchelson@kronos.com

1 - Solving Large Scale Strict-seniority Preferential Bidding Problems

Carl Mitchelson, OR Software Architect, AD OPT, 3535 Queen Mary Road, Suite 650, Montreal, QC, H3V1H8, Canada, Carl.Mitchelson@kronos.com, Yvan Dumas

Large-scale strict-seniority preferential bidding problems are extremely hard to solve. We present significant advances in solving these problems using a column generation approach. The proposed algorithm monitors the state of the problem before making branching decisions, allowing for steady convergence towards integer solutions. Numerical results will be presented for categories of up to 5000 crew members.

2 - Handling of Specific Crew Qualifications and Crew Types When Building Crew Pairings

Remy Gauthier, Manager of Products, AD OPT, 3535 Queen Mary Road, Suite 650, Montreal, QC, H3V1H8, Canada, remy.gauthier@kronos.com

Many airlines must manage specific crew qualifications during the monthly schedule construction process. These qualifications range from specific route languages, cabin classes of service, to cockpit ranks. This presentation will look at various needs expressed by airlines, and propose a solving and management approach usable at anonymous crew pairing level.

3 - Automatic Proof of Inconsistency of a Crew Scheduling Problem

Sandrine Paroz, GERAD, 3000, Chemin de la Côté-Sainte-Catherine, Montreal, QC, H3T 2A7, Canada, Sandrine.Paroz@gerad.ca, Alain Hertz, Philippe Galinier

An irreducible infeasible set (IIS) of constraints is an inconsistent set of constraints which becomes consistent when any one constraint is removed. Determining an IIS can be very useful to know which data should be changed in order to get a solvable problem and to prove the inconsistency of a problem. We propose an efficient algorithm to automatically extract an IIS from an infeasible crew scheduling problem. Our algorithm is based on heuristics, and can thus be applied on large instances.

4 - Mixed Integer Programming (MIP) Based Column Generation (CG) For Airline Scheduling Problems

Hatem Ben Amor, AD OPT Division, Kronos, 3535 Queen Mary Road, Suite 650, Montreal, Qc, H3V1H8, Canada, hbenamor@kronos.com

CG is usually used within a branch-and-price algo that aims at solving a MIP problem. It solves a continuous restricted master problem (MP) to get multipliers used to generate columns expected to improve the primal solution and the dual bound of the continuous MP. We propose to get multipliers that are representative of a MIP solution of the MP so that the CG oracle targets columns more likely to improve the primal MIP solution. MDVSP and UBSP and real-world airline problems are used for tests.

■ MB06

Wellington - CC Lev. 1

Stochastic Location

Cluster: Location
Invited Session

Chair: Oded Berman, Professor, Rotman School of Management, University of Toronto, 105 St. George Street, Toronto, ON, M5S 3E6, Canada, berman@rotman.utoronto.ca

1 - Stochastic Location Analysis: Its Origin and Development

Jiamin Wang, Associate Professor, Long Island University, Roth Hall 202, 720 Northern Blvd., Brookville, NY, 11548, United States of America, Jiamin.Wang@liu.edu, Oded Berman, Dmitry Krass

In this review, we focus on Frank's original contribution to location problems with probabilistic node weights and its influence on stochastic location theory. We start with examining Frank's work. We then describe continuation of the research on location problems with probabilistic node weights. Finally, we summarize the analysis of other stochastic elements in facility location problems.

2 - The Network Design of Spatially Distributed Service Systems with Two Prioritized Call Classes

Dmitry Krass, University of Toronto, Rotman School of Management, 105 St. George Street, Toronto, ON, M5S 3E6, Canada, krass@rotman.utoronto.ca, Oded Berman, Opher Baron, Seokjin Kim

We develop location models for an emergency system with mobile servers and two call classes, one for high priority calls and the other for regular calls. The problem is to minimize the number of servers on a network while achieving at least required service levels for the two call classes. Markovian demands originate at nodes. Servers can be stationed at nodes and provide service to calls within a pre-specified coverage radius.

3 - Coordinating Replenishment Periods in Location-Inventory Model

M. Mahdi Tajbakhsh, Postdoctoral Fellow, Joseph L. Rotman School of Management, 105 St. George Street, Toronto, ON, M5S 3E6, Canada, Mahdi.Tajbakhsh@Rotman.Utoronto.Ca, Oded Berman, Dmitry Krass

We consider a periodic review location-inventory model where distribution centers follow order-up-to-level (R, S) inventory policies. System coordination is ensured by controlling replenishment periods. An algorithm for optimal center location, customer allocation and replenishment period choice is presented.

4 - A Production-inventory-transportation Model with Capacitated Cross-docks and Suppliers

Hossein Abouee Mehri, University of Toronto, 105 St George Street, Toronto, Canada, H.AboueeMehri07@Rotman.Utoronto.Ca, Oded Berman, Mohammad Reza Baharnemati

We analyze a production-inventory-transportation system problem where capacitated suppliers and cross-docks are to be established to satisfy the demand of retailers for different products. We consider the pipeline and retailers' inventory together with transportation, facility location and truck capacity costs in determining the optimal number and location of suppliers and cross-docks, allocation of retailers to suppliers, and truck capacity.

■ MB07

Metro Grand West - CC Lev. 2

Tutorial: Correcting the Foundations of OR

Cluster: Tutorials
Invited Session

Chair: Jonathan Barzilai, Dalhousie University, P.O. Box 1000, Halifax, NS, B3H 4R2, Canada, barzilai@dal.ca

1 - Correcting the Foundations of OR

Jonathan Barzilai, Dalhousie University, P.O. Box 1000, Halifax, NS, B3H 4R2, Canada, barzilai@dal.ca

Errors that require the attention of operations research teachers, practitioners, and theoreticians will be reviewed: Utility theory includes an intrinsic contradiction; the characteristic function of game theory is ill-defined; in measurement theory the models of the most elementary variables are incorrect; in decision theory what is being measured is not understood; and there are other errors. For additional information see scientificmetrics.com/publications.

■ MB08

Pier 2 - H Conv. Lev.

Analysis of Spare Part Provisioning Problems

Sponsor: Applied Probability Society
Sponsored Session

Chair: Baris Balcioglu, University of Toronto, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, baris@mie.utoronto.ca

1 - On Estimating Spare Parts Obsolescence

Rommert Dekker, Professor, Erasmus Universiteit, Postbus 1738, Rotterdam, 3000 DR, Netherlands, rdekker@few.eur.nl

We propose a method to estimate the risk on obsolescence of service parts. The method is based on making groups of service parts. For these groups, the risk on obsolescence is estimated using the behavior of similar groups of service parts in the past. We will give a practical application and the effects of these values on inventory control is examined.

2 - Replacement Strategies Using Reconditioned Spare Parts

Claver Diallo, Assistant Professor, Dalhousie University, Department of Industrial Engineering, 5269 Morris Street, Halifax, NS, B3J 2X4, Canada, Claver.Diallo@dal.ca, Daoud Ait-Kadi

This presentation investigates the conditions under which the reuse of reconditioned spare parts can be profitable. Reconditioned parts are recovered from end-of-life products or disassembled during preventive maintenance. They are less reliable than new ones for having been in use and come from non-steady supply lines. Their main advantage consisting in a low price can be overturned by frequent failures due to their lower reliability and, by longer downtime caused by a non-steady supply.

3 - Dispatching Policies for Spare Parts Provisioning

Pedram Sahba, University of Toronto, 5 King's College Rd., Toronto, ON, M5S 3G8, Canada, pedram@mie.utoronto.ca, Baris Balcioglu

We consider a system consisting of m fleets of machines. When a machine fails, its defective component is sent to a repair shop. This unit can be replaced if a spare part is available. Otherwise, the machine is down till a repaired component is put back into service. We assume that times-to-failure follow exponential distributions as well as the repair times. We investigate the effects of repair shop and/or inventory pooling on minimizing the total system cost under different scenarios.

4 - Scheduling Policies in the Repair Shop for the Spare Parts Provisioning Problem

Robert Svaluto, Graduate Student, University of Toronto, 5 King's College Rd., Toronto, ON, M5S 3G8, Canada, svaluto@mie.utoronto.ca, Baris Balcioglu

The system being considered consists of two different types of repairable components, as well as an inventory for each type. The repair shop is modelled as a single server queue, where First Come First Serve, non-preemptive priority, and myopic policies are investigated as possible repair shop scheduling policies. The performance of these policies will be compared with the optimal policy with the objective of minimizing the system cost, which includes holding and backordering costs.

■ MB09

Pier 3 - H Conv. Lev.

Supply Chain Management

Contributed Session

Chair: Jing Shao, UBC, 2053 Main Mall, Vancouver BC V6T 1Z2, Canada, jing.shao@sauder.ubc.ca

1 - Optimal Procurement Auctions Design with Endogenous Quantity

Jun-Yi Pu, Mr., The University of Hong Kong, Room 824, Haking Wong Building, University of Hong Kong, Pokfulam Road, Hong Kong, Hong Kong - ROC, h0795503@hkusua.hku.hk, Ling-Yau Chan

This paper studies the optimal auction design for a buyer faced with multiple competing suppliers. It is known that the buyer can maximize its profits by using a payment-quantity schedule in an auction. This paper shows that a well-designed demand schedule is an alternative way to optimize the buyer's profit. The new approach is strategically equivalent to the former one under certain settings, helping to explain the reasons why the former approach is sensitive to different auction formats.

2 - Optimal Pricing Strategies of the Manufacturer and the Retailer When Customers Negotiate

Chia-Wei Kuo, National Taiwan University, 1 Sec 4, Roosevelt RD, Taipei, Taiwan - ROC, cwkuo@ntu.edu.tw, Ying-Fei Wu

We consider a stylized supply chain. The manufacturer produces and sells items to the retailer at a wholesale price. The retailer, facing price-takers and bargainers simultaneously, determines the posted and the cut-off price. We characterize the optimal posted and the cut-off price as well as the wholesale price when the bargainer's negotiation cost is a function of her willingness to pay. We analyze the effects of model parameters on the optimal prices in a supply chain.

3 - Supply Chain and Optimization Models

Marija Cileg, Professor, Faculty of Economics, 9-11, Segedinski put, Subotica, Vo, 24000, Serbia-Montenegro, macileg@yahoo.com, Tibor Kis

All economic activities are directly or indirectly interconnected through supply chains. Improvements of performance and interactions in the supply chain network yield in harmonization, co-operation, coordination and efficiency. In this paper we present one possible approach to optimization problems in supply chain management through connecting different types of optimization models.

4 - Transshipping to the Gray Market: the Impact on a Decentralized Supply Chain

Jing Shao, UBC, 2053 Main Mall, Vancouver, BC, V6T 1Z2, Canada, jing.shao@sauder.ubc.ca, Harish Krishnan, S. Thomas McCormick

Recent literature has identified the profitability of gray markets (unauthorized dealers) for a monopolist. This paper investigates the impact of gray market on a decentralized supply chain with an upstream manufacturer and downstream retailers. We find that the manufacturer may be strictly better off from gray market under some conditions. In cases where it could be worse off, it may or may not be able to deter the retailers from transshipping to gray market.

■ MB10

Salon A - H Conv. Lev.

Service Process Outsourcing

Sponsor: Manufacturing and Service Operations Management Sponsored Session

Chair: Edieal Pinker, Associate Professor, University of Rochester, Simon Graduate School of Business, Rochester, NY, 14627, United States of America, ed.pinker@simon.rochester.edu

1 - Staffing Capacity for a Contact Center with Uncertain Arrival Rates and Customer Call-Back

Joe Milner, University of Toronto, Rotman School of Management, 105 St. George Street, Toronto, ON, M5S3E6, Canada, milner@rotman.utoronto.ca

We consider a call center for which the mean demand in each period is uncertain. To address the uncertainty, the call center offers customers the possibility of returning calls in a subsequent period. Using a fluid approximation for the queuing process, we determine the optimal staffing of the call center and the control of its call back process.

2 - Multiple Criteria Aggregation Procedure with Weak Preference Relation for Information Imperfections

Sarah Ben Amor, Professeur Adjoint, PhD, University of Ottawa, 55 LaReur E (7123), Ottawa, ON, K1N6N5, Canada, benamor@management.uottawa.ca, Jean-Marc Martel

A multiple criteria aggregation procedure is designed for different kinds of information imperfections at the same time. It is based on an adaptation of the stochastic dominance results and it leads to a global preference relational system containing strict preference, weak preference, indifference and incomparability relations. Introducing the weak preference relation allows for more nuance and flexibility to the decision maker given the nature of the information in hand.

3 - Service Supply Chains with Independent and Dependent Stages: The Impact on Customer Wait Times

Kuntal Bhattacharyya, Teaching Fellow & PhD Student, Kent State University, College of Business Administration, M&IS, P.O. Box 5190, Kent, OH, 44242, United States of America, kbhatta1@kent.edu, Alfred Guifrida, Michael Messina

This article investigates the impact of relationship between stages in a service supply chain and the total waiting time to a customer. When the assumption of independence between stages is slacked, a correlation model is introduced that demonstrates the optimum condition for reduced wait time. Finally, a generic model for evaluating the financial impact of customer waiting time to improve service quality is presented.

4 - Outsourcing a Two-level Service Process

Edieal Pinker, Associate Professor, University of Rochester, Simon Graduate School of Business, Rochester, NY, 14627, United States of America, ed.pinker@simon.rochester.edu, Robert Shumsky, Hsiao-Hui Lee

This paper studies two-level service systems with gatekeepers who diagnose a customer problem and then either refer the customer to an expert or attempt treatment. We study system performance when none, one or both of the levels are outsourced and consider optimal contract design taking into account staffing, customer waiting, and mistreatment costs.

■ MB11

Salon C - H Conv. Lev.

Modelling for Healthcare Applications

Sponsor: Health Applications Section Sponsored Session

Chair: Michael Carter, Professor, University of Toronto, Department of Mechanical and Industrial Engineering, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, carter@mie.utoronto.ca

1 - The Costs and Benefits of Using Telescreening Technology in Diagnosis of Macular Degeneration

Reza Mahjoub, Richard Ivey School of Business, University of Western Ontario, 1151 Richmond St., LONDON, N6A 3K7, Canada, rmahjoub@ivey.uwo.ca, Greg Zaric

Macular degeneration (MD) results in loss of vision through damage to the retina. MD is typically diagnosed in person by an ophthalmologist. New telescreening technology enables the diagnosis of MD with specialized three dimensional images. The images are taken by optometrists and sent to an ophthalmology clinic via a secure network. The use of telescreening reduces patient travel time and increases efficiency. We develop a model to assess the costs and benefits of an MD telescreening program.

2 - Cost Effectiveness of the Vancouver Supervised Injection Facility

Greg Zaric, Associate Professor, Ivey School of Business, 1151 Richmond St., London, ON, N6A 3K7, Canada, gzaric@ivey.uwo.ca, Ahmed Bayoumi

Insite, a supervised injection facility in Vancouver, has operated since 2003. We developed a dynamic compartmental epidemic model to assess the costs and health consequences associated with operating the supervised injection facility. Our model gives explicit consideration to the impact of the facility on the spread of HIV and hepatitis C. In the base case we find that the facility is cost saving, with the cost savings being driven by reduced HIV transmission.

3 - A Model for Automatic Indexing of Clinical Evidence with Diagnosis, Treatment, and Patient-specific

Craig Kuziemsky, Assistant Professor, University of Ottawa, Telfer School of Management, 55 Laurier Avenue East, Ottawa, ON, K1N 6N5, Canada, kuziemsky@telfer.uottawa.ca, Wojtek Michalowski, Szymon Wilk, Dymna O'Sullivan, Ken Farion

Every year well over 30,000 articles are published in medical journals and added to online repositories. It is practically impossible for a practicing clinician to follow these publications and to use results reported there in order to practice evidence-based medicine. In order to respond to this challenge we developed a comprehensive model that enables indexing of evidence-based documents and the retrieval of context-specific evidence at the point of care.

■ MB12

Pier 4 - H Conv. Lev.

Collaborative Information Technologies

Sponsor: Group Decision and Negotiation Section: GDN 2009 Sponsored Session

Chair: Deepinder Bajwa, Western Washington University, College of Business & Economics, Dept of Decision Sciences, Bellingham, WA, 98225, United States of America, deepinder.bajwa@wwu.edu

1 - Adding to Value to Group Model Building

Fran Ackermann, Professor, University of Strathclyde, 40 George Street, Glasgow, G1 1QE, United Kingdom, fran.ackermann@strath.ac.uk, George Richardson, David Andersen, Colin Eden

This paper improves the practice of group model building (GMB) by presenting three GMB scripts that can (1) create a preliminary problem boundary using less than 1 hour of group time, (2) convene discussions with the group that explicitly link dynamic structure with system behavior, and (3) allow participants to "zoom" between a micro & macro view of system structure. They utilize a well established Group Support System to facilitate group decision and negotiation.

2 - Organizational Impacts of Information Technology Enabled Collaboration

Floyd Lewis, Western Washington University, 516 High Street, MS 9077, Bellingham, WA, 98225, floyd.lewis@wwu.edu, Deepinder Bajwa, Graham Pervan

Data was collected from 73 Australian organizations to explore the impacts of IT supported collaboration. The results of our study suggest that IT enabled collaboration is positively and significantly associated with strategic, efficiency, and effectiveness-oriented organizational level impacts. This presentation outlines the study and implications of our findings.

3 - The Usage and Adoption of Technologies to Support Virtual Teams

Craig Tyran, Professor, Western Washington University, College of Business & Economics, Western Washington University, Bellingham, WA, 98225, United States of America, craig.tyran@wwu.edu, Deepinder Bajwa, V.T. Raja, Kristi Tyran

A variety of technologies are available to support collaborative work (e.g., e-mail, web conferencing, wikis). A study of ten virtual project teams was undertaken to learn more about the usage and adoption patterns of supporting technologies for virtual teams. This presentation will report on the results of the study.

4 - A Task- and Function-Centric Approach to Understand the Impacts of CIT Utilization

Inu Matter, University of Zurich, Department of Informatics, Zurich, Switzerland, matter@ifi.uzh.ch, Gerhard Schwabe, Deepinder Bajwa

Despite increasing popularity of collaborative information technologies (CIT) in supporting virtual teams, we know little about the impacts brought about by their use. Based upon a review of the existing literature, a framework highlighting several impacts of CIT use in virtual teams is presented for empirical validation.

■ MB13

Pier 5 - H Conv. Lev.

Negotiation and Game Theory

Sponsor: Group Decision and Negotiation Section: GDN 2009

Sponsored Session

Chair: Bill Samuelson, Boston University, 595 Commonwealth Avenue, Boston, MA, 02215, United States of America, wsamuels@bu.edu

Co-Chair: Kalyan Chatterjee, Penn State University, Department of Economics, 608 Kern Graduate Building, University Park, PA, 16802, United States of America, kchatterjee@psu.edu

1 - Citations, Networks and Diffusion of Knowledge

Kalyan Chatterjee, Penn State University, Department of Economics, 608 Kern Graduate Building, University Park, PA, 16802, United States of America, kchatterjee@psu.edu, Avantika Chowdhury

We consider a model in which rational players decide on whether to cite existing work, given that such citations could act as a recommendation to future entrants and therefore create competition for readership. The network of citations, by itself and combined with a random social network, is endogenously generated and is not a "power law" network.

2 - Competitive Negotiations: Theory and Experimental Evidence

Bill Samuelson, Boston University, 595 Commonwealth Avenue, Boston, MA, 02215, United States of America, wsamuels@bu.edu

In a negotiation model, buyers and sellers meet in the hopes of making trades. If no deal is reached, each can contact other partners. We find the equilibrium of this model and examine behavior in negotiation experiments. The equilibrium can suffer from too few trades or too many trades (excessive trades with marginal agents). The experiments support many of the model predictions: which buyer-seller pairs trade, at what approximate terms and when agents are likely to search for new partners.

3 - Communication via a Biased Mediator

Maxim Ivanov, McMaster University, 408 KTH, 1280 Main Street West, Hamilton, L8S 4M4, Canada, mivanov@mcmaster.ca

This paper investigates communication between an informed expert and an uninformed principal via an interested mediator. We demonstrate that for any bias in the parties' preferences, there exists a mediator that provides the highest expected payoff to the principal as if the players communicated through an optimal disinterested mediator. Comparative statics shows that the optimal interested mediator possesses some counter-intuitive properties.

■ MB14

Pier 7 - H Conv. Lev.

Information Security and Risk

Sponsor: Information Systems

Sponsored Session

Chair: Karthik Kannan, Purdue University, Krannert School of Management, 403 W State Street, West Lafayette, IN, 47904-2056, kkarthik@purdue.edu

1 - Identification of Information Security Policies Using Metagraph Transformations

Dmitry Zhdanov, University of Connecticut, 2100 Hillside Rd, Unit 1041, Storrs, CT, 06269, United States of America, dmitry.zhdanov@business.uconn.edu, Alok Gupta

This paper presents a systematic way to develop measurable, consistent and realistic security policies based on the network attack data and graphical formalisms known as metagraphs. We use data mining tools to build detection and exposure metagraphs in the networks of varying size. Metagraph transformations are then applied to identify information security policy rules.

2 - Information Risk Rating and Competition in the Business Services Market

Eric Johnson, Professor, Dartmouth College, Tuck School of Business, Center for Digital Strategies, Hanover, NH, 03755, United States of America, m.eric.johnson@dartmouth.edu, Zhizhong Zhou

Security breaches often stem from business partner failures within the value chain. In the financial services industry, there are several ongoing efforts to develop a common reference for rating the information risk posed by partners. Using a vertical differentiation framework, we model the impact of such ratings on competition within the business services market.

3 - IT Security Risk Management with Cyber-insurance

Hemantha Herath, Brock University, 500 Glenridge Avenue, St. Catharines, Canada, HHerath@brocku.ca, Tejaswini Herath

In recent years research has focused on cyber-insurance. Risk transference with insurance has been suggested to absorb losses caused by security breaches and to supplement the existing set of security tools to manage IT security residual risk. In this paper, we investigate pricing of cyber-insurance products using the emerging copula methodology for modeling dependent risks from an actuarial approach.

■ MB15

Pier 8 - H Conv. Lev.

Constraint Programming and Parallel Computing

Sponsor: Computing Society: Constraint Programming

Sponsored Session

Chair: Simon Boivin, Ecole Polytechnique de Montreal and CIRRELT, C.P. 6079, succ. Centre-ville, Montreal, QC, H3C 3A7, Canada, simon.boivin@polymtl.ca

1 - OOB: An Object-oriented Library for Parallel Branch-and-bound

Bernard Gendron, Université de Montreal (DIRO) and CIRRELT, C.P. 6128, Succursale Centre-Ville, Montreal, QC, H3C 3J7, Canada, Bernard.Gendron@cirrelt.ca, Antonio Frangioni, Francois Guertin, Teodor Gabriel Crainic

We present OOB an object-oriented library designed to help the development of parallel branch-and-bound algorithms. The main aim of the OOB project is to substantially enlarge the user base of parallel search methods beyond the traditional community of (mostly, academic) developers with a strong background in parallel computing algorithms.

2 - Task Parallelism in Constraint Programming: Parallel Consistency

Carl Christian Rolf, Lund University, Ole Romers vag 2, Lund, Sweden, Carl_Christian.Rolf@cs.lth.se, Krzysztof Kuchcinski

Most research in parallel constraint solving has focused on data-parallelism (DP), in which the search space is split between solvers. However, this type of parallelism is highly unsuitable for some problems. Furthermore, few search spaces can be split indefinitely. In this paper we look at task-parallelism (TP), where consistency is enforced in parallel. Our results show that TP can give a speed-up where DP gives a slow-down. Our research aim is to combine DP and TP to increase scalability.

3 - Parallel and Distributed Support in COMET

Laurent Michel, University of Connecticut, 2100 Hillside Road, Storrs, CT, 06269, United States of America, ldm@enr.uconn.edu, Pascal Van Hentenryck

The purpose of this talk is to present the recent advances on the parallel and distributed support available on the COMET platform for Constraint Programming and Constraint-Based Local Search. The talk will highlight how to use the facility transparently and discuss aspects of its implementation

4 - Parallelizing Global Constraints

Simon Boivin, Ecole Polytechnique de Montreal and CIRRELT,
C.P. 6079, succ. Centre-ville, Montreal, QC, H3C 3A7,
sboivin@crt.umontreal.ca, Gilles Pesant, Bernard Gendron

In this presentation, we introduce a parallel strategy for the global constraints filtering procedures. More precisely, we present parallel filtering algorithms for the Regular and the ListColoring global constraints. We present scalability tests that show the advantages and the disadvantages of this parallel strategy.

■ MB16

Pier 9 - Convention Level

Naval Mine Hunting and Reconnaissance Operations

Sponsor: Military Applications
Sponsored Session

Chair: Michel Couillard, Defence Scientist, DRDC CORA, MARLANT
N020R, P.O. Box 99000 Stn Forces, Halifax, NS, B3K 5X5, Canada,
michel.couillard2@forces.gc.ca

1 - Confidence Intervals for Binomial Probability Predictions

Paul Nguyen, PhD Student, The University of Western Ontario,
Western Science Centre, Room 230, 1151 Richmond Street,
London, ON, N6A 5B7, Canada, pnguye3@uwo.ca,
Duncan Murdoch

We studied methods for assessing the accuracy of detection probability estimates as a function of range to the target for side scan sonar systems used by the Canadian Navy. By simulation, we evaluated coverage probabilities and lengths of several confidence intervals for binomial proportions used in the traditional binning approach, linear and piecewise logistic models, and cubic regression splines. We determined that the best approach for modeling data was B-splines with careful knot selection.

2 - Optimized Route Survey Achieving a Desired Probability of Detection over a Given Search Area

Michel Couillard, Defence Scientist, DRDC CORA, MARLANT
N020R, P.O. Box 99000 Stn Forces, Halifax, NS, B3K 5X5,
Canada, michel.couillard2@forces.gc.ca, Vincent Myers,
Matt Davison

We present an optimized route survey for MCM vessels and autonomous vehicles designed to achieve a desired probability of detection throughout a given search area, while minimizing the distance to be traveled. The NURC Espresso sonar model is used to estimate the probability of detection versus range, bathymetry and seabed types. Platform motion characteristics are also considered. This route survey was tested by HMCS Glace Bay at the FRONTIER SENTINEL 2008 Exercise in Portsmouth, NH.

3 - Vessel of Interest Reconnaissance Tool

Benoit Arbour, Defence Scientist, DRDC CORA, CFMWC, P.O.
Box 99000 Stn Forces, Halifax, NS, B3K 5X5, Canada,
benoit.arbour@forces.gc.ca

Planning maritime security operations is an important aspect of the deployed forces' workload. A tool for the reconnaissance of vessels of interest (VOI) was developed using probabilistic methods to estimate the VOI position given vessel and expected course parameters. Helicopter search times are also given based on expected vessel densities. The development of the tool will be explained from problem formulation to algorithm design and implementation.

■ MB17

Regatta - H Main Lev.

Software Tutorial

Cluster: Software Tutorials
Invited Session

1 - Introduction to JMP

Melodie Rush, JMP System Engineer, JMP Div. of SAS, 100 SAS
Campus Dr., Cary NC 27513, melodie.rush@jmp.com

JMP, developed by SAS for engineering, science and business users, provides a spectrum of statistics and graphics from basic analytics to complex analyses. JMP creates statistics using point, click, drag, and drop, and then displays results as statistics and graphs in the same window. You can easily subset, perform subsequent analyses, and create 3D and dynamic graphics to help understand the results of your analyses. Join us for an introduction to JMP and learn about the newest features and capabilities available in the latest release—JMP 8.

■ MB18

Dockside 1 - H Lower Lev.

Modeling of Uneven-aged Forests

Cluster: Forestry
Invited Session

Chair: Shashi Kant, Professor, University of Toronto, 33 Wilcocks
Street, Toronto, ON, M5S 3B3, Canada, shashi.kant@utoronto.ca

1 - Uneven-aged Management Under the Generalized Faustmann Formula

Sun Chang, Professor, Louisiana State University, School of
Renewable Natural Resources, Baton Rouge, LA, 70803,
United States of America, xp2610@lsu.edu

An uneven-aged management model under the generalized Faustmann formula which allows the cutting cycle and the residual growing stock to vary over time is presented. The optimal conditions for the length of cutting cycle and level of the residual growing stock are derived and analyzed. The data from a southern pine uneven-aged forest is used to present sensitivity analyses on the effects of changes in the timber price, the value of the residual stands, the interest rates, and the land value.

2 - Forest Management and the Discount Rate

Mo Zhou, Assistant Professor, University of Alaska Fairbanks,
School of Management, Fairbanks, AK, United States of America,
ffmz2@uaf.edu, Joseph Buongiorno

It is standard to use a constant discount rate in long-term forest planning projects for timber income. This leads to two problems: the best policy is sensitive to the discount rate; harvests in the distant future have little effect on the present value. We studied the implications of different types of discount rate for managing uneven-aged forests for long-term ecological and economic benefits.

3 - Economics Analysis of Forest-level Structural Diversity

Shashi Kant, Professor, University of Toronto, 33 Wilcocks Street,
Toronto, ON, M5S 3B3, Canada, shashi.kant@utoronto.ca,
Feng'e Yang

A matrix growth model of an uneven-aged hardwood forest is estimated as a system of simultaneous growth equations using the seemingly unrelated regression technique. The estimated growth matrix and linear and non-linear programming models are used to analyze the trade-offs between financial returns and structural diversity at the forest as well as at the stand level. The optimal regimes based on forest-level decision making are different than those based on stand-level decisions.

■ MB19

Dockside 2 - H Lower Lev.

Applications of OR in the Public Sector

Sponsor: CPMS, The Practice Section of INFORMS
Sponsored Session

Chair: Louise Vignault, Principal Consultant, Government Consulting
Services, 112 Kent, Tower B, Room 1124, Ottawa, K1A 0S5, Canada,
Louise.Vignault@tpsgc-pwgsc.gc.ca

1 - Police Resourcing Model

Louise Vignault, Principal Consultant, Government Consulting
Services, 112 Kent, Tower B, Room 1124, Ottawa, On, K1A 0S5,
Canada, Louise.Vignault@pwgsc.gc.ca, Dan Harvey

The Police Resourcing Model is a discrete stochastic simulation used to estimate policing resources at RCMP and OPP detachments. Based on data such as type, place and time of call, response time, travel time and detractors, the model replicates the activities of officers as they respond to calls for service. The model is also used to assist decision makers in assessing the impact, on staffing level and performance indicators, of policy changes, legislative changes or procedural changes.

2 - Implementing Enterprise-Wide Capital Resource Optimization in Hospitals and Health Systems

Don Kleinmuntz, Executive VP, Strata Decision Technology LLC,
2001 S 1st St STE 200, Champaign, IL, 61820, United States of
America, dnk@strata-decision.com

Most U.S. hospitals and healthcare systems are mission-focused organizations that must balance quantity and quality of services against financial needs. This presentation will describe a multi-criteria decision analytic model for optimal capital allocation that has been implemented in hundreds of hospitals. The discussion will emphasize implementation challenges in these organizations.

3 - Model to Improve Quality of Household Moves

Louise Vignault, Principal Consultant, Government Consulting Services, 112 Kent st, Tower #B1124, Ottawa, On, K1A 0S5, Canada, louisevr@sympatico.ca

This simple but effective model was developed to improve the quality of household moves provided to government employees by private sector companies. It takes into account the employee satisfaction with the move as such and with the claim settlement process, as well as the mover's compliance with contract clauses. Twice a year, government moves are reallocated from one mover to another, based on the model's outcome.

■ MB20

Dockside 3 - H Lower Lev.

Pricing and Revenue Management with Strategic Customers

Sponsor: Revenue Management and Pricing Section
Sponsored Session

Chair: Jeff McGill, Professor, Queen's School of Business, Goodes Halls, 143 Union Street, Kingston, ON, K7L 3N6, Canada, jmcgill@business.queensu.ca

1 - Monopolistic and Duopolistic Dynamic Pricing in the Presence of Strategic Consumers

Benny Mantin, Assistant Professor, University of Waterloo, 200 University Ave., Department of Management Sciences, Waterloo, ON, N2L3G1, Canada, bmantin@engmail.uwaterloo.ca

We introduce and analyze dynamic pricing in two-period monopoly and duopoly models in the presence of both myopic and strategic consumers. In one duopolistic case all consumers who do not purchase in the first period visit the competing store in the second period. In another setting, strategic consumers observe prices set at both stores in the second period, and retailers are farsighted in the sense of Chwe (1994). The latter model hinges on the Largest Consistent Set concept due to Chwe (1994).

2 - Advance Selling, Strategic Consumers and Competition

Pnina Feldman, The Wharton School, 3730 Walnut St., JMHH Suite 500, Philadelphia, PA, 19104, United States of America, pninaf@wharton.upenn.edu, Gerard Cachon

Advance selling has been shown to be able to provide a firm with higher profits than spot selling. We investigate whether this continues to hold when firms compete in an environment of strategic consumers.

3 - Revenue and Cost Management for Remanufactured Products

Anton Ovchinnikov, University of Virginia, Darden School of Business, 100 Darden Blvd, Charlottesville, VA, 22903, United States of America, AOvchinnikov@darden.virginia.edu

We present a model of firm's remanufacturing operations and a behavioral study that estimates its key element - a function that describes the fraction of consumers who switch from new to refurbished product. Our behavioral study shows that this function has an inverted-U shape and hence cannot be modeled using the popular WTP-based approach. We solve the model for both the inverted-U and WTP-based behaviors and comment on how firm's policy changes.

4 - Speculative Behavior in a Queue

Andres Catalan, The Wharton School, University of Pennsylvania, Suite 500 Jon M. Huntsman Hall, 3730 Walnut Street, Philadelphia, PA, 19104, United States of America, andresc@wharton.upenn.edu, Gerard Cachon, Senthil Veeraraghavan

Not all the customers waiting for a service actually want the service: sometimes people queue solely to make a profit from customers. We analyze the behavior of a speculator in a queue that sells his position to the arriving customers. We derive different thresholds in terms of queue length, system utilization and the speculator's waiting costs that lead him to behave speculatively, that is, to hold his position and wait, in order to maximize his profit.

■ MB21

Dockside 4 - H Lower Lev.

Panel Discussion: Personal Decisions and Happiness

Sponsor: Decision Analysis Society
Sponsored Session

Chair: Rakesh Sarin, UCLA, Los Angeles, CA, rakesh.sarin@anderson.ucla.edu

1 - Perspectives on Happiness Research

Moderator: Rakesh Sarin, UCLA, Los Angeles, CA, rakesh.sarin@anderson.ucla.edu, Panelist: Manel Baucells

We use the decision analysis framework to provide an overview of recent research on happiness. Both empirical and modeling aspects will be discussed. We propose a mathematical model that captures several laws of emotions and argue that happiness can be improved through personal decisions.

Monday, 1:30pm - 3:00pm**■ MC01**

Frontenac - CC Lev. 1

VRPs Solved by Mathematical Programming Methods

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Guy Desaulniers, Ecole Polytechnique and GERAD, CP 6079, succ. Centre-ville, Montreal, QC, H3C 3A7, Canada, Guy.Desaulniers@gerad.ca

1 - Split Delivery Vehicle Routing with Time Windows: An Improved Branch-price-and-cut Method

Guy Desaulniers, Ecole Polytechnique and GERAD, CP 6079, succ. Centre-ville, Montreal, QC, H3C 3A7, Canada, Guy.Desaulniers@gerad.ca, Claudia Archetti

Very recently, Desaulniers (2008) proposed a new exact branch-price-and-cut method for the split delivery vehicle routing problem with time windows. In this talk, we present enhancements to this method that accelerate the search for negative reduced cost columns and improve the lower bounds. Computational results will be reported.

2 - Integrated Truck Routing and Scheduling in Forestry

Louis-Martin Rousseau, Associate Professor, Polytechnique Montreal, CP 6079 succ Centre-ville, Montreal, QC, H3C 3A8, Canada, louis-martin.rousseau@polymtl.ca, Nizar El Hachemi, Michel Gendreau

We present a log-truck scheduling problem that combine routing and scheduling of trucks with pick-up and delivery and stock management. We decomposed the problem in two phases. First phase we determines the destinations of full truckloads (from forest areas to woodmills). Then, we proceed to schedule the daily transportation of logs. This approach has been used the concept of constraint-based local search and was tested on a set of industrial cases from forest companies in Canada.

3 - A Vehicle Routing Problem for Planning the Transport of Disabled People

Michael Eley, Professor, Aschaffenburg University of Applied Science, Wuerzburger Str. 45, Aschaffenburg, Germany, michael.eley@fh-aschaffenburg.de

The project was motivated by a real world problem at a nonprofit organization that operates sheltered workshops for disabled people. 600 workers have to be transported between their homes and the workshops every day. The problem can be formulated as a variant of a vehicle routing problem which comprises different aspects of pick-up and delivery, dial-a-ride, multi-depot vehicle routing and vehicle fleet mix problems. We will present a problem formulation as well as a heuristic solution approach.

4 - Drivers' Rules in Vehicle Routing with Time Windows

Eric Prescott-Gagnon, Ecole Polytechnique, CP 6079, succ Centre-ville, Montreal, Canada, Eric.Prescott-Gagnon@polymtl.ca, Louis-Martin Rousseau, Guy Desaulniers, Jens Wollenweber

We address a variant of the vehicle routing problem with time windows that considers most of the European drivers' regulations. For this variant, we develop a large neighborhood search method that relies on column generation to evaluate a neighborhood. Computational results will be reported.

■ MC02

Queens Quay I - CC Lev. 1

Approximation Algorithms for Network Design

Cluster: Optimization/Combinatorial Optimization
Invited Session

Chair: Jochen Konemann, Associate Professor, University of Waterloo, Department of Combinatorics & Optimization, 300 University Avenue West, Waterloo, ON, N2L 3G1, Canada, jochen@uwaterloo.ca

1 - Strategic Network Formation with General Connectivity Requirements

Elliot Anshelevich, Assistant Professor, Rensselaer Polytechnic Institute, Computer Science Dept, 311 Lally Hall, 110 8th Street, Troy, NY, 12180, United States of America, eanshel@cs.rpi.edu, Bugra Caskurlu

When strategic agents are building a network together, new approximation algorithms and concepts are often required. In our game, every agent can have entirely different connectivity requirements, and attempts to satisfy them by purchasing links in the network. We show a variety of results about equilibrium properties in such games, including how to construct a 2-approximate Nash equilibrium that has the same quality as the optimum centralized solution.

2 - Linear Programming Relaxations for Steiner Trees

Deeparnab Chakrabarty, University of Waterloo,
200 University Avenue West, Waterloo, ON, N2L 3G1, Canada,
deepc@math.uwaterloo.ca

The Steiner tree problem is one of the classical NP-hard combinatorial optimization problems. The bidirected cut relaxation for the problem is an LP relaxation whose integrality gap lies between 1.15 and 2. It is expected that the truth lies closer to the lower bound although years of research have not improved upon the upper bound of 2. In fact, as far our knowledge goes, no natural LP relaxation for the Steiner tree problem has a gap provably better than 2. In this talk I will talk about some recent progress on the bidirected cut relaxation on special classes of graphs. A graph is quasi-bipartite (QB) if the Steiner vertices form a stable set. A quasi-bipartite is uniform (uQB) if all the edges incident on a Steiner vertex have the same cost. Previous to our work, the best known upper bound for QB and also uQB graphs was $3/2$. We improve this to $4/3$ and $73/60$ respectively. In the process we investigate other LP relaxations for the Steiner tree problem some stronger, and remarkably, some equivalent to the bidirected cut relaxation.

3 - The Design of Competitive Online Algorithms via a Primal-Dual Approach

Niv Buchbinder, Microsoft, New England, 295 Harvard St.
Apt 411, Cambridge, MA, 02139, United States of America,
nivbuchb@microsoft.com

In this work we study a wide range of online covering and packing problems with various objectives. We provide a unified approach, based on a clean primal-dual method, for the design and analysis of online algorithms for this large class of problems. In particular, our analysis uses weak duality rather than a tailor made (i.e., problem specific) potential function.

MC03

Queens Quay II - CC Lev. 1

Portfolio Optimization

Cluster: Optimization in Finance
Invited Session

Chair: Yuying Li, Professor, University of Waterloo, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, yuying@uwaterloo.ca

1 - Robust Index Tracking

Roy Kwon, University of Toronto, 5 King's College Road, Toronto,
ON, M5S 3G8, Canada, rkwon@mie.utoronto.ca, Chen Chen

We develop a robust portfolio selection model for index tracking. The model is a 0-1 integer program that seeks to maximize similarity between selected assets and the assets of the target index. Out-of-sample experiments using the S&P 100 demonstrate the advantages of the robust model.

2 - Market Impacts of Other Institutions in Portfolio Optimization Under Execution Cost

Somayeh Moazeni, PhD Candidate, University of Waterloo,
200 University Avenue West, Waterloo, ON, N2L3G1, Canada,
smaozeni@math.uwaterloo.ca, Yuying Li

A large institution's own trades as well as other concurrent large investments have non-negligible price impacts. Large trades are one of the main reasons for fat tails in the probability distribution function of a short time horizon return. We explicitly model uncertain arrivals of other large trades by two compound Poisson processes which describe these fat tails. We then analyze the effect of this model on the optimal trading strategy, cost and risk for two different market price models.

3 - Optimal Portfolio Selection Under Habit Formation

Matt Davison, Associate Professor, The University of Western Ontario, Department of Statistical & Actuarial Sciences,
Western Science Centre, London, On, N6A 5B7, Canada,
mdavison@uwo.ca, Roman Naryshkin

In a continuous time formulation, Merton formulated a nonlinear partial differential equation for the problem of optimizing the utility of consumption and bequest for an investor managing a portfolio of assets. We have extended this work to an investor with a non-addictive habit formation consumption utility. The resulting partial differential equation must be solved numerically. We present results, including those incorporating transaction costs.

MC04

Bay Room - CC Lev. 1

Simulation Competition I

Cluster: Competitions
Invited Session

Chair: Saeed Zolfaghari, Ryerson University, 350 Victoria Street,
Toronto, Canada, zolfaghari@ryerson.ca

1 - Simulation Competition

In this annual simulation competition, teams of 2-4 students from the same university work on a simulation problem that can be solved using SIMUL8. Five finalist teams are selected to present their solutions and compete for top three prizes. This year, participants have been asked to develop a simulator that models an elevator system in a 15-floor office building to determine the optimal elevator controller where each car can operate in one of the three pre-defined operation modes.

MC05

Yonge - CC Lev. 1

Reliability I

Contributed Session

Chair: Kouroush Jenab, Dr., Ryerson University, 350 Victoria St.,
Toronto, ON, M5B 2K3, Canada, jenab@ryerson.ca

1 - Remaining Useful Life of Repairable Systems Subject to Condition Monitoring

Elizabeth Lorna Wong, MIE, University of Toronto, 5 King's
College Road, Toronto, ON, M5S 3G8, Canada,
lorna@mie.utoronto.ca, Andrew K.S. Jardine, Dragan Banjevic

RUL prediction is of interest particularly when the repairable system in question is a large capital asset. The economic and strategic life must be considered in maintenance decision-making for complex and expensive equipment. Challenges include the good-as-new or bad-as-old dilemma - do maintenance actions return the system to a like-new state or to the same state as immediately preceding the action? Power transformers are used as a case study.

2 - Optimal Counting Number for a Two-unit System Subject to Failure Rate Interaction and External Shocks

Min-Tsai Lai, Professor, Department of Business Administration,
Southern Taiwan University, No.1, Nantai St, Yung-Kang
City, Tainan Tai, Tainan, 710, Taiwan - ROC,
lai1962@mail.stut.edu.tw

An optimal n-policy for a two-unit system subject to failure rate interaction is presented. Failure rate interaction means that unit-1 failure increases the failure rate of unit-2, while unit-2 failure causes unit-1 into failure. The system receives two kinds of shocks, type A shock causes unit-1 into failure, but type B shock causes the system total failure. Replace the system at the n-th unit-1 failure or on total failure.

3 - A Novel Intelligent Maintenance System

Kamyar Rashidi, Ryerson University, 414 - 23 Lascelles Blvd.,
Toronto, M4V2B9, Canada, kamyar.rashidi@ryerson.ca,
Kouroush Jenab

Condition-Based Maintenance (CBM) is the maintenance strategy, which can reduce equipment downtime, production loss, and maintenance cost based on a change in equipment condition. Our objective is to present a novel CBM model based on Bayesian Decision Theory to determine whether the system is working properly or it needs maintenance/service.

4 - Two-parameter Weibull Distribution Estimation Using Genetic Algorithm

Kouroush Jenab, Dr., Ryerson University, 350 Victoria St.,
Toronto, ON, M5B 2K3, Canada, jenab@ryerson.ca, Diane Liu

Two parameter Weibull distribution is often used to represent the time to failure of a sample of identical components. Different methods exist to fit this data, such as the Least Squares Estimation (LSE). To improve fit accuracy, determined by the Maximum Likelihood function, genetic algorithm with Matlab has been proposed.

■ MC06

Wellington - CC Lev. 1

Location Analysis and its Applications

Cluster: Location

Invited Session

Chair: Rongbing Huang, Assistant Professor, School of Administrative Studies, York University, Toronto, ON, M3J 1P3, Canada, rhuang@yorku.ca

1 - A Robust Optimization Approach for an Integrated Location-inventory Problem

Eissa Nematollahi, York University, 4700 Keele St, Toronto, Canada, eissa@yorku.ca, Fatma Gzara, Abdullah Dasci

We present an integrated network design and inventory problem in spare-parts logistics management. We introduce a robust optimization approach to deal with demand uncertainty. The resulting model is linear with a highly sparse structure. We also present the results of an extensive computational study to show the effectiveness of the robust model.

2 - Railroad Transportation of Hazardous Materials: A Conditional Population Exposure Approach

Manish Verma, Assistant Professor, Memorial University, Faculty of Business Administration, St. John's, NL, A1B3X5, Canada, mverma@mun.ca

Hazardous materials are potentially harmful to people and environment due to their toxic ingredients. Although a significant portion of hazmat is transported via railroads, prevailing studies on dangerous goods focus on highway shipments. In this work, we develop a risk assessment methodology that takes into consideration the differentiating features of trains, notably volume and nature of cargo and the sequence of events leading to release of hazmat from derailed/ruptured railcars.

3 - Return-On-Investment (ROI) Criteria for the Network Design of Retail Chains

Rongbing Huang, Assistant Professor, School of Administrative Studies, York University, Toronto, ON, M3J 1P3, Canada, rhuang@yorku.ca, Mozart Menezes, Seokjin Kim

To provide managerial insights on the network design of a retail chain on a network, we consider the problem of determining the number, location, and capacities of retail stores operating as an $M/M/1/c$ queue under several different performance criteria. We consider structural differences among the three formulations and their solutions to highlight the strategic implications of the ROI criterion. Numerical examples are presented.

■ MC07

Metro Grand West - CC Lev. 2

Tutorial: Data Envelopment Analysis for Health Care Efficiency Measurement: Recent Trends and Statistical Extensions

Cluster: Tutorials

Invited Session

Chair: Liam O'Neil, Associate Professor, University of North Texas, SPH / HMP Department, 3500 Camp Bowie Blvd, Fort Worth, TX, 76107, United States of America, loneill@hsc.unt.edu

1 - Data Envelopment Analysis for Policy Analysis and Managerial Benchmarking: Some Future Directions

Liam O'Neil, Associate Professor, University of North Texas, SPH / HMP Department, 3500 Camp Bowie Blvd, Fort Worth, TX, 76107, United States of America, loneill@hsc.unt.edu, Dash Wu

We consider recent advances in Data Envelopment Analysis (DEA) for both policy analysis and managerial decision-making. We compare DEA with econometric techniques, such as Stochastic Frontier Analysis (SFA). The bootstrap method is considered to increase the robustness of DEA results. Techniques are considered to increase model validity for both the input and output-oriented models. Merger and dynamic DEA models are also presented.

■ MC08

Pier 2 - H Conv. Lev.

Actuarial Ruin Theory

Sponsor: Applied Probability Society

Sponsored Session

Chair: Steve Drekic, University of Waterloo, Department of Statistics & Actuarial Science, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, sdrekic@math.uwaterloo.ca

1 - The Time of Recovery and the Maximum Severity of Ruin in Perturbed Risk Processes

Jiandong Ren, University of Western Ontario, Department of Statistical & Actuarial Sciences, Western Science Centre, London, ON, N6A 5B7, Canada, jren@stats.uwo.ca, Shuanming Li

In this paper, we study the perturbed risk processes with Markovian arrivals. We present explicit formulas for the Laplace transform of the time to cross a certain level before ruin, the Laplace transform of the time of recovery and the distribution of the maximum severity of ruin.

2 - General Tax Structures for Levy Risk Model

Xiaowen Zhou, Concordia University, Department of Mathematics & Statistics, 1455 de Maisonneuve Blvd West, Montreal, QC, H3G 1M8, Canada, xzhou@mathstat.concordia.ca

In this talk we consider a Levy risk model with general tax structure. In such a model the underlying surplus process is a spectrally negative Levy process and the tax rate depends on the previous maximum of the process. Using excursion theory we obtain expressions for quantities interested in risk theory. Such expressions are in terms of scale functions.

3 - Ruin Analysis of a Threshold Strategy in a Discrete-time Sparre Andersen Model

Steve Drekic, University of Waterloo, Department of Statistics & Actuarial Science, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, sdrekic@math.uwaterloo.ca

Using matrix analytic methods, computational procedures are constructed which enable one to calculate fundamental ruin-related probability distributions of interest for a discrete-time, delayed Sparre Andersen insurance risk model featuring a single threshold level and randomized dividend payments. Special cases of the general model are examined in several numerical examples.

■ MC09

Pier 3 - H Conv. Lev.

Supply Chain Optimization I

Contributed Session

Chair: Walid Abdul-Kader, University of Windsor, 401 Sunset Avenue, Windsor, ON, N9B3P4, Canada, kader@uwindsor.ca

1 - On Contracts for VMI Program with Continuous Review (r, Q) Policy

Ruoxi Guan, Tsinghua University, Department of Industrial Engineering, Beijing, China, ruoxi@mails.thu.edu.cn, Xiaobo Zhao

We study the contract design for vendor managed inventory (VMI) program based on a system with continuous review (r, Q) policy. A perfect contract should enable the system to be coordinated and guarantee the program to be trusted. We design revenue-sharing contract and franchising contract for two popular business scenarios in VMI called 'vendor with ownership' and 'retailer with ownership' respectively, and show that one contract can perform satisfactorily and the other is a perfect contract.

2 - Controlling Risk through Options in the Newsvendor Problem

Francisco Arcelus, Professor Emeritus, University of New Brunswick, P O Box 4400, Faculty of Business Administration, Fredericton, E3B 5A3, Canada, arcelus@unb.ca, Gopalan Srinivasan, Satyendra Kumar

The shortening of life cycle of products due to technological developments or change of fashion has led researchers to revisit the newsvendor problem. This paper tries to integrate the pricing, risk characteristics and the flexibility of the order quantity, by formulating the demand as a function of price, modifying the objective function to a risk adjusted expected value and providing the retailer an opportunity to acquire options.

3 - Optimum Base-Stock Levels in a Supply Network with Service Level Constraints

Yat-wah Wan, Professor, National Dong Hwa University, 1, Sec 2, Da-Hsueh Rd., Shou-Feng, Hualien, 974, Taiwan - ROC, ywan@mail.ndhu.edu.tw, Tsung-Sheng Chang

In our model, retailers adopt base-stock policies for items. They replenish under fixed order leadtimes and set constraints on customer service levels. The objective is to optimize a given combination of inventory holding costs, transportation costs, and sales revenues. A simulation procedure is developed to search for the global optimal base-stock levels for all items. The procedure is based on some sample-path and structural properties with respect to base-stock levels.

4 - A Generalized Preventive Maintenance Policy of a System Subjected to Shocks Based on Virtual Age

Shy-Huei Sheu, Professor, Department of Industrial Management, National Taiwan University of Science and Technology, 43 Keelung Road, Section 4, Taipei 106, Taipei, 106, Taiwan - ROC, shsheu@mail.ntust.edu.tw, Chin-Chih Chang, Yen-Luan Chen

This paper presents a periodic preventive maintenance model for a system subjected to random shocks. As shocks occur, the system experiences one of two types of failures: type-I failure and type-II failure. Type-I failures are rectified by minimal repair. The system is maintained at a type-II failure or at age T , whichever occurs first. Taking the shock number-dependent failure type and the virtual age into consideration, the object consists of determining the optimal schedules.

5 - Service Variability and Service Improvements in Supply Chains: Optimization of Total Costs

Walid Abdul-Kader, University of Windsor, 401 Sunset Avenue, Windsor, ON, N9B3P4, Canada, kader@uwindsor.ca, Ozhand Ganjavi

Service variability in supply chains entails many associated costs including penalties, loss of good will, etc. This research optimizes the sum of costs of variability in service levels and the cost of adjusting processes with the aim of reducing such variability. Optimal level of investment to reduce service level variability is the main objective of the proposed model. The direct cost of service level is represented by a truncated loss function often used for off-specification products.

MC10

Salon A - H Conv. Lev.

Supply Chain and Pricing Decisions

Sponsor: Manufacturing and Service Operations Management
Sponsored Session

Chair: Woonghee Tim Huh, Columbia University, 500W 120th Street, MC4704, New York, NY, 10027, United States of America, th2113@columbia.edu

1 - The Dynamic Substitution Problem with Pricing

Amr Farahat, Cornell University, 370 Sage Hall, Ithaca, NY, 14853, aaf33@cornell.edu, Joonkyum Lee

We study the problem faced by a centralized decision maker managing several substitutable products in a newsvendor setting. Using deterministic approximations to the stochastic problem, we investigate heuristics that perform well compared to existing approaches. These heuristics are then embedded in a larger problem that incorporates pricing under the MNL model.

2 - Modeling the Public Health Emergency Supply Chain

Kathleen King, Cornell University, 257 Rhodes Hall, Ithaca, NY, 14850, United States of America, kak59@cornell.edu, John A. Muckstadt

We will present linear programming and dynamic programming models of the United States' public health emergency response supply chain. We explain how these models can be used to identify minimum levels for supply stockpiles, transportation capabilities, and staffing requirements, as well as near-optimal policies for operating the medical supply distribution network during an emergency response. We will further discuss the circumstances under which these policies are optimal.

3 - Stable Supplier Coalitions in Assembly Systems with Commodity Components

Greys Susic, University of Southern California, Marshall School of Business, Los Angeles, CA, United States of America, susic@marshall.usc.edu, Mahesh Nagarajan

We study alliance formation between suppliers in an assembly model in which k suppliers sell commodity components, and the remaining suppliers are monopolists. In Stage 1, suppliers form coalitions that sell kits of components. In Stage 2, coalitions determine wholesale prices, while the assembler buys the kits and sets the product selling price. We predict the structure of stable alliances as a function of the power structure, the number of commodity/monopoly suppliers, and demand shape.

4 - Offshoring and Transfer Pricing Decisions of Global Supply Chains

Masha Shunko, Carnegie Mellon, Tepper School of Business, 5000 Forbes Avenue, Pittsburgh, PA, 15213, mshunko@andrew.cmu.edu, Srinagesh Gavirneni, Laurens Debo

We study how global firms can jointly leverage tax and cost differences through coordinated transfer pricing and offshoring. In a global firm, however, jointly optimal strategies are hindered by an incentive problem. The headquarters is concerned about the consolidated after tax profits, while local divisions have a better view on the product cost structure. We find that when the tax difference is large, a centralized firm structure works best. In other settings, decentralization is better.

MC11

Salon C - H Conv. Lev.

OR in Public Health

Sponsor: Health Applications Section
Sponsored Session

Chair: Eva Lee, Associate Professor & Director, Georgia Tech, School of Industrial & Systems Engineeri, Ctr for Operations Research in Medicine, Atlanta, GA, 30332, eva.lee@gatech.edu

1 - Using Simulation to Evaluate Public Health Surveillance

David Buckeridge, McGill University, 1140 Pine Avenue West, Montreal, QC, Canada, david.buckeridge@mcgill.ca

Public health surveillance is crucial for detecting disease outbreaks rapidly and initiating effective control measures. There is little empirical evidence, however, to guide the development and configuration of public health surveillance systems. I will demonstrate how discrete-event simulation models have been used to evaluate surveillance for an airborne release of *Bacillus anthracis* and surveillance for waterborne disease outbreaks, thereby providing evidence to guide surveillance practice.

2 - Approximate Dynamic Programming Approach to Ambulance Redeployment

Matthew Maxwell, Cornell University, Rhodes Hall, OR&IE, Ithaca, NY, 14853, United States of America, msm57@cornell.edu, Shane Henderson, Mateo Restrepo, Huseyin Topaloglu

Ambulance service providers must make efficient use of current resources to increase the number of "on-time" calls, or calls responded to within a given time threshold. One area of potential improvement is the real-time reallocation of ambulances to bases in response to the location and status of other ambulances. We illustrate an approximate dynamic programming approach to making real-time redeployment decisions for ambulances and provide computational results of the method.

3 - Emergency Evacuation Planning for Populations with Special Needs

Linda Hess, Florida Atlantic University, 777 Glades Rd Bldg#36, Boca Raton FL 33431, United States of America, LHess4@fau.edu, Evangelos Kaisar

Millions of people each day rely on public transportation, which could play a significant role in transporting people with special needs as well as people without cars in time of emergency. In this study, the main control strategy is to identify the best routing approach in order to fully utilize the available capacity of a transportation network.

4 - Modeling and Optimizing the Public Health Infrastructure for Emergency Response

Eva Lee, Associate Professor & Director, Georgia Tech, School of Industrial & Systems Engineeri, Ctr for Operations Research in Medicine, Atlanta, GA, 30332, eva.lee@gatech.edu

City readiness and emergency response involves multi-level strategic and operational planning of the public health infrastructure. We provide an overview infrastructure network and highlight some challenges. Strategic stockpile, medical supply distribution, locations of dispensing facilities, optimal facility staffing and resource allocation, routing of the population, and various logistics, transportation, and dispensing modalities will be discussed and analyzed. This work is joint with CDC.

MC12

Pier 4 - H Conv. Lev.

GDN Keynote Session I

Sponsor: Group Decision and Negotiation Section: GDN 2009
Sponsored Session

Chair: Marc Kilgour, Professor, Wilfrid Laurier University, Department of Mathematics, 75 University Avenue West, Waterloo, ON, N2L 3C5, Canada, mkilgour@wlu.ca

1 - Computational Agents for Inter-Cultural Negotiation: Perspectives and Challenges

Katia Sycara, Carnegie Mellon University, 5000 Forbes Avenue, Newell-Simon Hall 1602D, Pittsburgh, PA, 15213, katia@cs.cmu.edu

As business, political and social interactions become more globalized, understanding inter-cultural negotiations becomes increasingly important. In this talk we present our research on computational agents for inter-cultural negotiation. These agents could be used in: (a) helping to identify importance of cultural factors in outcome and process, (b) providing inter-cultural negotiation decision support, and (c) education and training of inter-cultural negotiators.

2 - Collaboration Engineering: Technical and Methodological Advances

Gert-Jan de Vreede, Professor, University of Nebraska- Omaha, Department of ISQA, Omaha, NE, 68182, United States of America, gdevreede@mail.unomaha.edu

Collaboration Engineering is a design approach for designing and deploying collaboration processes for recurring high-value collaborative tasks that are executed by practitioners without the ongoing intervention of professional facilitators. Researchers world-wide have made great progress in a number of areas to further develop and field test the Collaboration Engineering approach. This presentation will highlight recent advances from a technological and methodological perspective.

MC14

Pier 7 - H Conv. Lev.

E-Business

Sponsor: Information Systems

Sponsored Session

Chair: Zhongju (John) Zhang, University of Connecticut, 2100 Hillside Rd, Storrs, CT, United States of America, John.Zhang@business.uconn.edu

1 - Sequential Information Acquisition Under a Budget Constraint

Yonghua Ji, Assistant Professor of MIS, School of Business, University of Alberta, Edmonton, AB, T6G2R6, Canada, yji@ualberta.ca, Radha Mookerjee, Vijay Mookerjee

In this study, we study various heuristics to optimize the information acquisition strategy under a certain time or cost constraint. We carry out several numerical experiments to evaluate the effectiveness of such searching heuristics. Insights from the experiments are summarized in this study.

2 - Economic Impact of Carbon Reduction Regulation and Optimal Complying Strategies in Auto Industry

Qindong Liu, OPIM, UCONN School of Business, 2100 Hillside Road, Storrs, CT, 06269, United States of America, qindong.liu@business.uconn.edu

The automobile industry is facing serious regulatory challenges, as lawmakers demand significant reduction of carbon dioxide emission from their products. In light of the European Union's proposal, we investigate carbon reduction's implication on automakers' optimal product portfolio and pricing strategies. We propose a cooperation scheme under which the automakers jointly file for compliance while competing in the market.

3 - An Empirical Analysis of Dell IdeaStorm

Li Chen, University of Connecticut, 2100 Hillside Road, Storrs, CT, 06269, United States of America, li.chen@business.uconn.edu, Jim Marsden, Zhongju (John) Zhang, Paulo Goes

"Web" tools allow companies to obtain potentially valuable input from online 'brainstorm' communities (e.g. Dell IdeaStorm). However, we know little about how firms actually utilize them. Here, we analyze the correspondence between characteristics of the inputs and decisions of Dell. Our 'pre-theory' analysis aims to identify key relationships for subsequent theory developing. Initial results are encouraging, especially in terms of the ability to accurately classify certain Dell decisions.

MC15

Pier 8 - H Conv. Lev.

Novel Applications of Constraint Programming

Sponsor: Computing Society: Constraint Programming

Sponsored Session

Chair: Laurent Michel, University of Connecticut, 2100 Hillside Road, Storrs, CT, 06269, United States of America, ldm@engr.uconn.edu

1 - Constraint Models for Alternative Routes in Manufacturing, Air Traffic, and Grid Scheduling

Roman Bartak, Professor, Charles University, Department of Theoretical Comp. Science, Malostranske namesti 2/25, Praha 1, 11800, Czech Republic, bartak@ktiml.mff.cuni.cz

Real-life combinatorial problems frequently involve different types of alternatives, for example, scheduling problems involve alternative process routes and alternative ordering of activities in resources. Usually, different types of alternatives are handled separately which decreases quality of solutions. We propose an integrated constraint model describing alternative process routes motivated by production scheduling but applicable also in air traffic control and grid scheduling.

2 - A Constraint Programming Approach for Solving a Queueing Design and Control Problem

Daria Terekhov, Department of Mechanical and Industrial Engineering, University of Toronto, 5 King's College Road, Toronto, ON, M5S3G8, Canada, dterekho@mie.utoronto.ca, J. Christopher Beck, Kenneth N. Brown

A facility with front and back room operations can hire specialized or cross-trained workers. Assuming stochastic customer arrival and service times, we seek a smallest-cost mix of workers satisfying constraints on the expected customer waiting time and expected number of workers in the back room. A constraint programming approach using logic-based Benders' decomposition is presented. This work provides one of the first links between queueing optimization problems and constraint programming.

3 - Scalable Load Balancing in Nurse to Patient Assignment Problems

Pascal Van Hentenryck, Professor, Brown University, 115 Waterman Street, Providence, RI, 02912, United States of America, pvh@cs.brown.edu, Jean-Charles Regin, Pierre Schaus

This paper considers the daily assignment of patients to nurses. The objective is to balance the workload of the nurses, while satisfying side constraints. Prior work proposed a MIP model, which unfortunately did not scale to large instances and only approximated the objective function. This paper presents constraint programming (CP) models of increasing complexity to solve large instances with hundreds of patients and nurses in a few seconds using the Comet optimization system.

4 - Capabilities of Constraint Programming in Software Verification

Michel Rueher, Professor, University of Nice Sophia Antipolis, 135/ CNRS Polytech' Nice-Sophia, 930, Route des Colles - BP 145, Sophia Antipolis, 06903, France, michel.rueher@gmail.com

We will explain the advantages of Constraint Programming (CP) for automatic generation of test data and we will show that CP provides a nice implementation tool extending symbolic execution techniques. CP has recently been used to verify the conformity of a program with its specification. We will detail CPBPV, a novel CP framework for bounded program verification, which uses constraint stores to represent the specification and the program and explores execution paths non-deterministically.

MC16

Pier 9 - Convention Level

Naval Planning and Risk Analysis

Sponsor: Military Applications

Sponsored Session

Chair: Steve Guillouzie, Team Leader, Defence Research and Development Canada - Centre for Operational Research and Analysis, Canadian Forces Maritime Warfare Centre, P.O. Box 99000 Stn Forces, Halifax, NS, B3K 5X5, Canada, steve.guillouzie@forces.gc.ca

1 - A Strategic Simulation Tool for Capability-Based Resource Planning

Cheryl Eisler, Defence Scientist, Department of National Defence DRDC CORA, 101 Colonel By Drive, Ottawa, ON, K1A0K2, Canada, cheryl.eisler@forces.gc.ca, Alex Bourque

Tyche is a CBP tool that simulates a large number of time periods in which realistically random, concurrent and geographically distributed missions are scheduled, to which assets are assigned in the same way as a fleet scheduler. Force generation/employment scenarios, readiness profiles and crew quality of life issues are taken into account. This presentation will describe how Tyche can be used for modelling naval force structures and a political risk metric used to discriminate between fleets.

2 - Weapon Hazard Pattern and Collateral Damage

Talia McCallum, Defence Scientist, DRDC CORA, Canadian Forces Maritime Warfare Centre, P.O. Box 99000 Stn Forces, Halifax, NS, B3K 5X5, Canada, talia.mccallum@forces.gc.ca

The Canadian Navy uses live weapons in operations, testing and training on water without methods to systematically assess safety and collateral damage risks. Range safety templates have been evaluated via rudimentary geometry but have not been validated with real data. This study uses probabilistic methods to generate validated range safety and collateral damage risk assessments.

3 - A Verification Study of the Stochastic Salvo Model

Michael Armstrong, Associate Professor, Brock University, Finance, Operations, & Info Sys, Faculty of Business, St Catharines, ON, L2S3A1, Canada, michael.armstrong@brocku.ca

The salvo combat model was designed by Hughes (1995) to provide a simple way to model naval missile combat. A stochastic version of this model was later developed by Armstrong (2005). The derivation of the stochastic model made use of several simplifying assumptions and approximations. This presentation will examine those assumptions to see how well the model's actual behavior matches what was intended by the model's design.

4 - Probability of Collision Between Submarines

Steve Guillouzic, Team Leader, Defence Research and Development Canada - Centre for Operational Research and Analysis, Canadian Forces Maritime Warfare Centre, P.O. Box 99000 Stn Forces, Halifax, NS, B3K 5X5, Canada, steve.guillouzic@forces.gc.ca

Stealthiness constitutes the main operational advantage of submarines, but it also gives rise to a risk of collision when two of them operate in the same area. This talk will report on a recent assessment of the probability of collision between two submarines operating at the same depth. Bounds on the probability of collision were estimated using the theory of random search, the applicability of which was verified using simulations.

MC17

Regatta - H Main Lev.

Software Tutorial

Cluster: Software Tutorials

Invited Session

1 - What's New - IBM ILOG CPLEX®

Carol Tretkoff, Optimization Technical Account Manager, ILOG, an IBM Company, 4350 North Fairfax Drive, Suite 800, Arlington VA 22203, United States of America, tretkoff@us.ibm.com

Join us to learn about what's new with IBM ILOG CPLEX®, and why over 1,300 commercial users in virtually every industry worldwide have made it the gold standard solver in optimization. IBM ILOG CPLEX delivers the power needed to solve complex planning and scheduling problems—improving both efficiency and profitability.

MC18

Dockside 1 - H Lower Lev.

Mine Operations

Contributed Session

Chair: Patrick Ryan, Student/Programmer, MIRARCO, Laurentian University, Ramsey Lake Road, Sudbury, ON, P3E 2C6, Canada, pryan@mirarco.org

1 - Genetic Algorithm Features for the Solution of Large Underground Mine Scheduling Problems

Lorrie Fava, Senior Researcher, MIRARCO, Laurentian University, 935 Ramsey Lake Road, Sudbury, ON, P3E 2C6, Canada, lfava@mirarco.org, Dave Goforth, Patrick Ryan

The problem of optimizing underground mine schedules involves thousands of activities and precedence constraints, and many resource constraints. We describe features of a genetic algorithm that enable the efficient optimization of large scheduling problems, including villages, jitter mutation and learning thresholds. These features, designed for suitability in scheduling mining activities, are general enough to be applied to genetic algorithms in other contexts.

2 - Mathematical Versus Practical Optimum in Mine Ventilation Optimization

Julien Dompierre, Associate Professor, Laurentian University, 935 Ramsey Lake Road, Sudbury, ON, P3E 2C6, Canada, jdompierre@cs.laurentian.ca, Enrique Ignacio Acuna Duhart, Stephen Hall

Previous research done on the field of mine ventilation optimization had claimed to reach optimal solution for the proposed problem under some too restrictive assumptions or too coarse simplifications. A review of these works and the result obtained has shown that in mathematical terms those results are not optimal. The different approaches, solutions and counter examples will be presented to show that they are not mathematically optimal but practical optimal.

3 - A Linear Model for Optimal Auxiliary Fan Selection and Operational Settings for Multiperiod Duties

Enrique Ignacio Acuna Duhart, Researcher, MIRARCO, Laurentian University, 935 Ramsey Lake Road, Sudbury, ON, P3E 2C6, Canada, eacuna@mirarco.org, Lorrie Fava, Stephen Hall

Ventilation systems can be the primary consumers of energy in underground mining operations. In mechanized metal mines they can account for up to 40% of total mining costs. An application of a linear model to select the auxiliary fan that supplies the required multiple periods pressure and airflow for an underground mining operation at minimum cost will be presented, along with a case study to test its applicability, and to show the potential savings that can be generated.

4 - A Genetic Algorithm for Selection and Operation of Auxiliary Fans for Underground Mining

Patrick Ryan, Student/Programmer, MIRARCO, Laurentian University, Ramsey Lake Road, Sudbury, ON, P3E 2C6, Canada, pryan@mirarco.org, Enrique Ignacio Acuna Duhart, Dave Goforth, Lorrie Fava

A primary energy consumer in underground mining is the ventilation system. By making the ventilation system more efficient while still delivering the required pressure and airflow, the profitability of a mine can be significantly increased. A genetic algorithm was developed to solve the problem of auxiliary fan selection over multiple periods, and a case study was carried out to demonstrate the energy savings that can be achieved.

MC19

Dockside 2 - H Lower Lev.

Applications in Forecasting and Demand Planning

Sponsor: CPMS, The Practice Section of INFORMS

Sponsored Session

Chair: Anne Robinson, Cisco, annerobi@cisco.com

1 - Estimating Sigma for Unknown Populations

Richard Hansen, VP Demand Management, Maidenform, Woodbridge Corporate Plaza, 485-F U.S. Highway 1 South, Iselin, NJ, 08830, United States of America, rhansen@Maidenform.com, Lori Appelhans

In many commercial applications i.e. calculating safety stock levels, knowing sigma allows the user to utilize proven methodologies. While this is simple to calculate for known populations for new products and other unknown population's alternative methods must be used to estimate it. The alternative method suggested here leveraging the simplex method allows the user to identify relevant criteria to utilize in determining an appropriate estimate.

2 - Modern Adaptation of Sales and Operations Planning (S&OP)

Rob Benson, Managing Principal, Spinnaker, 231 Milwaukee St., Suite 200, Denver, CO, 80206, United States of America, rbenson@spinnakermgmt.com

Sales and Operations Planning (S&OP) has increased its popularity as a process framework to unify various department silos and to implement strategic and tactical goals. Many companies use S&OP to unlock the value of their large investments in APS and other decision support tools. As a result, S&OP is experiencing a transformation from its origins several decades ago. This presentation discusses recent changes to S&OP implementations as companies adapt it to modern business realities.

3 - Choosing the Right Model for the Data: Forecasting Product Demand at Cisco

Anne Robinson, Cisco, annerobi@cisco.com

Cisco's broad spectrum of products triggers a wide variety of demand patterns to meet a multitude of customer requirements. The challenge of statistically forecasting in this environment is finding the right statistical model to accurately predict the product demand. Leveraging different characteristics in the data allows us to better model the demand patterns and more effectively anticipate customer behavior.

MC20

Dockside 3 - H Lower Lev.

Topics in Revenue Management & Pricing

Sponsor: Revenue Management and Pricing Section

Sponsored Session

Chair: Srinivas Krishnamoorthy, University of Western Ontario, Richard Ivey School of Business, 1151 Richmond Street North, London ON N6A 3K7, Canada, skrishnamoorthy@ivey.uwo.ca

1 - Bundling Strategies in the TV Advertising Market

Mihai Banciu, Bucknell University, School of Management, 117 Taylor Hall, Lewisburg, PA, 17837, United States of America, mihai.banciu@bucknell.edu, Esther Gal-Or, Prakash Mirchandani

With more than 60 billion dollars spent yearly on TV advertising, it is increasingly important for TV executives to design better allocation policies for their air slots inventory. Our analysis of an optimal slot bundling policy helps in assessing the network's incentives to improve ratings of advertising time, and in prioritizing its programming quality improvement initiatives. Numerical analysis extends our analytical work and shows robustness to the relaxation of our modeling assumptions.

2 - Decentralized Inventory Sharing with Asymmetric Information

Xinghao Yan, Assistant Professor, Richard Ivey School of Business,
University of Western Ontario, 756 Platt's Lane, London, ON,
N6G 5E5, Canada, xyan@ivey.ca, Hui Zhao

We study an inventory sharing game between two retailers with private demand information. We find that sharing demand information does not always benefit retailers. However, a coordination mechanism through the involvement of the manufacturer, together with a truth-inducing scheme, can be developed to achieve the coordination of the manufacturer-retailers system. This paper is the first attempt to study inventory sharing systems with asymmetric information.

3 - Using Revenue Management to Enhance Profitability of a Dual-channel Supply Chain

Jing (Jenny) Chen, Assistant Professor, Department of Business & Administration, the University of Winnipeg, 515 Portage Avenue, Winnipeg, MB, R3B 2E9, Canada, je.chen@uwinnipeg.ca, Peter Bell

We consider a market served by a manufacturer through a retail channel, a direct channel, or a combination of both. Using pricing principles from revenue management (RM), we investigate the optimal channel structure for the manufacturer and how RM enhances profits of the manufacturer and the entire chain by examining three options for the manufacturer.

4 - Competitive Pricing with Reference Effects

Brian Coulter, University of Western Ontario, Richard Ivey School of Business, 1151 Richmond Street North, London, ON, N6A 3K7, Canada, bcoulte@uwo.ca, Srinivas Krishnamoorthy

We examine the effect of reference prices on the pricing strategies of two competing firms. We show that, in a two period game, the effect of reference prices motivates firms to price higher at equilibrium than they would if there was no reference pricing effect. The analogy drawn within the paper is to the MP3-Player market, wherein incumbents have large reference price advantages over effectively equivalent new entrants.

MC21

Dockside 4 - H Lower Lev.

Behavioral Decision Making

Sponsor: Decision Analysis Society

Sponsored Session

Chair: Franz Heukamp, IESE Business School, 21 Avenida Pearson, Barcelona, 8034, Spain, fheukamp@iese.edu

1 - Common Ratio Using Delay

Franz Heukamp, IESE Business School, 21 Avenida Pearson, Barcelona, 8034, Spain, fheukamp@iese.edu, Manel Baucells

We present an experiment in which we add a common delay in a choice between two risky prospects. The delay produces the same change in preferences as the common ratio effect in risky lotteries. The delay acts as if the probabilities were divided by some common ratio. We present a parameterization of the Probability Time Trade-off (PTT) model, showing the value function exhibits increasing relative risk aversion, the weighting function is s-shaped, and the intrinsic discount rate is decreasing.

2 - Sensitivity Analysis of Weighted-Sum Scoring Methods

Bohdan Kaluzny, Defence Scientist, Defence Research & Development Canada, Centre for Operational Research & Analysis, DRDC CORA, NDHQ 6 CBS, 101 Colonel By Dr., Ottawa, ON, K1A 0K2, Canada, bohdan.kaluzny@drdc-rddc.gc.ca, R.H.A. David Shaw

The general MCDA problem is the evaluation of a set of options against a set of criteria. Given criteria weights and per-option criteria ratings, weighted-sum methods (e.g. the Borda Count) are often used to score options. The ordering of options by score yields a final ranking. How sensitive is a ranking subject to changes to the criteria weights? To answer this we apply polyhedral theory to define and compute three measures of sensitivity classes: volume, distance, and representativity.

Monday, 3:30pm - 5:00pm**MD01**

Frontenac - CC Lev. 1

Models and Methods for Planning Railroad Operations

Sponsor: Transportation Science & Logistics

Sponsored Session

Chair: Teodor Gabriel Crainic, Department Management & Technology, ESG, UQAM, C.P. 8888, succ. Centre-ville, Montreal, QC, H3C 3J7, Canada, theo@crt.umontreal.ca

Co-Chair: Endong Zhu, University of Montreal, C.P. 6128, succursale Centre-ville, Montreal, QC, H3C 3J7, Canada, endong@crt.umontreal.ca

1 - Integrated Service Network Design in Freight Rail Transportation

Endong Zhu, University of Montreal, C.P. 6128, succursale Centre-ville, Montreal, QC, H3C 3J7, Canada, endong@crt.umontreal.ca, Teodor Gabriel Crainic, Michel Gendreau

Service network design aims to build a good operating plan for railway carriers. We integrate the primary operations (service selection, traffic distribution, blocking policy, and train make-up policy) into one compound model, and analyze the trade-offs among them in a 2-layer time-space network structure. A Tabu Search on cycle-based neighborhood is developed and numerical results on random instances show the algorithm proposed is robust to find good feasible solutions.

2 - Passenger Railway Crew Rescheduling

Daniel Potthoff, Erasmus University Rotterdam, Burg. Oudlaan 50, Rotterdam, 3000 DR, Netherlands, potthoff@ese.eur.nl, Guy Desaulniers, Dennis Huisman

The Dutch railway network experiences about three large disruptions per day on average. In this talk, we present an algorithm based on column generation techniques to reschedule the crews when such a disruption occurs. Computational experiments with real-life instances show that our method is capable of producing good solutions within a couple of minutes of computation time.

3 - A Cost and Expected Consequence Approach to Planning and Managing Railroad Transportation of HazMats

Manish Verma, Assistant Professor, Memorial University, Faculty of Business Administration, St. John's, NL, A1B3X5, Canada, mverma@mun.ca

Although hazardous materials account for over 5% (around 140 million tons) of all railroad freight traffic in the United States, it has not received much attention from academic researchers. We develop a bi-objective optimization model, where cost is determined based on the characteristics of railroad industry while transport risk incorporates the nature of railroad accident. A realistic size problem instance based in south-east US is solved and analyzed to gain managerial insights.

4 - Managing Locomotives in Freight Rail Transportation Systems

Mervat Chouman, University of Montreal, Montreal, QC, H3T 1J4, Canada, mervat@crt.umontreal.ca, Teodor Gabriel Crainic

The problem concerns the planning of locomotive fleet management for a freight rail carrier. It consists in assigning a set of heterogeneous locomotives to scheduled trains while a number of restrictions, e.g., power availability and maintenance rules, are satisfied. We propose to address the problem with a two-phase methodology, where a general locomotive circulation plan is first determined, followed by an operational day-to-day individual assignment.

MD02

Queens Quay I - CC Lev. 1

Algorithmic Game Theory

Cluster: Optimization/Combinatorial Optimization

Invited Session

Chair: Chaitanya Swamy, Assistant Professor, University of Waterloo, Combinatorics & Optimization, 200 University Ave. West, Waterloo, ON, N2L 3G1, Canada, cswamy@math.uwaterloo.ca

1 - Approximation Algorithms for Envy-free Profit-maximization Problems

Chaitanya Swamy, Assistant Professor, University of Waterloo, Combinatorics & Optimization, 200 University Ave. West, Waterloo, ON, N2L 3G1, Canada, cswamy@math.uwaterloo.ca, Maurice Cheung

We consider a class of pricing problems, called envy-free profit-maximization problems, wherein a seller wants to set prices on items (available in limited supply) and allocate them to customers so as to maximize his profit, with the constraint that each customer receives a utility-maximizing subset. We consider an important setting called the single-minded problem, where each customer desires a single set of items. We present the first approximation algorithms for this class of problems.

2 - On the Uniqueness of Equilibria in Atomic Flow Games

Umang Bhaskar, Dartmouth College, Sudikoff Lab, Dartmouth College, Hanover, NH, 03755, United States of America, umang@cs.dartmouth.edu, Lisa Fleischer, Chien-Chung Huang, Darrell Hoy

In routing games with atomic players, the uniqueness of equilibria has been demonstrated only in limited cases and existence of multiple equilibria is an open question. In our work, we show via two specific examples that there may be multiple equilibria in atomic player routing games. We also give a complete characterization of the class of network topologies for which unique equilibria exist. Our results are based on a novel characterization of these topologies in terms of circulations.

3 - Games on Networks

Tom Wexler, Assistant Professor, Denison University, Department of Mathematics and Computer S, Olin 205, Granville, OH, 43023, United States of America, wexlert@denison.edu, Alexa Sharp, David Liben-Nowell, Joshua Davis

In this talk we present a framework for modeling games played on networks. In particular, we consider a composition operation that combines a simple game and a network, creating a larger game played on that network. This class of games generalizes a number of games that have been studied in the context of diffusion in networks, while refining the class of graphical games. Our main results focus on comparing the price of anarchy in simple games and their networked counterparts.

■ MD03

Queens Quay II - CC Lev. 1

Financial Optimization

Cluster: Optimization in Finance

Invited Session

Chair: Matt Davison, Associate Professor, The University of Western Ontario, Dept of Statistical & Actuarial Sciences, Western Science Centre, London, On, N6A 5B7, Canada, mdavison@uwo.ca

1 - Swinging in Liquidity: The Use of Swing Options to Manage Liquidity Risk

R. Mark Reesor, Assistant Professor, University of Western Ontario, Dept of Applied Math, London, On, N6A 5B7, Canada, mreesor@uwo.ca, Shudan Liu

Recently there have been major disruptions in global financial markets due to evaporation of liquidity. Here we propose the use of "swing" or "take-or-pay" options to manage funding liquidity risk. For many years swing options have been used in commodity markets as a means for consumers to control the delivery amount and timing of the underlying asset. An example in which the underlying asset is a bond is analysed from both the issuer's and consumer's perspectives.

2 - Stable Local Volatility Calibration Using Kernel Splines

Yuying Li, Professor, University of Waterloo, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, yuying@uwaterloo.ca

We propose an optimization formulation to ensure accuracy and stability in the local volatility function (LVF) calibration. The proposed objective function balances the calibration accuracy with the model complexity. The unknown LVF is represented by a spline kernel function and the complexity of the model is controlled by minimizing the 1-norm of the vector of coefficients for the kernel spline. Stability of the calibrated local volatility function is illustrated based on market data.

3 - Applied Mathematical Advances for High Dimensional Portfolios

Matt Davison, Associate Professor, The University of Western Ontario, Department of Statistical & Actuarial Sciences, Western Science Centre, London, On, N6A 5B7, Canada, mdavison@uwo.ca, Matt Thompson, Greg Reid, Butt Nabeel

When partial differential equations (PDE) are used in finance, each additional asset adds more dimensions. In portfolio optimization under transaction costs, this can lead to PDE in dozens of variables. As the PDE are also nonlinear (by virtue of their moving boundaries), the resulting computational problems are highly nontrivial. In this talk we present recent work on numerical and symbolic-numerical approaches to this crucial problem.

■ MD04

Bay Room - CC Lev. 1

Simulation Competition II

Cluster: Competitions

Invited Session

Chair: Saeed Zolfaghari, Ryerson University, 350 Victoria Street, Toronto, Canada, zolfaghari@ryerson.ca

1 - Simulation Competition

In this annual simulation competition, teams of 2-4 students from the same university work on a simulation problem that can be solved using SIMUL8. Five finalist teams are selected to present their solutions and compete for top three prizes. This year, participants have been asked to develop a simulator that models an elevator system in a 15-floor office building to determine the optimal elevator controller where each car can operate in one of the three pre-defined operation modes.

■ MD05

Yonge - CC Lev. 1

Reliability II

Contributed Session

Chair: Sharareh Taghipour, PhD Candidate, University of Toronto, 1210- 450 Walmer Road, Toronto, ON, M5P 2X8, Canada, sharareh@mie.utoronto.ca

1 - Gearbox Fault Detection Using Vibration Data and Bayesian Process Control

Ming Yang, Mr., University of Toronto, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, yangming@mie.utoronto.ca, Viliam Makis

Collecting and analyzing gearbox vibration data has been very popular for condition monitoring and early fault detection. In this study, autoregressive model with exogenous variables (ARX) is built using multi-dimensional gearbox vibration data. Then, multivariate Bayesian process control is applied to ARX model residuals to identify incipient fault occurrence. Numerical example using real data is developed.

2 - Integrating Operator Variability in Predictive Reliability Optimization Analysis

Corey Kiassat, University of Toronto, Faculty of Applied Science & Engineering, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, ckiassat@mie.utoronto.ca, Dragan Banjevic, Andrew K.S. Jardine

For any system that involves human operators, probabilistic risk assessment should include the possibility of human error in the overall estimate. Human Reliability Analysis provides the means to capture the human contribution to risk as a part of the total risk equation. Predictive activities within HRA enable us to include the variability of the operators as a covariate included with the overall model for system reliability.

3 - Intelligent Traction Control Reliability System for Rail Base Vehicle

Kouroush Jenab, Dr., Ryerson University, 350 Victoria St., Toronto, ON, M5B 2K3, Canada, jenab@ryerson.ca, Kouroush R. Noori

A real-time intelligent reliability traction control system is proposed for rail base vehicle using Bayesian Decision Theory to classify motion into Normal, Spin and Slide. The model's engine involves mathematical problem which can be solved in any programming language. The conceptual model is applied to a hypothetical case study with promising results.

4 - Reliability Prediction of Medical Devices Using Field Data

Sharareh Taghipour, PhD Candidate, University of Toronto, 1210- 450 Walmer Road, Toronto, ON, M5P 2X8, Canada, sharareh@mie.utoronto.ca, Dragan Banjevic, Andrew K.S. Jardine

Medical devices are complex repairable systems, and the first step in optimizing their maintenance/inspection policy is to learn more about their current reliability and lifetime data. Required data for reliability analysis of medical devices could be extracted from the CMMS of a hospital. The CMMS integrates both inventory and inspection/maintenance data. This presentation describes required data and the essential steps necessary for reliability analysis of devices in different situations.

■ MD06

Wellington - CC Lev. 1

Generalized Facility Location Models

Cluster: Location

Invited Session

Chair: Dmitry Krass, University of Toronto, Rotman School of Management, 105 St. George Street, Toronto, ON, M5S 3E6, Canada, krass@rotman.utoronto.ca

1 - Joint Ground/Air EMS Coverage Models

Rajan Batta, University at Buffalo, 412g Bonner Hall, Buffalo, NY, 14260, United States of America, batta@eng.buffalo.edu,
Peter Rogerson, Alan Blatt, Marie Flanigan

Aeromedical and ground ambulance services often team up in responding to trauma crashes, especially when the emergency helicopter is unable to land at the crash scene. We propose location coverage models and solution methods for the problem of simultaneously locating ambulances, aeromedical servers and landing zones. We illustrate our results on a case study.

2 - Optimal Facility Location and Service Pricing Under Traffic Equilibrium

Dehui Tong, PhD Candidate, Rotman School of Management, University of Toronto, dtong@rotman.utoronto.ca, Oded Berman, Dmitry Krass

We analyze optimal design of a network of service facilities operating on a congested network. The objective is to determine number, locations, service capacity and pricing at the facilities. The distribution of the customer flows is guided by the traffic equilibrium. Structural, algorithmic and numerical results will be presented.

3 - Ensuring Coverage Under Travel Time Uncertainty

Iman Hajizadeh, Rotman School of Management, 105 St. George Street, Toronto, ON, M5S 3E6, Canada, iman@rotman.utoronto.ca, Oded Berman, Dmitry Krass

Maximum covering problem on a network with travel time uncertainty is analyzed with the objective of ensuring adequate coverage under all travel time scenarios. A variety of model formulations are explored and compared. Exact and heuristic algorithms are presented.

4 - Cooperative Cover Objective in Location Models

Dmitry Krass, University of Toronto, Rotman School of Management, 105 St. George Street, Toronto, ON, M5S 3E6, Canada, krass@rotman.utoronto.ca, Zvi Drezner, Oded Berman

We develop a class of location cover models where facilities cooperate to provide cover: each facility emits a signal that decays over distance; a customer is covered if total received signal exceeds a certain threshold. We show that this framework generalizes standard covering objective and is more appropriate in many applications. Exact and approximate algorithms are presented.

■ MD07

Metro Grand West - CC Lev. 2

Tutorial: Assessing Solution Quality in Stochastic Programs

Cluster: Tutorials

Invited Session

Chair: David Morton, University of Texas at Austin, Graduate Program in Operations Research, Austin, TX, 78712, United States of America, morton@mail.utexas.edu

1 - Assessing Solution Quality in Stochastic Programs

David Morton, University of Texas at Austin, Graduate Program in Operations Research, Austin, TX, 78712, United States of America, morton@mail.utexas.edu

Assessing whether a solution is (near-) optimal is fundamental in optimization. We describe a simple sampling-based procedure for assessing the quality of a candidate solution to a stochastic program. The procedure is easy to implement and widely applicable. Our simplest procedure allows significant computational improvements, which we discuss. Motivating applications thread their way through the presentation, illustrating results from the procedures we describe.

■ MD08

Pier 2 - H Conv. Lev.

Analysis of Risk in Actuarial Science

Sponsor: Applied Probability Society

Sponsored Session

Chair: Etienne Marceau, Full Professor, University of Laval, Pavillon Alexandre-Vachon, 1045 Avenue de la Medecine, Quebec, QC, G1V 0A6, Canada, Etienne.Marceau@act.ulaval.ca

1 - Evaluation of Participating Policies Under Mixed Funds

Patrice Gaillardetz, Assistant Professor, Concordia University, Department of Mathematics and Statistics, 1455 de Maisonneuve Blvd. West, Montreal, QC, H3G 1M8, Canada, gaillard@mathstat.concordia.ca, Cody Hyndman

We consider the pricing of participating contracts using financial and actuarial approaches. Since these products involve mortality and financial risks, we compare both approaches using a fund that reproduces typical investment instruments used in these policies. The financial framework of Vellekoop et al. (2006) that is based on the duration of the bond portfolio is generalized to a non-gaussian interest rate model. A detailed numerical analysis is performed using participating policies.

2 - A Generalized Penalty Function with the Maximum Surplus Before Ruin in a MAP Risk Model

David Landriault, Assistant Professor, University of Waterloo, Statistics and Actuarial Science, 200 University Avenue West, Waterloo, ON, N2L3G1, Canada, dlandria@math.uwaterloo.ca

An extension of the Gerber-Shiu (GS) function is proposed via the introduction of the maximum surplus before ruin into the penalty function. The generalized GS function is expressed in terms of the original GS function and the Laplace transform of a first passage time. The simplest case of a MAP risk model, the classical risk model, will then be studied. The joint defective density of the surplus prior to ruin, the deficit at ruin and the maximum surplus before ruin is identified.

3 - Discrete-time Risk Models Based on Time Series for Count Random Variables

Etienne Marceau, Full Professor, University of Laval, Pavillon Alexandre-Vachon, 1045 Avenue de la Medecine, Quebec, QC, G1V 0A6, Canada, Etienne.Marceau@act.ulaval.ca, Helene Cossette, Florent Tourelle, Veronique Maume-Deschamps

In this talk, we consider risk models based on time series models for count random variables, which can be applied in the context of accidents. Examples of time series models for count data are integer value moving average models and integer value autoregressive models. We examine the properties of the total amount of (discounted or not) claims over a fixed number of periods. We also analyze the dangerousness of the risk models through the measurement of the adjustment coefficient.

■ MD09

Pier 3 - H Conv. Lev.

Supply Chain Optimization II

Contributed Session

Chair: Navneet Vidyarthi, Assistant Professor, Department of Decision Sciences and MIS, John Molson School of Business, Concordia University, Montreal, QC, H3G 1M8, Canada, navneetv@jmsb.concordia.ca

1 - A Review of Methodologies for Comparing Supply Chain Replenishment Systems

Chandandeep S. Grewal, University of Calgary, Department of Mech. and Mfg. Engineering, Calgary, AB, T3E 6T3, Canada, csgrewal@ucalgary.ca, Silvanus T. Enns

This study examines methodologies used in simulation studies to compare the performance of replenishment systems, such as reorder, Kanban or MRP. In particular, the strengths and weaknesses of the independent measure, targeted response, economic criterion and tradeoff curve approaches are examined. As well, the issue of using optimal parameter settings is addressed. A methodology leading to more consistent and general conclusions regarding the dominance of one system over another is suggested.

2 - A Fuzzy Multi Objective Supplier Selection Model in Case of Incremental Discount with Fuzzy Prices

Farnaz Fereidoonian, Engineer, Student, Tarbiat Moallem University, Resalat Ave, Karaj, Te, 1634634974, Iran, fereidoonian80@yahoo.com

In this paper we propose a multi criteria supplier selection problem, when there is incremental discount in suppliers' prices. Since there is uncertainty in the market, the prices have fuzzy nature. Also, the percent of defective items may not be crisp. We represent these parameters by fuzzy numbers. The numerical example to illustrate the theoretical result has been applied.

3 - Service Level Differentiation in MTO Supply Chain Design with Segmented Markets

Navneet Vidyarthi, Assistant Professor, Department of Decision Sciences and MIS, John Molson School of Business, Concordia University, Montreal, QC, H3G 1M8, Canada, navneetv@jmsb.concordia.ca

Motivated by the strategic importance of response time, we consider the problem of designing a make-to-order supply chains for segmented markets with service-level differentiated customers. We present an iterative simulation based cutting plane method that relies on discrete-event simulation for the estimation of the service-level function and its subgradients. Computational results and some managerial insights are provided.

MD10

Salon A - H Conv. Lev.

Pricing and Capacity Management

Sponsor: Manufacturing and Service Operations Management
Sponsored Session

Chair: Philipp Afeche, Rotman School of Management, 105 St. George Street, Toronto, ON, M5S 3E6, Canada, philipp.afeche@rotman.utoronto.ca

1 - Optimal Price-Lead Time Menus for Queueing Systems with Customer Choice: Priorities, Pooling and Strategic Delay

Michael Pavlin, University of Toronto, Rotman School of Management, 105 St. George Street, Toronto, ON, M5S3E6, Canada, Michael.Pavlin06@Rotman.Utoronto.Ca, Philipp Afeche

We consider service provision over an M/M/1 facility to customers with heterogeneous and unobservable response time preferences. We consider a model of customer types that relaxes standard assumptions from existing studies. We characterize the optimal differentiated price-response time menu and the corresponding scheduling policies. We further specify how the solution structure depends on the server capacity and on demand attributes.

2 - Competition among Risk-Averse Newsvendors

Nima Sanajian, University of Toronto, Rotman School of Management, 105 St. George Street, Toronto, ON, M5S3E6, Canada, Nima.Sanajian06@Rotman.Utoronto.Ca, Philipp Afeche

We study single-period inventory competition among risk-averse duopoly firms in the context of the classic newsboy problem. We provide existence and uniqueness results and characterize the equilibrium orders as a function of the competitors' under- and overstocking costs. We study the effect of increasing risk aversion on the equilibrium. Higher risk aversion is known to reduce the order of a monopoly firm. We identify conditions when this 'order less' result ceases to hold under competition.

3 - Dynamic Pricing and Bayesian Learning of Customer Time-Sensitivity in Queues

Philipp Afeche, University of Toronto, Rotman School of Management, 105 St. George Street, Toronto, ON, M5S 3E6, Canada, afeche@rotman.utoronto.ca, Baris Ata

Virtually the entire revenue management literature for queues assumes that providers know the distribution of customer demand attributes. We relax this assumption and consider the case of unknown customer impatience. We characterize the dynamic pricing policy that optimally trades off revenue generation and learning customer demand. We analytically evaluate how the value of perfect demand information depends on operational and economic system characteristics.

MD11

Salon C - H Conv. Lev.

Optimization in Radiation Therapy Treatment Planning I

Sponsor: Health Applications Section
Sponsored Session

Chair: Edwin Romeijn, Professor, The University of Michigan, IOE Department, 1205 Beal Avenue, Ann Arbor, MI, 48109-2117, United States of America, romeijn@umich.edu

1 - Taking Advantage of Problem Structure in Optimization of Radiation Therapy

Anders Forsgren, Royal Institute of Technology (KTH), Department of Mathematics, Stockholm, SE 100 44, Sweden, andersf@kth.se, Albin Fredriksson, Fredrik Carlsson, Rasmus Bokrantz

The optimization problem in IMRT may be formulated in several ways. One may for example solve an optimization problem in the machine parameters, either directly, by a column generation approach or by combining these two approaches. We discuss ways of taking advantage of problem structure in the above approaches. We also discuss ongoing research on how to include uncertainty in the model, as well as on how to handle the conflict between high tumor dose and sparing of healthy tissue.

2 - A Two-stage Solution Approach for Optimizing IMRT Beam Angles

Gino Lim, Assistant Professor, University of Houston, Department of Industrial Engr., E211, Engr. Bldg 2, Houston, TX, 77204, United States of America, ginolim@uh.edu, Wenhua Cao

We have developed a two-stage local neighborhood search method for solving IMRT beam angle optimization problem. Two different heuristic algorithms are developed to find a good starting solution in the first stage. One-step ahead iterative beam angle elimination approach is used to achieve a substantial speed gain over MIP formulation. Then a local search heuristic is used to find a local optimal solution to the problem. Numerical experiments support the potential of this method in practice.

3 - Optimal Multileaf Collimator Leaf Sequencing in IMRT Treatment Planning

Z. Caner Taskin, PhD Candidate, University of Florida, Department of ISE, Gainesville, FL, United States of America, taskin@ufl.edu, J. Cole Smith, Edwin Romeijn, James Dempsey

Intensity modulated radiotherapy (IMRT) is a powerful technique for radiotherapy treatment delivery. We discuss the problem of efficiently delivering a given beam intensity profile. In particular, we need to decompose the intensity profile into a set of beam shapes satisfying the consecutive-ones property. We propose an exact algorithm to solve this problem under different efficiency criteria. Our results indicate that several clinical instances can be solved to optimality within a few minutes.

MD12

Pier 4 - H Conv. Lev.

Tools for GDSS Facilitators

Sponsor: Group Decision and Negotiation Section: GDN 2009
Sponsored Session

Chair: Pascale Zarate, Assistant Professor, IRIT-INPT, 118 Route de Narbonne, IRIT2 / Level 3, Office: 369, F-31062 Toulouse, Cedex 9, France, pascale.zarate@irit.fr

1 - Multiattribute Group Decision Aiding in Location Analysis

Joao Climaco, Professor, University of Coimbra, Faculty of Economics, Av Dias da Silva, 165, Coimbra, 3004-512, Portugal, jclimaco@fe.ucp.pt, Sergio Fernandes, Ines Vital, M. Eugenia Captiyo

An interactive bicriteria mathematical programming approach is used to identify neighborhoods of the most preferred solutions for a location problem. Then a group multiattribute evaluation of the solutions identified in the above referred to neighborhoods is proposed. Computational results on some examples are discussed.

2 - Building Scenarios: How a Causal Mapping Based GDSS Can Help

Colin Eden, University of Strathclyde, Strathclyde Graduate Business School, 199 Cathedral Street, Glasgow, G4 0QU, United Kingdom, colin@gsb.strath.ac.uk, Fran Ackermann

This paper presents a method for involving the senior management team that attends to the two concerns voiced above through the use of a causal mapping based Group Decision Support System (GDSS). The method has been used in a wide variety of organizations - public and private, large and small. The paper will describe the method, concentrating particularly on how causal mapping (as a modelling technique) used with a GDSS facilitate the integration of events into multiple, but linked, scenarios.

3 - Investigating Individual Trust in Computer Mediated Group Collaboration Using a Case Study Approach

Xusen Cheng, The University of Manchester, Room 2.36 Crawford House, Manchester Business School, Oxford Road, Manchester, M139PL, United Kingdom, xusen.cheng@manchester.ac.uk, Linda Macaulay

This paper offers insight into how individual trust develops over time in online collaboration. Different technologies and methods are used. The results of each group in this case are discussed. Some new trust factors which may be important to individual trust development are also presented in this paper.

4 - Towards a Dynamic Estimation of the Effectiveness of Collective Decision-making Meetings

Guy Camilleri, IRT-IC3 UPS, 118 Route de Narbonne, Toulouse Cedex 9, 31036, France, camilleri@irit.fr, Pascale Zarate

This article presents a generic framework to define and to assess dynamically the effectiveness of group decision-making meetings. In our approach, we propose through segmentation in stages to assess the effectiveness by dynamic models. The major advantage of such dynamic models is to provide some information about the evolution of the process effectiveness. It can be used as management criterion for supporting a GDSS facilitator.

■ MD13

Pier 5 - H Conv. Lev.

Preference, Strategy, and Consensus

Sponsor: Group Decision and Negotiation Section: GDN 2009
Sponsored Session

Chair: Hannu Nurmi, University of Turku, Department of Political Science, Turku, FIN 20014, Finland, hnurmi@utu.fi

1 - Strategic Behavior in Contested Pile Methods for Fair Division of Indivisible Items

Rudolf Vetschera, Professor, University of Vienna, Department of Business Administration, Bruenner Strasse 72, Vienna, 1230, Austria, rudolf.vetschera@univie.ac.at, Marc Kilgour

Fair division algorithms for indivisible items like the alternation procedure rely on ordinal preference information from players. Using a computational model, we study the effects of strategic misrepresentation of preferences on individual outcomes, fairness and efficiency. Our results indicate that strategic behavior sometimes can have a positive effect on efficiency and fairness, and also highlight the role of information on the opponent's preferences in shaping outcomes.

2 - Scoring Rules and Consensus

Jose Luis Garcia Lapresta, Professor, Universidad de Valladolid, Avda. Valle de Esgueva 6, Valladolid, 47011, Spain, lapresta@eco.uva.es, Bonifacio Llamazares, Teresa Peña

Scoring rules are voting systems where each voter ranks alternatives and then assigns scores to them depending on their positions in the individual rankings. Adding individual scores up, a collective order on the alternatives is obtained. In this paper we propose to generate the scores once voters have shown their preferences in such a way that consensus will be as large as possible.

3 - Anomalies in Spatial Models of Preferences

Hannu Nurmi, University of Turku, Department of Political Science, Turku, FIN 20014, Finland, hnurmi@utu.fi

Under specific circumstances it is possible to give complete and transitive preference relations a spatial representation. In spatial voting models it is often implicitly or explicitly assumed that agents give their support (e.g. vote) to alternatives closer to their ideal points than those further away. The aim of the paper is to critically examine the plausibility of this assumption.

■ MD15

Pier 8 - H Conv. Lev.

Integrating CP and OR

Sponsor: Computing Society; Constraint Programming
Sponsored Session

Chair: Tallys Yunes, University of Miami, 5250 University Drive, Room KE405, Coral Gables, FL, 33146, United States of America, tallys@exchange.sba.miami.edu

1 - Determining the Number of Games Needed to Guarantee an NHL Playoff Spot

Tyrel Russell, University of Waterloo, 200 University Avenue, Waterloo, Canada, trussel@cs.uwaterloo.ca, Peter van Beek

Many sports fans invest a great deal of time into watching and analyzing the performance of their favourite team. However, the tools at their disposal are primarily heuristic or based on folk wisdom. This paper provides a concrete mechanism for calculating the minimum number of points needed to guarantee a playoff spot in the National Hockey League (NHL). As a side effect of this calculation, we can identify those games where, if a team loses, they no longer control their playoff destiny.

2 - Constraint and Integer Programming in Comet

Pascal Van Hentenryck, Professor, Brown University, 115 Waterman Street, Providence, RI, 02912, United States of America, pvh@cs.brown.edu, Laurent Michel

This talk reviews the hybrid optimization system Comet with a focus on its constraint and integer programming components. In particular, it will describe its unified modeling and search facilities.

3 - The Polytope of Context-Free Grammar Constraints

Louis-Martin Rousseau, Associate Professor, Polytechnique Montreal, CP 6079 succ Centre-ville, Montreal, QC, H3C 3A8, Canada, louis-martin.rousseau@polymtl.ca, Meinolf Sellmann, Claude-Guy Quimper, Gilles Pesant

Context-free grammar constraints enforce that a sequence of variables forms a word in a language defined by a context-free grammar. Its application has been studied in the field of Constraint Programming, Mixed Integer Programming, and SAT to solve complex decision problems such as shift scheduling. In this theoretical study we demonstrate how the constraint can be linearized efficiently. In particular, we propose a lifted polytope which has only integer extreme points.

■ MD16

Pier 9 - Convention Level

Military Applications II

Sponsor: Military Applications
Sponsored Session

Chair: Rene Seguin, ORAD 4, Defense Research and Development, P.O. Box 17000 Stn Forces CP 17000, Winnipeg, MB, R3J 3Y5, Canada, rene.seguin@drdc-rddc.gc.ca

1 - An Airworthiness Corrosion Backstop Model

Abderrahmane Sokri, DS, DRDC CORA, Vanier Building, 11th Floor, 222 Nepean, Ottawa, ON, K1A 0K2, Canada, abderrahmane.sokri@drdc-rddc.gc.ca

This paper provides an inspection policy for aircraft by examining the impact of time on the formation of corrosion and therefore on the aircraft inspection decision. This analysis is based on a binary econometric model that establishes an operational relationship between the number of years since the last inspection and the inspection likelihood. A sensitivity analysis is carried out to assess the impact of each added year on the likelihood of inspection.

2 - Optimal Fleet Replacement and Forecasting Under Uncertainty

David Maybury, Defence Scientist, Department of National Defence, 101 Colonel By Drive, DMGOR 10 CBS M004, Ottawa, ON, K1A 0K2, Canada, david.maybury@drdc-rddc.gc.ca

Using the CP-140A maritime surveillance aircraft as a template, we study fleet replacement decisions for the Department of National Defence by applying the techniques of quantitative finance. Our prototype stochastic fleet replacement model balances tradeoffs between costs, military usefulness, and uncertainty. We find that the effects of uncertainty in both costs and availability play an important role in establishing an optimal replacement time.

3 - On Developing Ammunition Policy Guidance for the Canadian Forces

Raman Pall, Defence Scientist, DRDC CORA, 101 Col By Dr, Ottawa, ON, K1A 0K2, Canada, raman.pall@drdc-rddc.gc.ca, Gregory van Bavel

This study was conducted with the goal of developing ammunition policy guidance for the Canadian Forces (CF). A variety of scenarios in which Canada might participate in the near future were examined, which in turn enabled a calculation of the size of the required operational stocks. The sizes of the stockpiles in these missions were calculated using an innovative approach combining target-oriented (TOM) and level-of-effort (LOE) methodologies.

■ MD17

Regatta - H Main Lev.

Software Tutorial

Cluster: Software Tutorials

Invited Session

1 - FICO - Building Optimization Applications in Xpress-MP

Richard Marshall, FICO, 181 Metro Drive, San Jose, CA, 95110, United States of America, RickMarshall@fairisaac.com

This tutorial will focus on developing and deploying complete optimization applications using FICO's array of mathematical modeling and optimization tools. These tools can be used for modeling, solving, analyzing and visualizing optimization problems, and integrating them seamlessly in business applications. During this tutorial we will explain how Xpress-Mosel, Xpress-IVE and Xpress-Application Developer can decrease development time for new optimization applications and enable you and your customers to make smarter decisions.

■ MD18

Dockside 1 - H Lower Lev.

Energy and Natural Resources

Contributed Session

Chair: Julian Scott Yeomans, Professor, York University, Schulich School of Business, OMIS Area, 4700 Keele Street, Toronto, ON, M3J 1P3, Canada, syeomans@schulich.yorku.ca

1 - A Fuzzy AHP/DEA Scale Efficiency Approach for Prioritizing Energy Technologies Econometrically

Seongkon Lee, Researcher, Korea Institute of Energy Research, 71-2, Jang-dong, Yuseong-gu, Daejeon, 305-340, Korea, Republic of, sklee@kier.re.kr, Gento Mogi, Jongwook Kim, K.S. Hui, Masanari Koike

Korea's energy security is a key issue due to poor natural resources and large dependence on imports of consumed energy resources. Energy technology development is one of the best alternatives. In this paper, we allocate the relative weights of energy technologies by using two-stage approach, which is composed of the fuzzy AHP and DEA Scale Efficiency from a viewpoint of econometrics, with the limited R&D resources strategically for producing a well focused R&D outcomes.

2 - Less Expensive Transportation Facility Optimistic Thought

Laxminarayan Das, Assistant Professor, Delhi College of Eng, Department of Mathematics, Apartment 13 Block1 Type 5, Delhi, 110042, India, lndas@dce.ac.in

Logistic Operational methods executor intelligent machines are assisting transportation management server to decide quantity resources allotment for the next phased maintenance or developmental tasks to be performed in the developed nations within the periodic time. This facility extends few scopes to the infrastructure developing states. In the proposed paper writer prefer to publish a simple thought to limit symmetric dual models used in transportation and health care sciences.

3 - Water Resources Policy Formulation Using Simulation Optimization and Fuzzy Interval Programming

Julian Scott Yeomans, Professor, York University, Schulich School of Business, OMIS Area, 4700 Keele Street, Toronto, ON, M3J 1P3, Canada, syeomans@schulich.yorku.ca, Yavuz Gunalay

Simulation-optimization (SO) methods, which incorporate system uncertainties using probability distributions, can be used to formulate multiple policy alternatives meeting required system criteria. A concurrent fuzzy interval programming technique can be incorporated to significantly reduce the SO search times. This approach is illustrated using a specific water resource management case study.

■ MD19

Dockside 2 - H Lower Lev.

Cyberinfrastructure for OR

Sponsor: CPMS, The Practice Section of INFORMS
Sponsored Session

Chair: Robert Fourer, Northwestern University, Dept of Industrial Eng. & Mgmt. Sciences, 2145 Sheridan Road, Evanston, IL, 60208-3119, United States of America, 4er@iems.northwestern.edu

1 - New CoinMP Release 1.3: A Simple C-API Windows DLL and Unix Solver Library (LP/MIP) Based on COIN

Bjarni Kristjansson, President, Maximal Software, Inc., 2111 Wilson Boulevard, Suite 700, Arlington, VA, 22201, United States of America, bjarni@maximalsoftware.com

The COIN Open Source Initiative has become very popular in the recent years. To make life easier for users that simply want to solve models and not compile C++ applications, we have developed a standard C-API Windows DLL CoinMP.DLL that implements most of the functionality of CLP, CBC, and CGL. A Linux/Unix version using AutoMake is also available.

2 - Cyberinfrastructure and Optimization

Robert Fourer, Northwestern University, Department of Industrial Eng & Mgmt Sciences, 2145 Sheridan Road, Evanston, IL, 60208-3119, United States of America, 4er@iems.northwestern.edu

Cyberinfrastructures integrate hardware, software, and communications protocols to support activities of many kinds. We survey cyberinfrastructure projects that involve programs and standards for optimization, with particular relevance to applications in operations research. Examples include aspects of COIN-OR, NEOS, and the Optimization Services framework, and prospective uses of cyberinfrastructures for the support of intelligent optimization systems and access to advanced computing platforms.

3 - The New Business Intelligence and the Role of OR

Thomas Dong, Director, Product Management & Product Marketing, ILOG, an IBM Company, 1195 West Fremont Avenue, Sunnyvale, CA, 94087-3822, United States of America, tdong@ilog.com

OR is on the verge of mainstream, driven by the explosion of enterprise data and flourishing demand for forward-looking analytical insight and data-driven decisions. However demand won't be framed in a singular technology. Rather, the new BI is defined by the interlock between data mining, stats, simulation, machine learning, and all forms of optimization. To be prepared practitioners and vendors must be versed in the full range of Business Analytics and Optimization approaches.

■ MD20

Dockside 3 - H Lower Lev.

Topics in Revenue Management

Sponsor: Revenue Management and Pricing Section
Sponsored Session

Chair: John Wilson, Professor, University of Western Ontario, Richard Ivey School of Business, 1151 Richmond Street North, London, ON, N6A 3K7, Canada, JWilson@Ivey.uwo.ca

1 - Log-Robust Portfolio Management

Aurelie Thiele, Assistant Professor, Lehigh University, 200 W Packer Ave, Bethlehem, PA, 18015, United States of America, aurelie.thiele@gmail.com, Ban Kawas

We present a robust optimization approach to portfolio management under uncertainty that (i) builds upon the well-established Lognormal model for stock prices while addressing its limitations, and (ii) incorporates the imperfect knowledge on the true distribution of the uncertainty drivers in an intuitive manner. We derive theoretical insights into the worst-case uncertainty, the optimal asset allocation and the degree of diversification in the portfolio. We also present numerical results.

2 - Implications of Fencing for Revenue Management

Michael Zhang, Dr., Saint Mary's University, 903 Robie Street, Halifax, NS, B3H 3C3, Canada, michael.zhang@smu.ca

The purpose of this study is to illustrate the implications of fencing in revenue management. We examine the trade-off between the gain from segmenting markets and the cost associated with the segmentation mechanism. We propose that realization of the maximum gain from segmenting markets is based upon an understanding of the optimal cost to devote to fencing, or the implementation of 'optimal fences.'

3 - Repeated Interactions in Decentralized Assembly Systems

Xuan Zhao, Assistant Professor, Wilfrid Laurier University, 75 University Ave. W., Waterloo, Canada, xzhao@wlu.ca, Yong He

We consider an assembly system with multiple complementary suppliers repeatedly selling to a manufacturer that faces uncertain demand. It demonstrates that the long-term interaction motivates suppliers to behave cooperatively, which benefits the suppliers, manufacturer, and the entire system. We then provides insights into how and why suppliers' cooperation on pricing during repeated interactions can be sustained.

4 - Pricing and Inventory Decisions when Customer Preferences are Explicitly Modeled

John Wilson, Professor, University of Western Ontario, Richard Ivey School of Business, 1151 Richmond Street North, London, ON, N6A 3K7, Canada, JWilson@Ivey.uwo.ca, Craig Sorochuk

Previous work in this area has required strong assumptions about the nature of demand curves. We assume that customers have reservation prices and derive the form of demand curve that the approach induces. A practitioner often need only concentrate on estimating some intuitive quantities. It is also possible to infer what assumptions such as assuming a linear demand function impose on a model of individual consumer behaviour.

MD21

Dockside 4 - H Lower Lev.

Risk Informed Decision Making Models at Regulatory Agencies - Applications in the Environment, Public Safety and Health Sectors

Sponsor: Decision Analysis Society

Sponsored Session

Chair: Srikanth Mangalam, Team Leader, Public Safety Risk Analysis and Decision Support, Technical Standards and Safety Authority, 3300 Bloor Street West Centre Tower, 14th Floor, Toronto, ON, M8X 2X4, Canada, smangalam@tssa.org

1 - Regulatory Perspective on the Development of Risk Informed Inspection Scheduling

Muddassir Nazir, Risk Management Advisor, TSSA, 3300 Bloor Street West, Centre Tower, 14th Floor, Toronto, ON, M8X 2X4, Canada, mnazir@tssa.org, Lency Mulamootil, Dwight Reid

This paper provides an overview of current regulatory inspection scheduling models at the Technical Standards and Safety Authority, their limitations, and proposes an enhanced systematic risk management framework based on the ALARP principle.

2 - Application of Incident Management Information System as a Decision Support Tool

Lency Mulamootil, Decision Analysis Advisor, TSSA, 3300 Bloor Street West, Centre Tower, 14th Floor, Toronto, ON, M8X 2X4, Canada, Lmulamootil@tssa.org, Muddassir Nazir, Cole Lepine

This paper demonstrates the application of an incident management information system, as an effective decision support tool in the delivery of risk-informed public safety regulatory decisions. Specifically this paper deals with the innovative estimation of health impacts measured as Disability-Adjusted Life Years associated with occurrences involving hydrocarbon fuels. The paper demonstrates the application of Disability-Adjusted Life Years in prioritizing safety issue decision making.

3 - Efficacy of Risk-Informed Regulatory Oversight Regime: A Case Study

Paul Szwed, Department Head, U.S. Coast Guard Academy, Department of Management, 15 Mohegan Avenue, New London CT 06320, United States of America, Paul.S.Szwed@USCGA.edu

Risk-informed policy has become increasingly more prominent in the marine domain. Using theory building techniques, a model to identify the relative risk of small passenger vessels was developed that identified that 50% of all marine casualties were caused by the vessels with the top 10% risk scores. A pilot proportional regulatory oversight policy was deployed and evaluated using a split-half time-series experimental design with a non-equivalent control group.

4 - Risk Informed Decision Analysis for Safety Issue Management

Srikanth Mangalam, Team Leader, Public Safety Risk Analysis and Decision Support, Technical Standards and Safety Authority, 3300 Bloor Street West Centre Tower, 14th Floor, Toronto, ON, M8X 2X4, Canada, smangalam@tssa.org, Greg Paoli, Jorge Larez

This paper demonstrates the application of risk assessment and decision analysis techniques to manage a public safety issue arising from the historical failures of a certain category of elevating devices.

Tuesday, 8:00am - 9:30am**TA01**

Frontenac - CC Lev. 1

Transportation Chains in Latin America

Sponsor: Transportation Science & Logistics

Sponsored Session

Chair: Juan Gaytan, Dr., Tecnológico de Monterrey, Eduardo Monroy Cardenas 2000, Toluca, 50110, Mexico, jgaytan@itesm.mx

1 - Promoting Competitiveness of a Mexican Port Through Intermodal Networks & Entrepreneurship Initiatives

Marco Serrato, Dr, Tecnológico de Monterrey, Camino a Jesus del Monte s/n, Morelia, Mi, 58350, Mexico, mserrato@itesm.mx

The port of Lazaro Cardenas, located in the pacific coast of Mexico, has significantly increased its activity in recent years and has become a key port in promoting logistics development in Mexico. Through this research, the main challenges for creating intermodal networks linked to this port are identified, as well as future strategies to be performed by public and private organizations to increase its competitiveness, including entrepreneurship initiatives.

2 - Intermodal Transportation in Mexico

Jaime Mora, Head, Graduate Program in Industrial Engineering, Tecnológico de Monterrey, Campus Estado de Mexico, Carr. Lago de Guadalupe, km 3.5, Atizapon, 52926, Mexico, jmora@itesm.mx, Miguel Gonzalez Mendoza

In this paper the past, present and future for intermodal transportation at Mexico is presented. A long with the historic evolution of intermodal transportation, several government and private initiatives are discussed. The paper includes a brief survey of installed infrastructure at Mexico. Applications and opportunities areas for management sciences and operations research techniques are analyzed in order to achieve sinergies between academic and business sectors.

3 - Determining the Intermodal Transport Chain with Time Windows for the Automotive Parts Importation

Christopher Mejia, Engineer, ITESM Campus Toluca, Eduardo Monroy Cirdenas 2000, Toluca, ME, 50110, Mexico, vcarter_15@hotmail.com, Juan Gaytan, Manuel Robles

One of the most important challenges for automotive companies consists in coordinating the supply from suppliers located in different areas around the world to warranty the best logistic performance. This study includes time windows from the service time given by customs and transfer nodes. The result is a bicriteria optimization model (cost and travel time), to identify the intermodal transport chain to supply automotive parts from USA to Mex. Pareto frontier is built using the weighting method.

TA02

Queens Quay I - CC Lev. 1

Graph and Combinatorial Algorithms I

Cluster: Optimization/Combinatorial Optimization

Invited Session

Chair: Frantisek Franek, Professor, McMaster University, 1280 Main Str. West, Hamilton, ON, Canada, franek@mcmaster.ca

1 - On Number of Cliques and Cocliques in Nearly Quasirandom Graphs

Frantisek Franek, Professor, McMaster University, 1280 Main Str. West, Hamilton, ON, Canada, franek@mcmaster.ca

Consider the number of t -cliques and cocliques normalized by the number of all t -subsets in a graph G . Erdos posited a conjecture that as the order of G tends to infinity, the limit ought to be $2(1 - \binom{t}{2})$. The conjecture was disproved by Thomason and since then many better upper bounds have been found by search for suitable counterexamples. We show that starting a search with a quasirandom graph is not good as Erdos's conjecture is true for nearly quasirandom graphs.

2 - Quasi-Linear Time Circle Graph Recognition

Mark Tedder, Graduate Student, Department of Computer Science University of Toronto, 10 King's College Rd. Rm 3302, Toronto, ON, M5S 3G4, Canada, mtedder@cs.toronto.edu

The circle graphs are the intersection graphs of chords inscribing a circle. The fastest recognition algorithm for this family of graphs has remained $O(n^2)$ for 15 years. In this talk I will introduce the first sub-quadratic recognition algorithm for these graphs. The algorithm uses graph-labelled trees, a new way of conceptualizing the split-decomposition of graphs, along with lexicographic breadth-first search.

3 - A Computational Approach for Bounding Multiplicities of Cliques and Cocliques

Andrew Baker, McMaster University, 1280 Main Street West, Hamilton, Canada, bakerar2@mcmaster.ca

Erdos conjectured that the minimum ratio of t -cliques and cocliques and all t -subsets of order t in a graph would approach $2(1-t \setminus \text{choose } 2)$ as the number of vertices in the graph approached infinity. While true for t equals 2 and 3, it is false for larger t . Counterexamples exist in the form of infinite series of graphs formed from a seed graph upon which a transformation is performed. We explore one of these transformations and how different seeds may yield new lower bounds for Erdos' value.

■ TA03

Queens Quay II - CC Lev. 1

Large Scale Optimization and Decomposition Methods

Cluster: Large Scale Optimization and Applications
Invited Session

Chair: Joe Naoum-Sawaya, University of Waterloo, Department of Management Sciences, 200 University Ave. West, Waterloo, ON, N2L 3G1, Canada, jnaoumsa@uwaterloo.ca

1 - A New Lagrangean Approach to the Pooling Problem

Hossa Almutairi, University of Waterloo, 200 University Ave., W, Waterloo, Canada, halmutei@uwaterloo.ca, Samir Elhedhli

We present a new Lagrangean approach for the pooling problem where the resulting nonlinear subproblem is reformulated as an MIP. Besides being used to generate lower bounds, the subproblem solutions are exploited within Lagrangean heuristics. Valid cuts are added to the subproblem. The procedure is applied to a benchmark set of fifteen problems from the literature. The Lagrangean lower bound and the heuristics are on average 2.1% and 0.043% from the optimum, respectively.

2 - The Improved Primal Simplex for Degenerate Linear Programs

Francois Soumis, GERAD, C.P. 6079, Succ. Centre-Ville, Montreal, Qc, H3C 3A7, Canada, francois.soumis@gerad.ca, Vincent Raymond, Dominique Orban

The Improved Primal Simplex algorithm IPS is a dynamic constraint reduction method particularly effective on degenerate linear programs. We present some generalization, a number of further improvements and effective parameter choices for IPS. On degenerate problems (bus driver scheduling and airline fleet assignment problems) our improvements yield CPU times lower than those of CPLEX by a factor between 12 and 20.

3 - D-Wolfe Decompositions Putting in the Subproblem the Degenerated Constraints of a Linear Problem

Abdelmoutalib Metrane, GERAD/Polytechnique Montreal, C.P. 6079, Succ. Centre-Ville, Montreal, Qc, H3C 3A7, Canada, abdelmoutalib.metrane@polymtl.ca, Francois Soumis, Issmail Elhallaoui

We propose a new Dantzig-Wolfe decomposition based on the improved primal simplex algorithm (IPS). The original problem is partitioned automatically according to its deep algebraic structure rather than by the modeler. Experimental results on some degenerate instances (between 44 and 71%) show that the proposed algorithms yields computational times that are reduced by an average factor ranging between 3.32 and 13.16 compared to the primal simplex of CPLEX.

4 - Benders Decomposition Based on Analytic Centers and Branch-and-Cut

Joe Naoum-Sawaya, University of Waterloo, Department of Management Sciences, 200 University Street West, Waterloo, ON, N2L 3G1, Canada, jnaoumsa@gmail.com, Samir Elhedhli

We present the application of the Analytic Center Cutting Plane Method (ACCPM) in Benders decomposition. Unlike the classical Benders decomposition where Benders cuts are generated using extreme points, Benders cuts are generated from a central point of the master problem. A branch-and-cut approach is used to implement the ACCPM based Benders decomposition. Computational results on the capacitated facility location problem show that our algorithm outperforms the classical Benders decomposition.

■ TA04

Bay Room - CC Lev. 1

CORS Competition on the Practice of OR I

Cluster: Competitions
Invited Session

Chair: John Blake, Dalhousie University, Halifax, NS, Canada, john.blake@dal.ca

1 - Improving Production and Inventory Planning for Scotsburn Ice Cream

Andre Cameron, Department of Industrial Engineering, Eldon Gunn, Corinne MacDonald

A production and inventory management system was developed in a hierarchical framework for an ice cream manufacturer, to provide decision support at the tactical and operational levels. A database was built to store and manipulate all the data needed by each decision model, and to provide decision makers with meaningful reports and product information. The company has been using the database for 2 years, which has successfully reduced manual data input and resulting input errors, and improved communication across departments through efficient reporting. The decision models retrieve information from the database and develop production plans based on actual, up to date costs and inventory levels. The first model (Model A) plans for aggregated production and inventory levels over a period of at least one year, to minimize inventory storage and labour costs and meet forecasted demand in a highly seasonal industry. The problem is constrained by warehouse, production, and workforce capacities and is modelled as a mixed integer program. The model solves in less than 1 minute to produce a monthly production, labour, and anticipatory inventory plan for two dozen product groupings. The second, short term planning model (Model B) covers a number of months into the future and schedules production of individual products by week to minimize setup and holding costs. A mixed integer programming model determines the least expensive path from week 1 to t for each product grouping while maintaining the labour schedule imposed by Model A. A third model (Model C) produces a detailed weekly schedule of the products and run quantities defined by Model B while meeting the labour schedule imposed by Model A. Also formulated as a mixed integer programming problem, Model C sequences each production job on one of three machines to minimize product loss resulting from sequence dependent setups. The models provide timely production plans that are used by branch managers, operations coordinators, and production schedulers to make informed scheduling decisions and improve the use of the company resources.

2 - Should the New British Columbia Children's Hospital have an Express Surgical Suite?

Candice Chan, University of British Columbia, 2053 Main Mall, Vancouver, BC, Canada, candice.chan@coe.ubc.ca, Steven Shechter, Derek Atkins, Anjali Aswathi, Stuart Donald

The surgical department at British Columbia Children's Hospital (BCCH) provides care for children requiring surgery in British Columbia, and processes approximately 8,000 patients every year. BCCH is planning a new hospital to accommodate increased demand. As part of this plan BCCH is considering redesigning its current surgical configuration, aiming to achieve a higher patient throughput. This study was to evaluate the idea of a separate Ambulatory Surgical Unit designed specifically to handle relatively simple and less resource dependent surgeries, "express" surgeries. The hope was that such a configuration could accommodate more patients, and hence reduce its surgical wait list. Working with BCCH, we defined the meaning of "express" and selected 10 surgical procedures for evaluation. A Discrete-Event simulation with a front-end Excel-based VBA block scheduler, was developed to simulate the flow of scheduled patients through the current hospital. This model also allowed an evaluation of various surgical suite designs on its pre and post clinical resources. In particular, we assessed whether the express surgical unit should be implemented as a completely stand alone unit, separate from BCCH's current tertiary surgical suite, or whether some functional overlaps should exist between the two. Our analysis showed the value of reduced express OR procedure and changeover (clean up and set up) times and their variability. However, increasing express throughputs would cause an increase in upstream bed usage at the current shared Single Day Care Unit (SDCU). The value of a separate express-only pre-surgery preparation system which allowed express patients to be processed in a more standardized way could also be measured. Furthermore, this allowed express patients to arrive much closer to their scheduled surgery time and wait less for the OR without seriously increasing the probability of starving an express OR. Increasing throughputs also resulted in an increase in downstream (Post Anesthesia Care Unit (PACU) and post-surgery-SDCU) bed usage. However, results showed that the current capacities at both of these units

were sufficient to handle the change without forming new bottlenecks. Various "what if" scenarios were developed with the BCCH along with performance measures, giving an overall picture of the impact of express surgeries. The model results and analysis have been used as a decision aid to help BCCH decide whether to employ an express configuration. Our recommendation was that BCCH consider the idea of running express surgical blocks in its current configuration to test whether procedure and changeover time mean/variability reductions were practical, as well as to get an idea of what extra support might be needed to achieve specified target reductions. We also recommended that running express OR blocks in a "flexible" surgical unit is preferable to dedicated express OR facilities because BCCH's present demands are insufficient to attain full utilization. Since the completion of the project, BCCH has been using the tools provided to run additional scenarios and develop business cases on alternatives.

3 - Evaluating the Dual Stream, An Early Return to Work Program, at WorkSafeBC

Stoney Chen, Centre for Operations Excellence,
Sauder School of Business, UBC, Derek Atkins

WorkSafeBC (WSBC) is a Provincial Agency dedicated to promoting workplace health and safety for the workers and employers of British Columbia. The vision of WSBC is to ensure that workers and workplaces are safe and secure from injury, illness, and disease. There are four main services offered by WSBC: prevention, compensation, return-to-work program, and insurance. An Early Intervention for Return to Work and Recovery Planning Model (the Dual Stream Program) was introduced in April 2006. The purpose of the Dual Stream Program (DSP) is to enable Nurse Advisors to become involved in claims at a very early stage. It is believed that the earlier a Nurse Advisor is involved, the better and more effective is recovery and return to work. WSBC approached the Centre for Operations Excellence (COE) regarding a project to evaluate the impacts of this program. The effectiveness of the DSP is important to WSBC, partly because of the cost of the program, but also the need to ensure effective pathways to guide skilled workers back into productive and rewarding careers. The COE was also informed that some other provinces in Canada are considering adopting a similar program and are looking for evidence that such a program will be successful. A team drawn from the COE and WorkSafeBC was challenged with this evaluation. The major challenge for the team was that although good data was available on claims handled through the DSP since its inception in 2006, there was no way of knowing which claims might have been handled in this way pre 2006, before the program started. For example, post 2006 claims were sent to the DSP on the basis of individual assessments; there were no standard protocols available that might have allowed the team to identify which pre 2006 claims were likely to have been chosen for the DSP. It was also impractical to re-assess the many thousands of claims pre-2006 to identify likely DSP cases. Therefore we had to find an alternate route to make a 'fair apple-to-apple' comparison. To this end we grouped post 2006 claims on the basis of as many different characteristics as the data allowed. Some characteristics were industry sector, type of injury, body part, local district office, employer etc. This allowed us to identify subgroups of post 2006 claims with the highest use of DSP. Then we identified the same subgroups pre-2006 and compared the first time back to (partial) work and back to full time work. By processing the same claims through varied subgroups and applying non-parametric tests such as the Wilcoxon test, we were able to evaluate the program in terms of total years saved. The results showed that certain sectors or claim types had a significant reduction in the first return to work although the time to full time return had often increased. We were also to identify where the impact had been significant and where there was no evidence to date of a significant reduction.

■ TA05

Yonge - CC Lev. 1

Statistical Process Control and Testing

Contributed Session

Chair: Walter Priesnitz Filho, Professor, UCS - Vacaria, Av. Joco Machado Soares, 3199, Santa Maria, 97110000, Brazil, pwfilho@ucs.br

1 - Inspection Station Allocation at a Serial Production Line with Imperfect Machines

Yavuz Gunalay, Bahcesehir University, Faculty of Econ. & Admin. Sciences, Ciragan Cad. No:4 Besiktas, Istanbul, 34353, Turkey, yavuz.gunalay@bahcesehir.edu.tr

At a serial production system imperfect machines cause many problems, such as product quality, bottlenecks, high costs, low throughput. 100% inspection stations are not only useful to improve product quality but also useful to influence the throughput rate. An optimal inspection allocation method is suggested to increase the system throughput.

2 - Early Fault Detection of a Deteriorating System Using Bayesian Control Chart

Rui Jiang, University of Toronto, 5 King's College Road, Toronto, On, M5S 3G8, Canada, jiangrui@mie.utoronto.ca, Viliam Makis

Deterioration process of many industrial systems can be described by a continuous-time 3-state Markov chain. States 0 and 1 are operational but unobservable, and state 2 is observable failure state. We consider a system monitored and controlled by a Bayesian control chart. Preventive maintenance is

triggered when true alarm occurs, and corrective maintenance is performed when system fails. The objective is to minimize average system cost by determining control limit and sampling interval.

3 - Analysis of the Performance of Three Techniques Application in Statistical Quality Control

Maria Emilia Camargo, Dr, Mestrado UCS, Av. Joco Machado Soares, 3199, Santa Maria, 97110-000, Brazil, mariaemiliacamargo@hotmail.com, Suzana Russo, Eric Dorion, Walter Priesnitz Filho

In this paper, SQC of a production line has been presented using the classical method Shewhart, CUSUM method and EWMA smoothing models. The CUSUM method is more efficient in detecting small changes in the mean. The EWMA smooths model, includes the two techniques, as limited cases, since when $\alpha=1$ the EWMA smooth model is equivalent to the Shewhart, and when $\alpha=0$ equivalent to the CUSUM.

4 - Corrective Measure in the Presence of Serial Correlation Data of Perfilagem

Suzana Russo, Dr, Federal University of Sergipe, Rua Josue Carvalho Cunha 395, Aracaju, SE, 49035490, Brazil, suzana.ufs@hotmail.com, Maria Emilia Camargo, Vitor Hugo Simon

The objective of this article is to present measured corrective for models with serial correlation, the data used in this study is the profiles of wells of oil of the basin sedimentary Sergipe-Alagoas (Brasil). The result showed that the choice of the iterative method of Cochran-Orcutt, for the esteem for squared minimums generalized was efficient for removing the serial correlation.

5 - Development of an Algorithm for Statistical Process Control: An Application in the Textile Industry

Walter Priesnitz Filho, Professor, Universidade de Caxias do Sul, Trav. Jalis Tim, 90 Apt. 301, Cruz Alta, 98035070, Brazil, prof.priesnitz@gmail.com, Maria Emilia Camargo, Suzana Russo

The purpose of this paper is development of an algorithm to X-bar and CV-charts for SPC in the Textile Industry. Statistical process control can provide to the manager of the productive process the maintenance and improvement in the levels of quality of the manufactured product, and the reduction of production costs. The Coefficient of Variation chart was used as tool to evaluate the productive process. The results showed that the process had been out of control needing systematic monitoring.

■ TA06

Wellington - CC Lev. 1

Facility Location: Theory and Applications

Contributed Session

Chair: Jack Brimberg, Royal Military College of Canada, Department of Business Administration, Kingston, K7K 7B4, Canada, jack.brimberg@rmc.ca

1 - Modeling and Solving Pool Segmentation in the Car Rental Business

Gen-Han Wu, PhD Candidate, The Pennsylvania State University, 265 Blue Course Drive, Apt 25B, State College, PA, 16803, United States of America, guw109@psu.edu

Pool segmentation is an important part of strategic planning in the car rental business. All rental locations are split into different pools and a hub is selected within a pool. In this paper, we consider the hub opening cost, transportation cost, and car types to formulate a binary integer programming model. The proposed algorithm offers a reliable clustering method to quickly find an initial solution with a small solution gap and to gradually approach a local optimum by an iterative method.

2 - A Multi-objective Model to Facilities Layout Problem by Genetic Search Algorithm and ELECTRE Method

Meisam Nasrollahi, Mr, Azad University of Najafabad, 32th, Fereydunpur, Masjed Jame, Fasa, Iran, meisam_nasrollahi@yahoo.com, Majid Tavassoli Kojani, Arash Shahin

Most of plant layout problems involve several conflicting objectives requiring multi-objective formulation. Such approaches lead to the maximization of a weighted sum of score functions. Since normalizing these functions and quantifying the weights is not a straightforward process, these approaches are poor in practice. This difficulty is overcome by using ELECTRE method for evaluation of strings. Results confirm the effectiveness of the proposed model as a practicable tool for designers.

3 - Locating a Reliable Center-Median Facility on a Network

Abdallah Aboutahoun, Assistant Professor, King Saud University, Department of Mathematics, Riyadh, 4341/11491, Saudi Arabia, tahoun@ksu.edu.sa

We address the problem of locating a single facility on an undirected network with unreliable edges using two objectives, the reliable center and the reliable median (reli-cent-dian). The suggested approach for solving this bicriterion location model is minimization of the convex combination of the two objective functions. Properties of the reli-cent-dian are studied. To determine the optimal location point, an efficient algorithm is developed and provides a numerical example.

4 - Locating a Minisum Circle in the Plane

Jack Brimberg, Royal Military College of Canada, Department of Business Administration, Kingston, K7K 7B4, Canada, jack.brimberg@rmc.ca, Anita Schoebel, Henrik Juel

We consider the problem of locating a circle with respect to existing facilities in the plane such that the sum of weighted distances between the circle and the facilities is minimized. If the radius of the circle is a variable we show that there always exists an optimal circle passing through two of the existing facilities. For the case of fixed radius we provide characterizations of optimal circles in special cases. Solution procedures are suggested.

■ TA07

Metro Grand West - CC Lev. 2

Tutorial: OR Challenges in Water Security Applications

Cluster: Tutorials

Invited Session

Chair: William Hart, Sandia National Laboratories, wehart@sandia.gov

1 - OR Challenges in Water Security Applications

William Hart, Sandia National Laboratories, wehart@sandia.gov, Jean-Paul Watson

Reliable, clean water is critical for maintenance of public health, protection of public infrastructure and the operation of key industries. We describe a variety of OR challenges that have arisen when addressing water security challenges related to contamination threats. We will review this application area, describe OR models used to deploy water sensors that can minimize contamination risks, and highlight technical hurdles that remain in practical applications.

■ TA08

Pier 2 - H Conv. Lev.

Tail Asymptotics in Multi-Dimensional Stochastic Models I

Sponsor: Applied Probability Society

Sponsored Session

Chair: Yiqiang Zhao, Carleton University, 1125 Colonel By Drive, Ottawa, ON, K1S 5B6, Canada, zhao@math.carleton.ca

Co-Chair: Qi-Ming He, Professor, Dalhousie University, P.O. Box 1000, Halifax, Nova Scotia, NS, B3J 2X4, Canada, Qi-Ming.He@Dal.Ca

1 - Large Deviations and Exact Asymptotics

Robert D. Foley, Professor, Georgia Tech, ISyE, Georgia Tech, Atlanta, GA, 30332, United States of America, rfoley@gatech.edu, David McDonald

We derive exact asymptotic expressions for the stationary distribution of Markov chains, including situations where the fluid limit of the path to the large deviation is piecewise linear. For example, such situations can arise in queuing networks where the most likely path to a large deviation in a particular node, first involves a large deviation in an upstream node followed by a change of direction where customers cascade from the upstream node into the node of interest.

2 - Asymptotic Level Crossing Distribution for a Random Walk in the Positive Quadrant

Aziz Khanchi, Carleton University, School of Mathematics and Statistics, Carleton University 1125 Colonel By Dr., Ottawa, ON, K1S 5B6, Canada, akhan037@uottawa.ca

Consider a stable skip free random walk in the two dimensional positive quadrant, where the first state is the level. We study the asymptotic distribution of the second coordinate at the moment the process hits a level for the first time before returning to the starting level. We apply our results to a Modified Jackson network with partially coupled servers. The existence of the hitting distribution in limit is surprising when the large deviations path tries to avoid the level axis.

3 - Light-tailed Behaviour for a QBD Process with Countably Many Background States

Hui Li, Professor, Mount Saint Vincent University, 166 Bedford Highway, Department of Mathematics, Halifax, NS, B3M 2J6, Canada, Hui.Li@msvu.ca, Qi-Ming He, Yiqiang Zhao

We present light tail properties in a stationary probability distribution for a QBD process with countably many background states. Especially, for the joint and the marginal stationary probability distributions, we characterize the conditions under which the tail probability has an exact geometric decay or it has a light-tailed behaviour without an exact geometric decay, respectively. We illustrate the results obtained by queueing examples.

4 - Three Types of Exact Tail Asymptotics for Random Walks in the Quarter Plane

Yiqiang Zhao, Carleton University, 1125 Colonel By Drive, Ottawa, ON, K1S 5B6, Canada, zhao@math.carleton.ca

Under some irreducible conditions, there are only three types of exact tail asymptotics in the joint stationary distribution along a coordinate direction. In this talk, we try to relate key components in different methods to have a better understanding of tail asymptotics properties.

■ TA09

Pier 3 - H Conv. Lev.

Logistics and Supply Chains

Contributed Session

Chair: Muhammed Ali Ulku, University of Waterloo, Department of Management Sciences, Waterloo, ON, N2L3G1, Canada, mauku@uwaterloo.ca

1 - Performance Based Logistics for Service Supply Chain Management

Morris Cohen, Professor, The Wharton School, University of Pennsylvania, 546 SHDH, Philadelphia, PA, 19104, United States of America, cohen@wharton.upenn.edu

Manufacturers and providers of maintenance support services for mission critical products are using Performance Based Logistics (PBL) to re-design service supply chain relationships to provide superior cost effective aftermarket support. PBL aligns service supply chain incentives by tying supplier compensation to the product output value generated by customers. This talk introduces an economic logistics modeling framework and reviews empirical research on the impact of performance incentives.

2 - Pricing Transportation Procurement Auctions in Many-to-many Markets

Monia Rekik, Professor, Laval University, Pavillon Palasis-Prince, 2325 rue de la Terrasse, Québec, QC, G1V 0A6, Canada, monia.rekik@cirrelt.ca, Teodor Gabriel Crainic, Michel Gendreau

We consider a multilateral transportation procurement market where multiple shippers and carriers trade transportation contracts. The trading process corresponds to a combinatorial reverse auction where carriers are the only bidders. By participating to the same auction, shippers offer the carriers more choice in constructing interesting package bids. We propose some procedures inspired by cooperative game theory to determine each shipper's payment at the end of the auction.

3 - Freight Shipping Decisions in an Airfreight Forwarding Network

Zichao Li, University of Waterloo, 200 University Avenue West, Dept of Management Science, Waterloo, ON, N2L3G1, Canada, z72li@uwaterloo.ca, Samir Elhedhli, Jim Bookbinder

We consider a shipment decision problem faced by international airfreight forwarders, focusing on freight consolidation decisions on the network level. We provide a nonlinear integer programming formulation that accounts for volume and weight constraints and use a piecewise air cargo price rates.

4 - Myopic Analysis of Multi-Item Shipment Consolidation

Muhammed Ali Ulku, University of Waterloo, Department of Management Sciences, Waterloo, ON, N2L3G1, Canada, mauku@uwaterloo.ca, Jim Bookbinder

Shipment consolidation (SCL) may drive substantial costs out of the logistics supply chain. Though SCL is more effective when shipments differ in their characteristics (e.g. weight, and volume), that may complicate the analysis. We propose a new cost model of multi-item shipment consolidation. Via myopic analysis, we explore the effects of load make-up on the dispatch decisions for a private carrier, and report some managerial implications and other possible applications in industry.

■ TA10

Salon A - H Conv. Lev.

Topics in Transportation

Sponsor: Manufacturing and Service Operations Management
Sponsored Session

Chair: Benny Mantin, Assistant Professor, University of Waterloo, 200 University Ave., Department of Management Sciences, Waterloo, ON, N2L3G1, Canada, bmantin@gmail.uwaterloo.ca

1 - Optimal Stock Level in Stations of a Bike-Sharing System

Tal Raviv, Tel Aviv University, Department of Industrial Engineering, Ramat Aviv, Tel Aviv, 69978, Israel, talraviv@eng.tau.ac.il, Ofer Kolka

A major issue, reported by the operators of metropolitan bike sharing systems is the need to reposition the bicycles among the various stations in order to meet the non-symmetric and fluctuating demand. Methods to optimize the number of bicycles that should be removed or added to each station at each visit of the repositioning vehicle, so as to minimize shortage and surplus costs are devised in this study.

2 - Service Performance and Profitability: The U.S. Airline Case

Jen-Hung Edward Wang, M.A.Sc. Candidate, University of Waterloo, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, jewang@gmail.uwaterloo.ca

We examine the impact of operational performance on profitability using both absolute and relative measures in the context of U.S. domestic airline industry. In addition, we investigate the impact of focused and non-focused airlines on profitability in service. We use quarterly service and operational data on all carriers between year 1998 and 2008 reported by U.S. Department of Transportation.

3 - Estimating Demand, Facing Censored Observations, Competition and Imperfect Substitutable Products

Hamed Hashemini, PhD Student, Sauder School of Business (UBC), Box 226-2205 Lower Mall, Vancouver, BC, V6T1Z4, Canada, hamed.hashemini@sauder.ubc.ca, David Gillen

In this paper a methodological framework for estimating the joint demand function of imperfect substitutable products facing censored demand observations, and competitive environment is introduced, and air industry is used as a case study. We assume demand comes from a compound Poisson process, and customers choose between different products considering all other imperfect substitutable, and competitors' products. Finally MLE technique is used to estimate the parameters of interest.

4 - Price Volatility in the Airline Markets: Wait or Buy?

Benny Mantin, Assistant Professor, University of Waterloo, 200 University Ave., Department of Management Sciences, Waterloo, ON, N2L3G1, Canada, bmantin@gmail.uwaterloo.ca, David Gillen

Price volatility, which could represent the implied demand volatility or the revenue management system sensitivity, could also be intentionally adopted by airlines to induce demand. We empirically find that price pertinent variables, such as price volatility, could bear predictive power about price drop/increase probability in the immediate future and the relative magnitude of this price movement. Strategic consumers could be aware of these dynamic pricing mechanisms and react accordingly.

■ TA11

Salon C - H Conv. Lev.

Scheduling and Capacity Planning

Sponsor: Health Applications Section
Sponsored Session

Chair: Jonathan Patrick, University of Ottawa, 55 Laurier Ave, Ottawa, ON, K1N 6N5, Canada, Patrick@telfer.uottawa.ca

1 - Radiation Therapy Treatment Scheduling

Antoine Saure, PhD Student, Sauder School of Business, University of British Columbia, 402-930 Seymour St., Vancouver, BC, V6B1B4, Canada, antoine.saure@sauder.ubc.ca, John French, Mike Darud, Jonathan Patrick, Martin Puterman

Motivated by the adverse effect of delays on patients' health such as physical distress and deterioration of quality of life, and the inefficiencies in the use of expensive resources, we develop a model for scheduling multi-priority patients into Radiation Therapy treatment units. The main purpose of this model is to allocate available capacity to incoming demand, while achieving wait time targets and increasing treatment units utilization.

2 - Modelling the Cancer Care System in British Columbia

Pablo Santibanez, BC Cancer Agency, 600 West 10th Avenue, Vancouver, BC, V5Z 4E6, Canada, psantibanez@bccancer.bc.ca, Scott Tyldesley, Vincent Chow, John French, Martin Puterman

We present a model of the cancer care system to evaluate strategic decisions such as screening policies, treatment alternatives, capacity planning, and resource allocation. The core of our model is the treatment process, with a dynamic demand that depends on population characteristics and operating policies. We consider two performance categories: patient wait times and resource utilization.

3 - Strategic Planning of Radiation Therapists at the BC Cancer Agency

Greg Werker, University of British Columbia, 3869 W 18th Avenue, Vancouver, BC, V6S1B4, Canada, greg.werker@sauder.ubc.ca, Martin Puterman, Mike Darud

The Vancouver Centre of the British Columbia Cancer Agency (BCCA) employs 80 radiation therapists who work in a number of different areas. Our integer programming (IP) model is used to create a five-year plan for all therapists, balancing experience against various scheduling considerations. We use additional techniques to handle variability to create a more robust plan. While the focus of this presentation is on the BCCA, it could be extended to other staff planning applications in health care.

■ TA12

Pier 4 - H Conv. Lev.

Collaboration Support for Requirements Engineering I

Sponsor: Group Decision and Negotiation Section: GDN 2009
Sponsored Session

Chair: Gwendolyn Kolfschoten, Delft University of Technology, Postbus 5, Delft, 2600 AA, Netherlands, g.l.kolfschoten@tudelft.nl

1 - Designing Collaborative Processes for Requirements

Aida Azadegan, PhD Student, Manchester Business School, Booth Street West, Manchester, M15 6PB, United Kingdom, Aida.Azadegan@postgrad.manchester.ac.uk, Linda Macaulay

Evidence shows that a major cause of project failure is the lack of agreed requirements and consensus among stakeholders. This paper reviews current requirements methods and identifies similarities and differences in their approach to stakeholder involvement. The authors use the principles of Collaboration Engineering to design a collaboration process that can be applied across a range of methods. The paper concludes with an evaluation of the collaborative process.

2 - Eliciting Requirements with Audio-based Collaborative Storytelling

Michael Klebl, FernUniversitaet in Hagen, Universitaetsstrasse 11, Hagen, 58084, Germany, michael.klebl@fernuni-hagen.de, Tanja Buttler, Monika Hackel, Stephan Lukosch

In this paper we describe a process for requirements elicitation and negotiation by means of audio-based collaborative storytelling. This utilizes the development of a common understanding within a group by coordinated and oral narrating activities. Furthermore, we present an applicable information system that supports this process even for distributed use.

3 - Understanding Relationships In Software Requirements

Aaron Read, PhD Student, University of Nebraska Omaha, PKI 274, 1110 South 67th Street, Omaha, NE, 68182, United States of America, aarons.read@gmail.com, Robert Briggs, Gert-Jan de Vreede

Understanding the relationships that exist between software requirements is an important factor in assuring the quality of software requirements. Several approaches to the development of software requirements require collaborative efforts. The research of this study reviews the literature to identify and evaluate the role of organizing. Collaboration Engineering is used as a method to improve identification of relationships between requirements in improving quality.

4 - A Diagnostic to Identify and Resolve Different Sources of Disagreement in Requirements Engineering

Gwendolyn Kolfschoten, Delft University of Technology, Postbus 5, Delft, 2600 AA, Netherlands, g.l.kolfschoten@tudelft.nl, Gert-Jan de Vreede, Robert Briggs

When negotiating requirements stakeholders need to be involved and several key tradeoffs will emerge. To build consensus among key stakeholders on the requirements for the system, facilitators are confronted with disagreements that originate in different sources ranging from misunderstanding to truly conflicting stakes. In this paper we will offer a diagnostic to identify the source of a disagreement in requirements and we will offer a first step towards a framework of strategies to resolve them.

■ TA13

Pier 5 - H Conv. Lev.

Phased-conflict Analysis Transformation and Resolution I

Sponsor: Group Decision and Negotiation Section: GDN 2009
Sponsored Session

Chair: Amer Obeidi, University of Waterloo, 200 University Avenue West, Waterloo, Canada, aaobeidi@engmail.uwaterloo.ca

Co-Chair: James Bryant, Professor of Operational Research & Strategy Sciences, Sheffield Hallam University, Stoddart Building, City Campus, Sheffield, UK, S10 1ES, United Kingdom, j.w.bryant@shu.ac.uk

1 - Commitment Valence in Group Negotiation

Randy Harris, Professor, University of Waterloo, English Language and Literature, 200 University Avenue, Waterloo, ON, N2L 3G1, Canada, raha@uwaterloo.ca, Amer Obeidi

Valence divergences in negotiator's sets of beliefs and commitments are major obstacles to successful group negotiation. Serious difficulties arise when those sets share what appear to be the same elements, but have different valences for different negotiators. A phased-conflict analysis process using current advances in formal game-theoretic conflict modeling will be employed to identify parties' valences and provide ways for achieving enduring treaties. A real-world example will be used.

2 - Creative Conflict Resolution

Paul Thagard, Professor, University of Waterloo, 200 University Avenue E., Waterloo, ON, Canada, pthagard@uwaterloo.ca

Conflict resolution can be modeled as reconciliation of differences between disputants with a fixed set of options and preferences. More creative conflict resolution involves the introduction of novel options and revision of preferences as the result of changes in emotional values. This talk will describe how options and preferences can be changed by neural mechanisms for generating and revaluating goals.

3 - Cognitive Mapping & Problem Structuring in Expert-Stakeholder Interaction Approach

Hironori Kato, Associate Professor, Department of Civil Engineering, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo, Japan, kato@civil.t.u-tokyo.ac.jp, Yoshinori Nakagawa, Hideaki Shiroyama

A modified problem structuring method is proposed. It adopts the hypothesis-and-modification approach for interviewing the stakeholders and developing cognitive maps, which contributes to collecting rich information. The method also includes the analytical tools for supporting the policy-making process. The expert, as knowledge is effectively introduced into generation of the political agenda through a factor-driver analysis and an interaction analysis among stakeholders.

■ TA14

Pier 7 - H Conv. Lev.

Data Mining - Theory

Contributed Session

Chair: Sivanthan Sivaraja, Mr., Canada Border Services Agency, 66A Chesterton, Ottawa, Canada, ssivaraj@connect.carleton.ca

1 - Relational Data Mining via Matrix Decomposition

Fei Xie, Student, Key Lab, School of Information System and Management, National University of Defense Technology, No 47, Road Deya, Borouh Kaifu, Changsha, 410073, China, xiefei2046@hotmail.com, Yong Zhang, Jichang Sha, Chao Chen

Recently there has been a surge of interest in tackling the problem of mining richly structured datasets, fueled by interest in mining hypertext, social networks, law enforcement data etc. We explore the applications of Matrix Decomposition to mining such relational data to detect objects (anomalies, communities etc.) which may endanger homeland security.

2 - Research Information Retrieval From a Co-occurrence Matrix

In-Chan Choi, Korea University, 1, 5Ka, Anamdong, Seongbookku, Seoul, Korea, Republic of, ichoi@korea.ac.kr, Jiwoong Choi

A concept search model for extracting a set of research information from a co-occurrence matrix of articles by words is presented. In the model, three different approaches, based on the Latent semantic analysis, the minimum capacity path model, and a neighborhood search, are considered. Also reported are rudimentary experimental results and some observations from the experiment.

3 - Application of Rough Sets with Fuzzy Weight for Recommendation Capability

Shimpei Matsumoto, Department of Computer and Control Engineering, Oita National College of Technology, 1666 Oaza-Maki, Oita, 870-0152, Japan, smatsu@oita-ct.ac.jp, Tomoko Kashima, Hiroaki Ishii

The novelty of this paper is integration of two capabilities, the recommendation and the stock control by point of sales (POS). To implement the recommendation, this paper uses fuzzy rough set proposed by Han that is based on the information system with the fuzzy weights, and can cover all uncertainties and noises in a database from every aspect by evaluating each attribute including both of condition and decision using a fuzzy number.

4 - Risk Rules Design Using Hierarchical Data Approach and Minimum "No Rule Zone" in Apriori Models

Sivanthan Sivaraja, Mr., Canada Border Services Agency, 66A Chesterton, Ottawa, Canada, ssivaraj@connect.carleton.ca, Darren Cougherty, Rosario Feghali, Ilya Volnyansky, Alex Trichtchenko

Border agencies build rules around patterns and trends within the commodity and geographical attributes of commercial cargo to improve risk assessment. These rules are evaluated by their individual support and confidence. This study proposes an approach to design a set of rules. Using the apriori model, a newly defined metric, no-rule-zone is minimized over the space of varying granularity levels of the commodity dimension yielding a set of risk rules better suited for risk assessment purposes.

■ TA15

Pier 8 - H Conv. Lev.

Advanced Search Techniques

Sponsor: Computing Society: Constraint Programming
Sponsored Session

Chair: Meinolf Sellmann, Brown University, Department of Computer Science, P.O. Box 1910, Providence, RI, 02912, sello@cs.brown.edu

1 - Backdoors to Combinatorial Optimization: Feasibility and Optimality

Bistra Dilkina, PhD Student, Cornell University, Department of Computing Science, Ithaca, NY, United States of America, bistra@cs.cornell.edu, Carla P. Gomes, Meinolf Sellmann, Ashish Sabharwal, Yuri Malitsky

There has been considerable interest in the identification of structural properties of combinatorial problems. One such concept is that of a backdoor set, originally defined for decision problems with discrete variables. Here we introduce a notion of backdoors that captures structure in optimization problems, which often have both discrete and continuous variables. We show that finding an optimal solution and proving optimality are characterized by backdoors of different kinds and size.

2 - Understanding the Behavior of Solution-Guided Search for Job-Shop Scheduling

J. Christopher Beck, University of Toronto, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, jcb@mie.utoronto.ca, Ivan Heckman

This paper investigates constructive Solution-Guided Search (SGS). Two hypotheses are investigated: (1) Like randomized restart, SGS exploits heavy-tailed distributions; and (2) Like local search, SGS exploits the clustering of high-quality solutions. Theoretical and experimental evidence strongly support both hypotheses. Unexpectedly, the experiments also indicate that randomized restart and standard chronological backtracking are also correlated with solution clustering.

3 - Learning Value Selection Heuristics

Meinolf Sellmann, Brown University, Department of Computer Science, P.O. Box 1910, Providence, RI, 02912, sello@cs.brown.edu, Carlos Ansotegui-Gil, Warren Schudy

A hybrid algorithm is devised to boost the performance of complete search on under-constrained problems. We suggest to use random variable selection in combination with restarts, augmented by a coarse-grained local search algorithm that learns favorable value heuristics over the course of several restarts. Numerical results show that this method can speed-up complete search by orders of magnitude.

■ TA16

Pier 9 - Convention Level

Organizational Flexibility and Resilience: How Do You Get There From Here?

Sponsor: Military Applications
Sponsored Session

Chair: Ben Skipper, Air Force Institute of Technology,
2950 Hobson Way, WPAFB, OH, 45433, United States of America,
joseph.skipper@afit.edu

1 - Resilience for the Warfighter: Assessment and Benchmarking for Maximizing Mission Effectiveness

Tim Pettit, Air Force Institute of Technology, 2950 Hobson Way,
WPAFB, OH, 45433, timothy.pettit@afit.edu

Resilience is the ability to survive and adapt in the face of turbulent change. Research has shown the need to supplement risk management with resilience, designed for extreme complexities, unpredictable events and adaptive threats. Military operations (training, contingencies and reconstitution) require expedient transition between states, placing demands on policies, resources and personnel. Lessons learned provide recommendations to improve resilience.

2 - Logistics Flexibility: A Military Perspective

Dan Mattioda, Assistant Professor of Logistics, USAF, 2950 Hobson Way,
Wright-Patterson AFB, OH, 45433, United States of America,
daniel.mattioda@afit.edu

Logistics flexibility is an area where efficiencies will increase operational availability of a weapons system while at the same time reduce expenditures for the contractor. Research identified generic resources that provide a foundation for internal logistics flexibility (internal processes of a supplier that allow the supplier to meet customer demand) which leads to external logistics flexibility (ability of a supplier to meet customer demand).

3 - The Moderating Effect of Information Technology on the Relationship between Comprehensive Planning Processes and Flexible Responsiveness

Dianne Hall, Associate Professor of Information Management,
Auburn University, dhall@auburn.edu

Uncertainty and disruptions often cause significant effects on businesses worldwide. As part of ever increasing efforts to combat these issues, many businesses often seek to improve their flexibility. This study examines two antecedents of flexible responsiveness - information technology and comprehensive planning processes. A model was developed and then tested using survey data collected from supply chain managers and analyzed using partial least squares techniques. Based on the sample used, information technology moderates the effect of comprehensive planning on flexible responsiveness.

■ TA19

Dockside 2 - H Lower Lev.

Optimization Modeling in Practice

Sponsor: CPMS, The Practice Section of INFORMS
Sponsored Session

Chair: Bjarni Kristjansson, President, Maximal Software, Inc.,
2111 Wilson Boulevard, Suite 700, Arlington, VA, 22201,
United States of America, bjarni@maximalsoftware.com

1 - Why is Maximal Software Now Giving Away Free Development Copies of MPL?

Bjarni Kristjansson, President, Maximal Software, Inc.,
2111 Wilson Boulevard, Suite 700, Arlington, VA, 22201,
United States of America, bjarni@maximalsoftware.com

In today's challenging economy, many are now looking for ways to save on their IT budget, including when purchasing optimization software. We at Maximal have now decided to fundamentally change how we sell our software, by greatly reducing how much you pay for development copies of MPL, in many cases bringing the actual cost down to zero. We will explain several new programs: "Pay Maintenance Only" "Subscription-Based Pricing" "Free Development Copies of MPL" and "Free Software for Academics".

2 - Using an Algebraic Modeling Language for Access to Advanced Solver Features

Robert Fourer, Northwestern University, Dept of Industrial Eng &
Mgmt Sciences, 2145 Sheridan Road, Evanston, IL, 60208-3119,
United States of America, 4er@iems.northwestern.edu

Algebraic modeling languages can conveniently support such diverse solver features as infeasibility diagnosis, quadratic convexity detection, multiple solutions, parameter tuning, generalized variable domains, and logic operations in constraints. We present test results using the AMPL language to show how different features are applied and why they make a difference. AMPL's variable and constraint suffixes are notable for their role in making a number of these features readily accessible.

3 - Scheduling Movies for TV: Modeling, Solving, and Displaying the Solution

Carol Tretkoff, Technical Account Manager, ILOG, an IBM
Company, 4350 North Fairfax Drive, Suite 800, Arlington, VA,
22203, United States of America, tretkoff@us.ibm.com

The problem is to schedule the airing of movies for 1 or 2 months on a TV movie channel subject to multiple constraints and preferences. Movies may be shown multiple times during each exhibition day. The time between the movies may vary between 5 and 20 minutes, so the length of the movie is not known. We will discuss modeling issues with MIP models, CP models, and Hybrid models using IBM ILOG OPL and ODM. Displaying the results is important in optimization practice and will also be discussed.

■ TA20

Dockside 3 - H Lower Lev.

Finance

Contributed Session

Chair: John Glen, Dr, University of Edinburgh, Business School,
50 George Square, Edinburgh, EH8 9JY, United Kingdom,
John.Glen@ed.ac.uk

1 - Investor Decision Making and Structured Financial Products

Rosella Castellano, University of Macerata - DIEF, Via Crescimbeni
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Cerqueti

The recent financial crisis, among other things, emphasized the role of retail structured products since many buyers have experienced huge losses and, in some cases, have seen the investments completely wiped out. A structured product is a combination of simpler financial instruments put together by the 'structurers' of the financial institutions, supported by a chain of people involved in products pricing, accounting, legality, marketing and sales. Structured products may include assets such as stocks and bonds, as well as basic derivatives and credit default swaps, some of which have been blamed for the current financial crisis. Evidences suggest that structured products tend to be overpriced and this is consistent with models where producers of financial products take advantage of naïve consumers by consciously making these product extremely complicated. In this paper, studying investor decision making, we show that simpler products should be preferred by investors and that the decision to invest in structured products is puzzling from the stand point of decision theory.

2 - Continuous-Time Portfolio Execution with Futures Hedging

Youxun Shen, VP, Goldman Sachs, 17 Fenton Dr, Short Hills,
07078, United States of America, youxun@yahoo.com

Beta-neutrality is a popular risk control technique. We prove that portfolio execution with futures hedging leads to near-beta-neutrality with respect to the underlying benchmark(s). Dollar-neutrality is another popular risk-control technique. By adding a dollar-neutral twist to the factor risk model, we show that dollar-neutrality can be approximately satisfied via futures hedging as well.

3 - Light Stocks and Wealth Allocation

Roy Cerqueti, University of Macerata - Department of Economic
and Financial Institutions, Via Crescimbeni, 20, Macerata, Italy,
roy.cerqueti@unimc.it

In this work we deal with the problem of optimal portfolio selection in presence of light stocks, which are characterized by low trading volumes. Using the optimal control approach in a dynamic programming setting, we implement a continuous time portfolio. This is a joint work with Rosella Castellano.

4 - The Effectiveness of Prepayment Penalty Ban in Turkey

Orhan Erdem, Asst. Professor, Istanbul Bilgi Universitesi, MSc. in
Financial Economics, Silahtaraga Mah. Kazım Karabekir Cad.,
Istanbul, Turkey, oerdem@bilgi.edu.tr

This paper values the prepayment option under two types of prepayment penalties: a fixed rate penalty and a yield maintenance penalty. Using the bivariate binomial option pricing technique, we calibrate prepayment option values for Turkey with different prepayment penalties. The sensitivity of option value to penalty changes is assessed. Furthermore, we also question the effectiveness of the fix-prepayment penalty upper ban imposed by the law.

5 - Transaction Costs and Funding Changes in Mean-Variance Portfolio Rebalancing

John Glen, Dr, University of Edinburgh, Business School,
50 George Square, Edinburgh, EH8 9JY, United Kingdom,
John.Glen@ed.ac.uk

Standard mean-variance (MV) portfolio selection methods are not appropriate for portfolio rebalancing since the initial portfolio, funding changes and fixed and variable transaction costs are ignored. A quadratic mixed integer programming model for MV portfolio rebalancing is developed to take account of these factors. Use of this model shows that when these factors are considered, MV efficient portfolios that include risk-free lending do not have the structure expected from portfolio theory.

■ TA21

Dockside 4 - H Lower Lev.

Making Decisions

Contributed Session

Chair: Jared Lee Hanson, Al Yamamah University, P.O. Box 45180, Riyadh, 11512, Saudi Arabia, info@themop.org

1 - GDSS Based on Second Order Preferences

Laura Plazola, Dr., Universidad de Guadalajara, Periferico Norte 799, Zapopan, Ja, Mexico, plazolaz@ucea.udg.mx

A GDSS based on second order preferences is presented, in which every member of the group influences the group ranking to the same degree. To achieve this, it is necessary that preferential information of the individuals not only includes a ranking of the alternatives, but also data on the strength of their preferences. This support system is web based and allows six alternatives, indifference is not allowed.

2 - The Calculus of Chaos - Black Swans, Butterflies, and Judgement-Based Decision-Making

Lorna Strobel Stewart, PhD, Founder & CEO, Decyde Inc, 2 St. Clair Avenue East, Suite 800, Toronto, ON, M4T 2T5, Canada, lss@decydeinc.com

The global press & books have popularized tensions between decision-makers who trust statistics/numbers & those choosing to trust intuition when making judgements. Commentators highlight the critical importance of gut feelings in many situations. This paper describes an intelligent method to bring transparency, consistency & mathematical rigor to judgements. By modeling decision processes with fuzzy logic & non-linear calculus trust issues are mitigated & incipient black swans can be identified.

3 - Inversion of Control in Heterogeneous Meta-NSS Design

Przemyslaw Szufel, Warsaw School of Economics, Division of Decision Support, Al. Niepodleglosci 164, Warsaw 02-554, Poland, pszufe@gmail.com

The article presents design aspects of a meta NSS architecture for construction of NSSs supporting negotiating processes in information, communication and decision layers. The proposed solution is built around an abstract, container-managed negotiation model. In the meta-NSS approach the NSS construction requires the specification of a set of attributes, independent actions, events and views together with externally defined dependencies between them.

4 - Basic Social Math - A Linguistic Upgrade for Decision Analysis in the Management & Political Sciences

Jared Lee Hanson, Al Yamamah University, P.O. Box 45180, Riyadh, 11512, Saudi Arabia, info@themop.org

This paper examines the structure of math as a problem-solving framework. It shows where agent-based modeling is illuminating approaches to decision analysis in cross-cultural contexts. Currently, we do not have any standardized math at the fundamental levels of management or political science. The author explores how a mathematical upgrade in our linguistic framework enables us to construct internal decision maps that accurately assess risk and better match changing operational conditions.

Tuesday, 11:00am - 12:30pm

■ TB01

Frontenac - CC Lev. 1

Humanitarian Logistics

Sponsor: Transportation Science & Logistics

Sponsored Session

Chair: Soumia Ichoua, Johnson C. Smith University, Computer Science & Engineering Department, 100 Beatties Ford Road, Charlotte, NC, United States of America, soumia.ichoua@fsa.ulaval.ca

1 - Equity Considerations in Relief Routing

Michael Huang, Northwestern University, 2145 Sheridan Road, Evanston, IL, 60208, United States of America, Michael-Huang@u.northwestern.edu, Burcu Balcik, Karen Smilowitz

We study the effects of routing decisions on equitable service provision in disaster relief. We explore the implications of different objectives on the performance (efficiency, effectiveness and equity) of aid distribution. We develop a formulation and a solution approach and compare the solutions obtained with the different objectives. We present computational analysis with a set of problem instances that capture a variety of network structures.

2 - Multicriteria Path Planning for Search and Rescue

Michael Morin, Graduate Student, Departement d'Informatique et de Genie Logiciel, Université Laval, Pavillon Adrien-Pouliot, Université Laval, Quebec, G1K7P4, Canada, michael.morin.3@ulaval.ca, Luc Lamontagne, Irene Abi-Zeid

We consider the problem of multicriteria path planning of ground search units searching for an object of unknown location. A particular attention will be paid to the probability of finding the target and to the terrain topology that influence the choice of navigable paths as well as the detection capabilities of the search units. We will present algorithms and formulations that integrate notions from search theory and artificial intelligence.

3 - Design of a Humanitarian Distribution Network

Soumia Ichoua, Johnson C. Smith University, Computer Science & Engineering Department, 100 Beatties Ford Road, Charlotte, NC, United States of America, soumia.ichoua@fsa.ulaval.ca

We present an on-going work aimed at designing an effective humanitarian distribution network. We address the problem of inventory pre-positioning that takes place prior to the disaster start. The intent is to prepare for a fast and efficient disaster response. We propose a scenario-based model that integrates location inventory decisions while taking into account transportation costs.

■ TB02

Queens Quay I - CC Lev. 1

Graph and Combinatorial Algorithms II

Cluster: Optimization/Combinatorial Optimization

Invited Session

Chair: Frantisek Franek, Professor, McMaster University, 1280 Main Str. West, Hamilton, ON, Canada, franek@mcmaster.ca

1 - Recent Progress on Dejean's Conjecture

Narad Rampersad, University of Winnipeg, 515 Portage Ave., Winnipeg, MB, R3B 2E9, Canada, narad.rampersad@gmail.com, James Currie

The exponent of a word is the ratio of its length to its period. In 1972 Dejean conjectured that for $n \geq 5$, there exists an infinite word over an n -letter alphabet containing no subword of exponent greater than $n/(n-1)$. Later work proved the conjecture for $5 \leq n \leq 14$. A major breakthrough came in 2006/2007 when Carpi proved the conjecture for $n \geq 33$. This left $15 \leq n \leq 32$ as the only remaining cases. We present recent work extending Carpi's ideas to verify the conjecture for $27 \leq n \leq 32$.

2 - Increasing Subsequences and Regev's Theorem

Jonathan Novak, PhD Student, Queens University, 99 University Avenue, Kingston, ON, K7L 3N6, Canada, jnovak@mast.queensu.ca

Monotone subsequences of permutations were introduced by Erdos and Szekeres. Ulam asked about is the value of $u_d(N)$, the number of permutations in $S(N)$ with decreasing subsequence length bounded by $d > 1$. $u_2(N)$ is the N th Catalan number and $u_3(N)$ formula was given by Gessel. No general formula for $u_d(N)$ is known for $d > 3$. Regev gave an asymptotic formula for $u_d(N)$ based on Selberg's integral. We present an elementary proof of Regev's result which avoids the use of Selberg's integral.

3 - A New Approach to the Periodicity Lemma on Indeterminate Strings

Shu Wang, McMaster University, 1280 Main St. W, Hamilton, ON, L8S4L8, Canada, shuw@mcmaster.ca, Bill Smyth

We first give an elementary proof of the periodicity lemma for strings containing one indeterminate letter based on Euclid's GCD algorithm. We then discuss the two-indeterminate-letter case giving an easier proof than Blanchet-Sadri & Hegstrom 2002. Moreover our approach identifies the maximum-length prefix or suffix of the string to which the periodicity lemma does apply. Finally we extend our result to strings with an arbitrary number of indeterminate letters.

■ TB03

Queens Quay II - CC Lev. 1

Optimization in Logistics and Supply Chain Management

Cluster: Large Scale Optimization and Applications

Invited Session

Chair: Guoqing Zhang, Associate Professor, University of Windsor, 401 Sunset Ave, Windsor, ON, N9B 3P4, Canada, gzhang@uwindsor.ca

1 - Models for Sustainable Supply Chain Design

Montar Ramudhin, Professor, ETS, 1100 Notre Dame West, Montreal, Qc, Canada, Amar.Ramudhin@etsmtl.ca, Amin Chaabane, Marc Paquet, Pierre-Rémi Fourés

Increasing legislations for carbon, waste management and corporate citizenship are some of the drivers for supply chain sustainability. In this paper, we present a mathematical programming based methodology for analysing this problem that incorporates regulatory, environmental and cost constraints. The results obtained show that this approach offers a good framework for the development of sustainable supply chains.

2 - A Supply Chain Design Under Price and Demand Uncertainty

Mohamed Wahab Mohamed Ismail, Assistant Professor,
Department of Mechanical and Industrial Engineering, Ryerson
University, 350 Victoria Street, Toronto, ON, M5B 2K3, Canada,
wahab@ryerson.ca, Rongbing Huang

Valuing operational flexibility under uncertainty has become an area of interest for many companies utilizing a globalization strategy for their operations. In this paper, a valuation framework for a supply chain network is presented aiming to maximize discounted, expected, after-tax profits for a company that has plants and markets in more than one country. To this end, capacity flexibilities, uncertainties from demand, product life cycle, and exchange rate are considered. The output of this study helps a company determine the best locations for its markets and plants.

3 - Green Supply Chain Design: A Nonlinear Mixed Integer Programming Formulation

Ryan Merrick, Ryan.Merrick@rwdi.com, Samir Elhedhli

We present a mathematical programming model for the design of green supply chains. The cost of CO₂ emissions is incorporated in the objective function to minimize the total cost of the system by strategically locating warehouses. The relationship between CO₂ emissions and vehicle weight is modeled using a concave function, resulting in a nonlinear MIP model. Lagrangian relaxation is used to decompose the problem by echelon and by potential warehouse site. A primal heuristic is proposed.

4 - Multi-period Multi-product Acquisition Planning with Supplier Discounts

Guoqing Zhang, Associate Professor, University of Windsor,
401 Sunset Ave, Windsor, ON, N9B 3P4, Canada,
gzhang@uwindsor.ca, Jianmai Shi

In this talk we address a multi-period multi-product acquisition planning problem with supplier discounts. A nonlinear integer programming model is presented, and a Lagrangian relaxation approach is developed to solve large scale problems. We will report preliminary computational results.

■ TB04

Bay Room - CC Lev. 1

CORS Competition on the Practice of OR II

Cluster: Competitions

Invited Session

Chair: John Blake, Dalhousie University, Halifax, NS, Canada,
john.blake@dal.ca

1 - Thinking into the Box: Packing Containers for BuildDirect

Koyuki Nakamori, Centre for Operations Excellence, Sauder
School of Business, UBC and BuildDirect, Mehmet Ayyaci, Ricky
Ip, Mahesh Nagarajan, Derek Atkins, Stuart Donald

BuildDirect has an innovative delivery model for building supplies, arranging for direct delivery in whole shipping container loads from manufacturers mainly in Asia or Europe direct to users, mainly in North America. Customers, by phone or increasingly the internet, place orders with BuildDirect from the on-line catalogue. These orders typically include a variety of products with different weight and volume dimensions. BuildDirect sales staff pack these heterogeneous orders into 40' and 20' containers, encouraging extra purchases to 'fill up' containers. A major part of the success of this direct business model is to provide packing an efficient packing algorithm that is web-enabled for customers to do themselves and to do so in a timely manner. A project team jointly drawn from BuildDirect and the Centre for Operations Excellence (COE) at the Sauder School of Business addressed this task. The goal for this project was to minimize shipping costs by optimally packing containers. Some of the performance constraints placed upon the project were that an algorithm handle heterogeneous products, that weight balance throughout the container be maintained, that the rotability of pallets be considered, and that the degree to which pallets could be stacked is included. The balance constraint is needed because of the safety during the transportation of containers such as lifting by crane. In terms of the interface with the customers, the project scope specified that solutions be rendered visually in three dimensions, that the algorithm be capable of being web-enabled direct to customers and finally that solution times (not including the visualisations) be a maximum of 10 seconds per order. BD currently uses an existing algorithm. This was not satisfactory to them as salespersons could typically manually improve on the solutions generated, and in addition items such as rotability, weight balancing, web-enabled and visualisations were not included functionalities. A search of the literature did not uncover any algorithm capable of addressing all the implementation constraints surrounding the packing, so the problem was approached from first principles although using some ideas about aggregating products prior to trial packing's that formed part of the existing algorithm. The project delivered a C# code to the company that could satisfy all the constraints imposed. As there was no standard international test-bed available for testing, we and the company created a test bed of problems in two parts 1. actual company orders, and 2, a larger generated set but displaying typical order characteristics. The algorithm improved or

equalled both the existing algorithm and manual packing for all of the test data and the 10 second constraint was comfortably satisfied. The COE generated code for a 3D packing diagram that is displayed for each optimally packed container. Hence, if their wished, customers could know exactly where and how to load each pallet and container.

2 - Complex Care & Assisted Living Capacity Forecasting for Vancouver Island Health

Matthew Nelson, Centre for Operations Excellence, UBC,
Vancouver, Canada, matthew.nelson@coe.ubc.ca, Martin
Puterman, Mehmet Ayyaci, Steve Atkinson, Yue Zhang,
Derek Atkins

Vancouver Island Health Authority (VIHA) VIHA is one of 5 geographic health authorities in British Columbia. VIHA provides programs and services that address the following: public and environmental health; maternal and family health; home care and supports; primary health care; residential care; hospital care; mental health and addictions services; rehabilitation; and end-of-life care. VIHA serves over three-quarters of a million people and employs over 17,000 professionals, technicians and support staff. In response to an aging population, a shortage of health professionals, and continued financial pressures, VIHA must continue to ensure the efficient delivery of health services. The Residential Capacity Challenge VIHA must ensure that adequate capacity is in place for the anticipated demand for assisted living (capable of their own daily living needs) and complex care (require full time nursing care) beds and spaces. However geographic and socio-economic differences make each local health area (LHA) within the health authority unique. VIHA approached the Centre for Operations Excellence (COE) to investigate methods to forecast capacity for complex care and assisted living units to the year 2020. The COE Methodology Step 1: Discovery The COE team investigated patient pathways and created process flow diagrams to ensure all aspects of the process were considered. Data sources were identified and data was cleaned and analyzed. Population data was drawn from existing government sources. Step 2: Time in residence data. It was identified early on that the length of stay was the most sensitive determinant of capacity. Using only data from patients who had already completed their stay (typically died) is right censored. However the degree of the error in estimation that this might cause was a surprise. The COE was therefore meticulous in the use of Kaplan-Meier survival techniques to estimate length of stay. Step 3: Model development. A discrete event simulation model was developed in Arena® that combined arrival streams from both acute care and the community, with stay times for each LHA to predict capacity needs. A service level approach to planning was taken: that 80% of arrivals did not wait more than 30 days. A number of scenarios were explored. Step 4: Comparison with current benchmarks. The standard method for comparing residential care capacity uses the number of places per 1,000 population aged 75 years and over. Our forecasts significantly challenged this traditional approach to benchmarking. We therefore took considerable care to check every aspect of our model to understand why our results (when compared using the standard benchmarking methodology) exhibited considerable variance. The reason is simply that regions differ widely in their incidence of care needs, demographic profiles, admission practices, and survival probabilities. One size does not fit all, even approximately. Value Delivered 1. The use of Survival Analysis to predict times in care as accurately as possible. 2. The principle of a capacity forecast based on service level framework. 3. A simulation that can be used by planners at VIHA to help support current and future capacity deployment. 4. A challenge to the standard approach to capacity benchmarking by illuminating local differences.

3 - Modelling the Future of the Canadian Cardiac Surgery Workforce Using Systems Dynamics

Sonya Vanderby, University of Toronto and Canadian Society of
Cardiac Surgeons, Michael Carter, Christopher Feindel,
Timothy Latham

Corresponding to an increased use of non-surgical interventions in recent years, coronary artery bypass graft (CABG) rates have been declining. Historically the primary procedure performed by cardiac surgeons, this reduction has significantly affected employment prospects for newly licensed surgeons, deterring current medical students from selecting the specialty. Reduced enrolment, coupled with the aging of both the current cardiac surgeons and Canadian populations is raising concerns. The threat of a future shortage of cardiac surgeons in Canada motivated the Canadian Society of Cardiac Surgeons (CSCS) to collaborate with the Centre for Research in Healthcare Engineering to develop a model of the future of this specialty in Canada, integrating the supply capacity of current and future providers with the general population's demand for surgery. The objectives were to determine the legitimacy of concerns about a future surgeon shortage and to provide a means of communicating the future need for providers to current medical students. Constrained by a short time horizon, we sought to provide a useful, communicable model that is easily adaptable to other specialties, while also promoting the usefulness of operations research (OR) techniques in health care. Using system dynamics, we first developed a causal loop diagram based on information provided by CSCS representatives. On this foundation, we developed a stock-and-flow simulation of the supply of and demand for cardiac surgeons in Canada based on four main components: (a) demand for CABG and non-CABG surgical interventions generated by the population, based on age and gender cohort demand and population projections, (b) cardiac resident population, including enrolment and attrition rates, by post graduate year, (c) demography and departure rates of the provider population, (d) clinical productivity based on the average annual per-

surgeon case load. A feedback loop in the model simulates surgeons altering their annual clinical productivity in response to changes in the "demand-supply gap", which reflects the difference between the demand for surgery and the surgical capacity of practicing surgeons. A presentation of the model and outcomes of various scenarios at the Canadian Cardiovascular Congress (CCC) generated significant interest, leading to a request for an encore presentation at the conference the following day. The model design and implications of the outcomes led to lengthy discussions among surgeons and students regarding the current and future situations, and possible interventions. The following month, a second presentation was delivered to the Royal College of Physicians and Surgeons of Canada, generating further interest from other surgical specialties, enabling opportunities for broader impact. The tight timelines imposed by the desire of CSCS to present this work at the CCC posed a key challenge in this study; yet also provided an opportunity to demonstrate the ability of OR to provide timely, relevant solutions to evolving problems. We frequently hear the comment that lengthy development times have impeded the broader use of OR in practice, particularly in the health care sector. This study, however, demonstrates that this need not be the case; broader use of OR to address real challenges is feasible.

■ TB05

Yonge - CC Lev. 1

Forecasting Applications

Contributed Session

Chair: Cynthia Forgie, Assistant Professor, University of Southern Indiana, 3103 Oriole Drive, Louisville, KY, 40213, United States of America, ccforgie@usi.edu

1 - Fast, Lean Workforce Analysis, Planning & Alignment: A Case Study of a Growing Federal Organization

Rudy Weber, Associate, Booz Allen Hamilton, 6703 Odyssey Dr. Northwest, #200, Huntsville, AL, 35806, United States of America, weber_rudy@bah.com, Kenneth Evans, Melville Adams

Workforce planning and alignment is a slow, subjective, qualitative analysis of job descriptions from current workloads in response to uncertain projected organizational growth. This paper documents how lean thinking developed a fast, cost-effective process and analytical tool to align a workforce. A case study of a multi-site federal agency illustrates cost savings using this quantifiable approach to determine the number and alignment of staff required to fulfill a mission.

2 - Improving the Efficiency of African Central Banks

Innocent Zimuto, Student, NUST, 6 Earls Reoad, Elaxandra Park, Harare, 4490, Harare, Harare, Zimbabwe, zimuto63@gmail.com

To improve the efficiency of the African Central Banks through the use of the analytical hierarchy process. This can be done by employing the modern operations research technique. To try and engage ourselves in quantitative rather than qualitative analysis of the central banks with particular reference to Zimbabwe.

3 - Metrics for Revealing Information About Future Outcomes

Steven Shugan, Professor, University of Florida, 2030 NW 24th Avenue, Gainesville, FL, 32605, United States of America, sms@ufl.edu, Debanjan Mitra

Good metrics are well-defined formulae transmuting multiple observations of raw numerical performance measures to create informative summary statistics (e.g., average share of wallet, average customer tenure). We show empirically that although averaging has remarkable theoretical properties, supposedly inferior non-averaging statistics (e.g., maximum, variance) are often better. We explain theoretically (with exact proofs) and numerically (with simulations) when and why.

4 - Technology Forecasting Methodologies

Cynthia Forgie, Assistant Professor, University of Southern Indiana, 3103 Oriole Drive, Louisville, KY, 40213, United States of America, ccforgie@usi.edu

Managing an innovative technology development program is highly complex. Critical decisions regarding which technologies to employ profoundly influence the course of a program. Unfortunately, mitigation of risk attributed to technology development is a frequently overlooked component of the program management process. This paper discusses various technology readiness assessment and forecasting techniques.

■ TB06

Wellington - CC Lev. 1

Facility Territory Design

Contributed Session

Chair: Roger Z. Rios-Mercado, Associate Professor, Universidad Autonoma de Nuevo Leon, Graduate Program in Systems Engineering, San Nicolas de los Garza NL, Mexico, roger@mail.uanl.mx

1 - Scatter Search for a Multi-type Transshipment Point Location Problem with Multi-Commodity Flow

Jinfeng Li, PhD Student, University of Troyes, 12 rue Marie Curie - BP 2060, Troyes, 10000, France, jfli_1983@hotmail.com, Feng Chu, Christian Prins

We consider a location problem, which consists of determining the location and capacity of transshipment points and moving multi-commodity flow from plants to customers through a couple of them to meet customers' demands. We propose a scatter search, including a clustering-based method to initialize the Reference Set and a method of evaluating the neighborhood of an incumbent solution in the local search. By comparing with CPLEX, we obtain 2% gaps of optimality on average within acceptable time.

2 - An Integer Quadratic Programming Model for Commercial Territory Design in a Distribution Company

Maria Angélica Salazar-Aguilar, Universidad Autónoma de Nuevo León, Graduate Program in Systems Engineering, Cd. Universitaria, San Nicolás de los Garza, NL, 66450, Mexico, angysalag@gmail.com, Jose Luis Gonzalez-Velarde, Roger Z. Rios-Mercado

In this work we introduce an integer quadratic programming (IQP) model for a commercial territory design problem (TDP) which is motivated by a real-world case. The model uses a lower number of binary variables than the existing mixed-integer linear programming (MILP) model. We propose a solution procedure to the IQP model. We present a computational evaluation of this procedure and a comparison between the IQP and MILP models over a wide range of instances, including a case study from industry.

3 - Efficient Territory Design Planning by a Novel Location-Allocation Scheme

Ada M. Alvarez, Associate Professor, Universidad Autónoma de Nuevo León, Graduate Program in Systems Engineering, San Nicolás de los Garza NL, Mexico, adalvarez@mail.uanl.mx, Karim de-Alba, Roger Z. Rios-Mercado, Angel Segura-Ramiro

A commercial territory design problem motivated by a real-world application from a bottled beverage distribution firm is presented. The problem consists of finding a set of territories subject to contiguity, compactness, and multiple balance requirements with respect to each node activity measure. A proposed solution approach based on a novel location-allocation scheme is presented and empirically evaluated.

4 - Territory Design Planning for Recycling of Electric and Electronic Goods: A GRASP Approach

Roger Z. Rios-Mercado, Associate Professor, Universidad Autonoma de Nuevo Leon, Graduate Program in Systems Engineering, San Nicolas de los Garza NL, Mexico, roger@mail.uanl.mx, Elena Fernandez, J'rg Kalcsics, Stefan Nickel

The territory design problem under study consists of assigning recollection stations for electric and electronic equipment to companies in such a way that company monopoly over specific regions is avoided as much as possible. The proposed model considers the minimization of an objective function based on maximum territory dispersion subject to other specific planning criteria. A GRASP solution approach is presented and empirically evaluated.

■ TB07

Metro Grand West - CC Lev. 2

Tutorial: Semidefinite Programming and Application to Hard Combinatorial Optimization Problems

Cluster: Tutorials
Invited Session

Chair: Henry Wolkowicz, Professor, University of Waterloo, Faculty of Mathematics, Waterloo, ON, N2L3G1, Canada, hwolkowi@uwaterloo.ca

1 - Semidefinite Programming and Application to Hard Combinatorial Optimization Problems

Henry Wolkowicz, Professor, University of Waterloo, Faculty of Mathematics, Waterloo, ON, N2L3G1, Canada, hwolkowi@uwaterloo.ca

The interest in Semidefinite Programming, SDP, has grown tremendously during the last twenty years. This is partly due to the many diverse applications. This is a tutorial on the theory, algorithms, and applications for SDP. We emphasize the applications to solving hard combinatorial optimization problems, e.g. to: Max-Cut; Quadratic Assignment; Graph Partitioning; and Ad-hoc Sensor Localization.

■ TB08

Pier 2 - H Conv. Lev.

Joint Session APS/ Queueing: Tail Asymptotics in Multi-Dimensional Stochastic Models II

Sponsor: Applied Probability Society & Queueing
Sponsored Session

Chair: Qi-Ming He, Professor, Dalhousie University, P.O. Box 1000, Halifax, Nova Scotia, NS, B3J 2X4, Canada, Qi-Ming.He@Dal.Ca

Co-Chair: Yiqiang Zhao, Carleton University, 1125 Colonel By Drive, Ottawa, ON, K1S 5B6, Canada, zhao@math.carleton.ca

1 - Nonlinear Large Deviations

David McDonald, Professor, University of Ottawa, Department of Mathematics and Statistics, 585 King Edward Avenue, Ottawa, K1N 6N5, Canada, dmdsg@uottawa.ca, Robert Foley

Imagine a stable network with two nodes A and B. We are interested in a large deviation of node B. It may be the case that the path of the large deviation is nonlinear. In other words, first node A gets big and then dumps its customers into node B which in turn gets big. We discuss a general methodology for obtaining exact asymptotics of the steady state probabilities of such networks using an approximate time reversal.

2 - Conditions for Tail Asymptotics for GI/G/1-type Markov Chains

Yongming Tai, School of Mathematics and Statistics, Carleton University, Ottawa, ON, K1S 5B6, Canada, ytai@math.carleton.ca, Yiqiang Zhao

We consider the asymptotic behavior of the stationary distribution for GI/G/1-type Markov chains with finitely background states under light-tailed assumption. The rough decay (in logarithmic sense) and the exact decay of the stationary distribution are discussed. We provide sufficient conditions to both rough decay and exact decay.

3 - On the Probability Distribution of Join Queue Length in a Fork-Join Model

Jun Li, Research Scientist, VPNT/RASN, Communication Research Centre (CRC), 3701 Carling Ave., P.O. Box 11490, Stn. H, Ottawa, ON, K2H 8S2, Canada, jli@math.carleton.ca, Yiqiang Zhao

In this talk, we consider the two-node fork-join model with a Poisson arrival process and exponential service times of heterogeneous service rates. We first derive the probability distribution function of the join queue length in terms of joint probabilities in the parallel nodes, and then study the exact tail asymptotics of the join queue length distribution. Our results show that the asymptotics of the join queue length distribution are characterized by two scenarios.

4 - Stationary Distribution of Queue Lengths in a Multi-Class Priority Queue with Customer Transfers

Qi-Ming He, Professor, Dalhousie University, P.O. Box 1000, Halifax, Nova Scotia, NS, B3J 2X4, Canada, Qi-Ming.He@Dal.Ca, Jingui Xie, Xiaobo Zhao

This talk is about a multi-class priority queueing system with customer transfers that occur only from lower priority queues to higher priority queues. Using the mead-drift method, conditions for the queueing system to be stable/unstable is obtained. Using matrix-analytic methods, it is shown that the tail asymptotics of the stationary distribution is exact geometric, if the queue with the highest priority is overloaded.

■ TB09

Pier 3 - H Conv. Lev.

Supply Chains, Disruption and Disruptive Events

Contributed Session

Chair: Walid Klibi, PhD Student, CIRRELT, Université Laval, Quebec, Canada, walid.klibi@cirrelt.ca

1 - Enhancing the Efficacy of Strategic Balance-Cost Model on Product Design Stage

Chun-Ying Shen, Assistant professor, Ching Yun University, 229, Chien-Hsin Road, Jung-Li, Taiwan, Jung-Li, 320, Taiwan - ROC, shency@cyu.edu.tw

The published paper almost adopted the throw-away tolerance-cost model for solving the minimum manufacturing cost problems. Our model deals with quality multi-characteristic tolerances and product design functions to pursue the minimum total cost on product design stage. The design team could trade-off the quality requirement and the contingent costs based on the intended strategic positioning. An empirical case is performed to demonstrate and provide interesting managerial implications.

2 - Introduction of New Products in the Supply Chain: Optimization and Management of Risks

Laoucine Kerbache, HEC, School of Management, Paris, 1, Rue de la Liberation, Jouy en Josas, 78350, France, kerbache@hec.fr, Hiba El-Khobry, Christian van Delft

We analyze the problem of product rollover under uncertain regulatory date, a situation frequently met in companies dealing with medical products and devices, software, electronics, etc. Our approach is novel in the sense that it minimizes the underlying risk via the CVar approach. Main results and managerial insights will be presented.

3 - Designing Resilient Supply Networks under Disruptions

Walid Klibi, PhD Student, CIRRELT, Université Laval, Quebec, Canada, walid.klibi@cirrelt.ca, Alain Martel, Adel Guitouni

This paper considers a location-transportation problem under uncertainty where the future environment is characterized by random, hazardous and deep uncertain scenarios. It proposes stochastic programming formulations including resilience strategies and a good anticipation of the user transportation response problem. Three flexibility based strategies are elaborated to improve responsiveness. Using a large sample of scenarios, the evaluation of these designs provides the most resilient one.

■ TB10

Salon A - H Conv. Lev.

Learning in Pricing and Capacity Management

Sponsor: Manufacturing and Service Operations Management
Sponsored Session

Chair: Mikhail Nediak, Queen's University, School of Business, 143 Union St., Kingston, ON, K7L 3N6, Canada, MNediak@business.queensu.ca

1 - Non-parametric Inventory Control with Censored Demand

Woonghee Tim Huh, Columbia University, 500W 120th Street, MC4704, New York, NY, 10027, United States of America, th2113@columbia.edu

We develop a non-parametric algorithm for a stochastic inventory model with lost sales and censored demand, where the demand distribution is not known a priori. In the repeated newsvendor problem, we prove the convergence of our algorithm to the optimal solution, and demonstrate it numerically.

2 - Estimation, Pricing, and Strategic Customer Behavior

Dan Zhang, McGill University, 1001 Sherbrooke Street West, Montreal, QC, H3A 1G5, Canada, dan.zhang@mcgill.ca, Adam Mersereau

A growing segment of the revenue management and pricing literature assumes "strategic" customers who are forward-looking in their pursuit of utility. Recognizing that such behavior may not be directly observable, we examine the implications in a markdown pricing setting of seller uncertainty around the proportion of customers behaving strategically. We prove revenue bounds for single-season problems, and we examine multi-season versions where the seller estimates demand based on observations.

3 - Aggregating Algorithm for Pricing and Capacity Planning under Uncertain Demand

Mikhail Nediak, Queen's University, School of Business, 143 Union St., Kingston, ON, K7L 3N6, Canada, MNediak@business.queensu.ca, Yuri Levin, Tatsiana Levina, Vladimir Vovk, Jeff McGill

We study the problem of pricing and stocking of perishable items when demand and the reservation price distributions are unknown. The company learns consumer demand through successive observations over consecutive planning horizons, views the problem as a game against nature and applies Aggregating Algorithm to find the policies which are asymptotically optimal in the long run. The proposed methodology is general and independent of the form of the distributions.

■ TB11

Salon C - H Conv. Lev.

Cancer Performance Improvement

Sponsor: Health Applications Section

Sponsored Session

Chair: Michael Carter, Professor, University of Toronto, Department of Mechanical and Industrial Engineering, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, carter@mie.utoronto.ca

1 - Patient Travel Forecasting in Cancer Services

Graham Woodward, CCO, 620 University Ave, Toronto, ON, Canada, Graham.Woodward@cancercare.on.ca, Nadia Berger, Kelly Woltman, Andriy Kolos

Recent standards regarding the delivery of thoracic surgery and systemic treatment in Ontario will result in substantial changes in demand for care and location of service. A Demand Forecast Tool was created to model the impact of various standards implementation strategies regarding hospital volumes and patient travel. The objective was to maximize access to care closest to home while maintaining quality, and remaining compliant with the standards.

2 - Developing a Generic Simulation Model to Assess Efficiency Improvements in Ontario Endoscopy Suites

Deborah Loach, Masters Student, University of Toronto, Mechanical & Industrial Engineering, 5 Kings College Rd, Toronto, ON, M5S 3G8, Canada, deb.loach@utoronto.ca, Michael Carter, Nadia Berger, Adriane Lau, Graham Woodward

Ontario's new colorectal cancer screening program has created additional endoscopy demand. This research provides an overview of an improvement process assessing six Ontario endoscopy suites. Through observation and comparison of these sites, a generic process was developed and used as the basis for creating a discrete event simulation model. This model will be used to determine the most efficient ways for Ontario hospitals to increase their endoscopy capacities.

3 - Radiation Therapy Wait Times in British Columbia

Pablo Santibanez, BC Cancer Agency, 600 West 10th Avenue, Vancouver BC V5Z 4E6, Canada, psantibanez@bccancer.bc.ca, John French, Martin Puterman, Scott Tyldesley

As part of the process to understand the radiation therapy (RT) pathway for cancer patients in British Columbia, we reviewed wait time data for different points in the treatment process for all patients that received RT within 12 months of diagnosis for the years 1984 to 2006. We present the findings from this wait time analysis and reflect on the limitations of available data, difference in practice across cancer centres, and definition of wait time standards.

■ TB12

Pier 4 - H Conv. Lev.

Collaboration Support for Requirements Engineering II

Sponsor: Group Decision and Negotiation Section: GDN 2009

Sponsored Session

Chair: Gert-Jan de Vreede, Professor, University of Nebraska- Omaha, Department of ISQA, Omaha, NE, 68182, United States of America, gdevreede@mail.unomaha.edu

1 - First Impression in E-Negotiation Counts? An Empirical Study on Anchoring Effects and Trust Building

Andrea Graf, Professor, University of Regensburg, Universitaetsstrasse 31, Regensburg, 93040, Germany, andrea.graf@wiwi.uni-regensburg.de, Katrin Stiglbauer

Anchoring effects can set the course for trust building before any contact occurred. So far the effect has been analysed in face-to-face interaction. We could demonstrate anchoring in trust processes in e-negotiations conducting laboratory experiments. Participants quantified their trust level before and after negotiating according to a priori information about the partner's trustworthiness. Intuitive estimations about trustworthiness seem to act as anchors regulating ensuing trust evaluation.

2 - Strategic Networking Systems: A Collaboration Engineering Approach to Aligning Individual Work with Strategic Goals Using Social Networking Software

Danny Mittleman, danny@cdm.depaul.edu, Pamela Meyer, Douglas Druckenmiller, Christian Kern, Brandy Agerbeck

While implementation of enterprise social networking systems is all the rage in 2009, little work has been undertaken to engineer collaboration processes that enhance the value of social software implementation. This paper describes a collaboration engineering approach toward the development of facilitated processes to use social networking software to increase individual productivity in activities that further the enterprise's strategic goals.

3 - Conceptual Model of eNS For Supporting Preference Elicitation and Counterpart Analysis

Tomasz Wachowicz, Karol Adamiecki Univeristy of Economics in Katowice, ul. Bogucicka 14, Katowice, 40-227, Poland, wachowicz@ekonom.ue.katowice.pl, Jakub Brzostowski

In the paper we present a conceptual model of eNS that provides the tools for negotiation analysis and the personality profile creation. The preference elicitation is based on difference curves generation using multiple application of "even swaps". The ordinal utility scale is used realized by linguistic terms. The profile building is based on the linguistic classification of messages sent and received by negotiators and the overall behavior of players in past interactions.

4 - A Pattern Language Approach to Requirements Definition for a Facilitation Database

Douglas Druckenmiller, Assistant Professor, Western Illinois University, 3561 60th Street, Moline, IL, 61265, United States of America, DA-Druckenmiller@wiu.edu, Jon Jenkins

The IAF Methods Database has 416 reported techniques used by facilitators divided into 3 Levels: Applications, Methods and Models, and Interventions. Methods and Models are the same level of abstraction as ThinkLets. We use the ThinkLet pattern language to define requirements for a redesign of the database. We also discuss the implications for collaboration engineering and examine requirements for other levels of abstraction at the intervention and application level.

■ TB13

Pier 5 - H Conv. Lev.

Phased-conflict Analysis Transformation and Resolution II

Sponsor: Group Decision and Negotiation Section: GDN 2009

Sponsored Session

Chair: Amer Obeidi, University of Waterloo, Department of Management Sciences, 200 University Avenue West, Waterloo, ON, N2L 3G1, aobeidi@uwaterloo.ca

Co-Chair: James Bryant, Professor of Operational Research & Strategy Sciences, Sheffield Hallam University, Stoddart Building, City Campus, Sheffield, UK, S10 1ES, United Kingdom, j.w.bryant@shu.ac.uk

1 - Explorative Nature of Negotiation in Participatory Decision Making for Sustainability

Concilio Grazia, Dr, DiAP, Politecnico di Milano, Via Golgi 133, Milano, 20133, Italy, grazia.concilio@polimi.it, Celino Adele

The paper discusses participatory decision making challenging the traditional decision analysis approach and focussing on the evolutionary nature of negotiation processes. First authors argue that, in environmental field, decision analysis usually poses the attention on values and therefore amplifies the risk for conflicts to arise. Then authors describe a real participatory process as a knowledge supply chain searching for negotiation keys able to collaboratively explore the decision space.

2 - Alethic Pluralism and Conflict Transformation

John Darwin, Sheffield Hallam University, City Campus, Sheffield, SY, S1 1WB, United Kingdom, J.A.Darwin@shu.ac.uk

The nature of truth is rarely explored in discussions about conflict transformation, and it is the contention here that this exploration can be illuminating and helpful. After outlining the theory of alethic pluralism, we shall consider its potential relevance through three examples: first, the nature of influence and persuasion; second, the nature of conflict transformation itself; and third the formal truth-telling and truth-seeking mechanisms adopted in the aftermath of some conflicts.

3 - Eliminating the Dilemmas of Collaboration

James Bryant, Professor of Operational Research & Strategy Sciences, Sheffield Hallam University, Stoddart Building, City Campus, Sheffield, UK, S10 1ES, United Kingdom, j.w.bryant@shu.ac.uk

Drama theory - an extension of game theory - provides a theoretical framework for supporting parties in negotiated situations. It takes the game to be dynamic, changing under the pressure of the emotions and rationalisations generated by participants. Dilemmas arise as "characters" seek to achieve positions that are not sufficiently supported by inducements or sanctions. This paper examines the formal means by which the game changes so that these dilemmas may be eliminated.

■ TB14

Pier 7 - H Conv. Lev.

Data Mining - Applications

Contributed Session

Chair: Jinlin Wang, Senior Director, Yahoo! Inc, 701 First Ave, Sunnyvale CA 94089, United States of America, jinlin@yahoo-inc.com

1 - Network Analysis and its Application to C2 Organizations

Chao Chen, Student, Key Lab, School of Information System and Management, National University of Defense Technology, No 47, Road Deya, Borough Kaifu, Changsha, 410073, China, chenchaoy_china@hotmail.com, Fei Xie, Yong Zhang, Jichang Sha

As the network organizational form has proliferated, the requirement to describe, estimate and predict the dynamic structure as well as to measure performance in network-organizations has become critical. We introduce the model and framework of applying the Network Analysis techniques to military Command and Control (C2) organizational issues.

2 - Computational Prediction of Plant Polyadenylation Sites

Ji Guoli, Professor, Xiamen University, Department of Automation, Xiamen University, Xiamen, Fujian, 361005, PR China, Xiamen, FJ, 361005, China, glji@xmu.edu.cn, Tang Meishuang

The recognition of poly(A) sites can help to find and annotate the gene ends and predict alternative poly(A) sites. Our current poly(A) recognition model can help to analyze large numbers of EST sequences and other high-throughput genomic sequences produced by genomic sequencing and predict potential poly(A) sites. It also can recognize the sites unrecognizable in experiments and predict many of the alterations of the poly(A) sites constructed by conventional genetic means.

3 - Customer Requirements Analysis Based on Data Mining Techniques

Juite Wang, Professor, National Chung Hsing University, 250 KuoKuang Road, Taichung, 402, Taiwan - ROC, rdwang@nchu.edu.tw

Failed to capture customer requirements will give wrong inputs to the product development and cause product failure. This paper proposes an association rule mining approach to find hidden patterns between customer attributes and product requirements to help product developers understand customer needs for a specific target market segment for developing innovative products. An example of online-game product development is used to illustrate the proposed methodology.

■ TB15

Pier 8 - H Conv. Lev.

Game Theory Applications

Contributed Session

Chair: Nobusumi Sagara, Professor, Faculty of Economics, Hosei University, 4342, Aihara, Machida, Tokyo 194-0298, Japan, nsagara@hosei.ac.jp

1 - A Coordinating Negotiation Scheme for Transshipment in a Two-Location Supply Network

Behzad Hezarkhani, Memorial University of Newfoundland, Faculty of Business, St. John's, A1B 3X5, Canada, b.hezarkhani@mun.ca, Wieslaw Kubiak

We study a decentralized two-location supply network with transshipment. Using the Generalized Nash Bargaining Solution, we model the negotiation process between the two companies. We derive a contractual scheme for determining the transfer prices which fairly divides the expected extra profits and also coordinate the production decisions of the two companies.

2 - Manufacturer Leadership Versus Retailer Leadership for a Vendor Managed Inventory Supply Chain

Eman Almehdawe, PhD Candidate, University of Waterloo, Department of Management Sciences, 200 University Avenue West, Waterloo, ON, N2L3G1, Canada, ealmehda@engmail.uwaterloo.ca

We formulate the Vendor Managed Inventory (VMI) problem as a Stackelberg game. The manufacturer produces a single product with a limited capacity and supplies it to multiple retailers who in turn sell this product to non overlapping markets. We solve the leader-follower NLP problem using GAMS. We examine the possibility of having a leader retailer versus the well known assumption of having a manufacturer leader.

3 - Equity and Efficiency in Fair Division Problems with Nonadditive Evaluations

Nobusumi Sagara, Professor, Faculty of Economics, Hosei University, 4342, Aihara, Machida, Tokyo, 194-0298, Japan, nsagara@hosei.ac.jp, Milan Vlach

We demonstrate the existence of solutions satisfying equity and efficiency in fair division problems with nonadditive evaluations. The existence of Pareto optimal alpha-fair partitions is established. Moreover, we show that every Pareto optimal alpha-equitable partition iff it is alpha-maximin optimal for some alpha and a partition is alpha-maximin optimal partition iff it is positive and Pareto optimal.

■ TB16

Pier 9 - Convention Level

FUTURE: Agent Based Simulation for Managing the Navy's Personnel Enterprise

Sponsor: Military Applications

Sponsored Session

Chair: Tanja Blackstone, Economist, Navy, 5720 Integrity Drive, PERS-1, Millington, TN, 38055, United States of America, tanja.blackstone@navy.mil

1 - FUTURE: Force Utilization through Unit Readiness and Efficiency

David Cashbaugh, Institute Leader PERS-11, Navy, 5720 Integrity Drive, PERS-1, Millington, TN, 38055, United States of America, David.Cashbaugh@navy.mil

The Navy has a strategic vision within the manpower and personnel enterprise to be more agile, cost efficient and competitive in the marketplace while exploiting the effectiveness of the Total Force (Active Duty, Reserves, civilians, contractors). NPRST developed an alternative institutional design to achieve this vision. FUTURE is the research agenda to model and test institutional design alternatives and develop the decision support tools necessary to achieve those alternative designs.

2 - Simulation Toolset Experimental Environment

Rodney Myers, Navy, NPRST, 5720 Integrity Drive, Millington, TN, 38055, Rodney.Myers@navy.mil

Simulation toolset experimental environment is an Agent-based simulation development environment. The simulation toolset is a model development environment versus a single simulation. This provides Navy analytical professionals with: a custom workforce analysis model development environment, access to verification and validation data, and an Agent-based framework where interactions between subjects can be explored.

3 - Optimized Skills Bank

David Dickason, Navy, NPRST PERS-11, Millington, TN, 38055, United States of America, David.Dickason@navy.mil

Optimized Skills Bank provides a venue for Navy advertised jobs and personnel interested in viewing and applying for these jobs to more closely align, and enable FUTURE to have visibility of all current and potential Navy personnel and jobs. OSB will provide candidate slates based on personnel skills vs. skill requirements, costs, personnel availability versus position availability, and eligibility factors such as physical and security screening.

4 - INCENTIVES

Jerry Crabb, Economist, U.S. Navy, 5720 Integrity Drive, Millington, TN, 38055, United States of America, Jerry.Crabb@navy.mil, Tanja Blackstone

INCENTIVES is a research program that supports NPRST's FUTURE research agenda by making use of experimental and behavioral economics. Various economic experiments will be conducted to predict individual's response to incentives. The results will be used to develop future incentive policies that align expected behaviors with the organizational goals of the Navy. INCENTIVES will also inform software agent development in planned personnel simulation models.

■ TB18

Dockside 1 - H Lower Lev.

Wind Energy and Planning

Contributed Session

Chair: Ziad Shawwash, Dr., UBC, Department of Civil Engineering, 6250 Applied Science Lane, Vancouver, BC, V6T 1Z4, Canada, shawwash@civil.ubc.ca

1 - Implementation of a Wind Energy Model

Hai Doan, Assistant Model Developer, Ontario Power Generation, Energy Markets, H9, Toronto, ON, M5G 1X6, Canada, hai.doan@opg.com, Hans Tuenter

Wind generation plays an increasing role in Ontario's energy mix, and a need to provide reliable forecasts. As wind energy displaces other generation, the need to model the impact on a fleet of generators is paramount. In the last years, our group in Energy Markets has developed, fine-tuned and calibrated statistical models for wind energy. This talk focuses on the process of implementing these models and the stages, from its conception to the successful implementation as a business tool.

2 - Wind Power Curtailment in a Hydroelectric Generation System: An Economic Perspective

Joel Evans, Graduate Research Assistant, University of British Columbia/BC Hydro, 6911 Southpoint Drive, 15th Floor, Burnaby, BC, V3N4X8, Canada, joelevans914@hotmail.com, Ziad Shawwash

Changes to the operational strategies of existing hydro generation and transmission assets contribute to the costs of integrating wind power into a power system. This work incorporates wind power curtailment as a decision variable into an economic optimization model of a generation system. This curtailment of wind power is incremental, beyond that necessary to maintain system reliability.

3 - Valuation of Pump Storage Hydro System Integrated with Wind Power in British Columbia Power System

Humberto Rivas Guzman, M.A.Sc Candidate / Research Assistant, UBC - BC Hydro, 1250 Comox St, Vancouver, BC, v6e1k8, Canada, hrivas@interchange.ubc.ca, Ziad Shawwash

We present an optimization model to value a pump storage system integrated with different levels of wind power penetration and to assess the impacts of the wind forecast error on a day-ahead electricity market.

4 - Establishing the Marginal Value of Water for Multi-reservoir Systems Applying Reinforcement Learning

Alaa Abdalla, Dr., BC Hydro, 6911 Southpoint Dr, Burnaby, BC, V3N 4X8, Canada, alaa.abdalla@bchydro.com, Ziad Shawwash

We present the use of a novel methodology to establish a good approximation of the marginal value of water for a large-scale hydroelectric power system applying Reinforcement Learning (RL). RL is an artificial intelligence method to machine learning that offers key advantages in handling problems that are too large to be solved by conventional stochastic dynamic programming methods.

5 - Modeling Methodology to Assess the Impacts of Integrating Wind in the BC Hydro System

Ziad Shawwash, Dr., UBC, Department of Civil Engineering, 6250 Applied Science Lane, Vancouver, BC, V6T 1Z4, Canada, shawwash@civil.ubc.ca, Alaa Abdalla, Douglas Smith

We present a high level overview of the set of deterministic and stochastic simulation and optimization models that were used to assess the short and long term impacts on generation operations and operations planning and system limitations of increasing wind penetration levels and multiple regional diversity and curtailment scenarios. Of particular interest is modeling of impacts of wind forecasting and incremental ancillary services on system operations.

■ TB19

Dockside 2 - H Lower Lev.

Telecommunications Applications

Contributed Session

Chair: Brigitte Jaumard, Professor, Concordia University, 1455 De Maisonneuve Blvd. West, EV-007-6, Montreal, Canada, bjaumard@ciise.concordia.ca

1 - Equitable Allocation of Resources in Networks

Hanan Luss, Senior Scientist, Telcordia Technologies, One Telcordia Drive, Piscataway, NJ, 08854, United States of America, hluss@telcordia.com

We review a variety of models and algorithms for allocation of resources on network links and nodes where an equitable solution is obtained by solving a lexicographic maximin optimization problem. We highlight problems for which efficient algorithms exist and discuss challenges in other problems. Allocation of link capacities and facility location applications are used to illustrate various issues.

2 - Relationship of Telecommunication Technology Proliferation and Economic Activity: An Empirical Study

Zenzo Polite Ncube, Mr, North West University, P Bag X 2046, Cnr Albert Luthuli/University Drive, Mmabatho, NW, 2735, South Africa, ncubezp@nwu.ac.za, JM Hattingh, ASJ Helberg

This paper uses multiple regression techniques and Linear Response surface analysis (LRSAs) to investigate the relationship between telecommunication technology proliferation and economic activity and other factors such as demographic and economic factors in an effort to explain whether or not a lack of telecommunication technology has a negative influence on economic growth potential of a country. The relationship between telecommunication proliferation and some of these factors is poorly understood and remains a challenge especially in the developing world.

3 - Evaluation of R&D Projects in Telecommunications

Joana Fialho, Escola Superior Tecnologia Viseu, Campus Politecnico, Repeses, Viseu, Portugal, jofialho@hotmail.com, Pedro Godinho, Joao Paulo Costa

The aim of this presentation is to present an approach to evaluate R&D projects in telecommunications. These projects have particular features that cannot be properly incorporated by classical valuation methods, and they can be discriminated by activities. We evaluate the activities, modeling the necessary time to finish the activity and the respective cost and profit. The evaluation uses real options analysis and a simulation method based in the Least Square Monte Carlo simulation.

4 - Competing Vendors in the Telecom Value Chain

Taner Bilgic, Bogazici University, Department of Industrial Engineering, Istanbul, 34342, Turkey, taner@boun.edu.tr, Unal Gok

We consider the competition between two vendors that serve a common telecom operator. The two vendors make independent R&D investments on a substitutable technology which increases the random demand if the innovation ever materializes. The operator buys the new technology from the vendor that achieves it first and decides on the capacity to build in each period. We fully characterize the centralized solution and the operator's problem. We partially characterize the vendors' investment game.

5 - Survivable Wavelength Division Multiplexing Mesh Networks Design Using Unrestricted Shape Structures

Brigitte Jaumard, Professor, Concordia University, 1455 De Maisonneuve Blvd. West, EV-007-6, Montreal, Canada, bjaumard@ciise.concordia.ca, Samir Sebbah

In optical networks based on WDM, the flexibility and efficiency of protection schemes using predefined protection structure patterns are highly dependent on the network topology, the traffic distribution, and the spare capacity budget. We propose a column generation framework for preplanned protection schemes design using unrestricted protection structure patterns. Our objective is to design the most efficient and flexible protection scheme whatever the design related constraints.

■ TB20

Dockside 3 - H Lower Lev.

Electrical Markets and Pricing

Contributed Session

Chair: Tiago Filomena, PhD Student, George Washington University, 1776 G Street, NW, Washington, DC, 20052, United States of America, tiagopf@gwu.edu

1 - Market Based, Hydro-Electric Incentive Mechanisms in a Regulated Environment

Hans Tuenter, Senior Model Developer, Ontario Power Generation, 700 University Avenue, Energy Markets, H9-C27, Toronto, ON, M5G 1X6, Canada, hans.tuenter@opg.com

In Ontario, most hydro-electric generation is regulated, and receives a fixed price for its production. This provides more predictable earnings on these assets. However, it also eliminates the economic driver to shape production to market prices. This is important, as additional generation made available at higher priced hours lowers the market-clearing price, and benefits the rate-payers of Ontario. We describe an incentive mechanism that provides operational drivers that are market driven.

2 - Price Formation and Reliability of Supply Under a Cap & Trade System

Enrique Campos-Nanez, Assistant Professor, The George Washington University, 1776 G Street NW, Suite 161, Washington, DC, 20052, United States of America, ecamposn@gwu.edu

We study price formation and reliability of electricity markets operating under cap & trade. We discuss equilibrium policies found by modeling this system as a dynamic game with stochastic demand.

3 - Pricing Electricity Forward and Option Contracts

Laura Gunn, FEM-UNICAMP, Rua Mendeleiev s/n, Campinas, Brazil, lauragunn@fem.unicamp.br, Paulo de Barros Correia

In Brazil electricity is traded through three segments: spot market that balances offer and demand at the Price for Settlement of Differences (PLD), calculated by cost based computational model; regulated market (ACR) where prices are settled in public auctions; free market (ACL) for bilateral contracts. As PLD and ACR prices are public information, this paper develops a binomial lattice approach to calculate the opportunity price for forward and option contracts.

4 - Technology Portfolio and Capacity Investments Under Emissions Cost Uncertainty

Tiago Filomena, PhD Student, George Washington University, 1776 G Street, NW, Washington, DC, 20052, United States of America, tiagopf@gwu.edu, Michael Duffey, Enrique Campos-Nanez

We develop a model which helps to understand the impact of emissions policies in electricity generation investment behavior. The model is based on a Nash-Cournot open-loop dynamic optimization and the emissions cost is considered as a stochastic parameter. The model helps to forecast the short-term portfolio of technologies, capacity availability and electricity clearing price for an oligopoly under emissions cost uncertainty.

■ TB21

Dockside 4 - H Lower Lev.

Decision Analysis

Contributed Session

Chair: Fuminori Toyasaki, York University, 4700 Keele Street, Toronto, Canada, toyasaki@yorku.ca

1 - Forecasting Fashion Sales: A Comparison of Artificial Neural Networks and ARIMA Model

Kin Fan Au, The Hong Kong Polytechnic University, ITC, HK PolyU, Hunghom, Kowloon, Hong Kong, China, tcaukf@inet.polyu.edu.hk, Jason Choi, Jeremy Yu

Artificial neural networks (ANN) have been proven recently as more appropriate than the traditional models such as ARIMA in the forecasting of fashion sales time series. The neural network model has been proved more reliable in capturing the dynamic nonlinear trends and seasonal patterns and is therefore a more suitable tool in the forecasting of fashion retail sales.

2 - Nanomanufacturing Risk Analysis Models

James Benneyan, Northeastern University, 334 Snell Engineering Center, Boston MA 02115, United States of America, benneyan@coe.neu.edu, Jackie Isaacs, Zeynep Ok

Given the significant uncertainty regarding nanomanufacturing health risks, we explore several potential risk modeling approaches for various carbon nanotube applications, including stochastic programming, multi-criteria, desirability function, and Monte Carlo models. These models can help decision-makers develop a more informed understanding of inherent trade-offs in nanotechnology research, production, and commercialization.

3 - A Multi-objective Meta-heuristic for Assessment of Information Technology Options under Uncertainty

Pooria Assadi, PhD Student, University of British Columbia, 2424 Main Mall, Vancouver BC V6T 1Z4, Canada, passadi@interchange.ubc.ca, Nima Safaei

Information technology could increase efficiency and performance of organizations. The choice of suitable technology requires systematic evaluation of different options to meet certain organizational objectives. A multi-objective nonlinear model is presented to assess information technology investment options. The proposed model is solved using a particle swarm optimization algorithm to obtain a set of best non-dominated solutions. Results imply our method outperforms others for large problems.

4 - A Quantitative Analysis of the Effects of Earmarking of Private Donations

Fuminori Toyasaki, York University, 4700 Keele Street, Toronto, Canada, toyasaki@yorku.ca, Tina Wakolbinger

In this paper, we analyze if NGOs should allow for earmarking of private donations or if they should only allow for unrestricted donations. Allowing for earmarking leads to a higher donor utility, larger donations, and a lower fundraising cost percentage. Desirable fundraising modes for NGOs differ depending on levels of several parameters including NGO's utility of a dollar raised, the fundraising cost factor, the measure of donation substitutability, and donors' unit utility of donations.

Tuesday, 1:30pm - 3:00pm

■ TC01

Frontenac - CC Lev. 1

GIS and Network Optimization

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Burcin Bozkaya, Asst. Professor, Sabanci University, Faculty of Management, Orhanli Tuzla, Istanbul, 34956, Turkey, bbozkaya@sabanciuniv.edu

1 - Thiessen Polygon-based Algorithms to Create Balanced and Connected Clusters

Buyang Cao, Operations Research Lead, ESRI, Inc., 380 New York Street, Redlands, CA, 92373, United States of America, bcao@esri.com, Fred Glover

We propose new algorithms to create balanced and connected clusters based upon Thiessen polygons. The problem arises in the logistics arena where it is important to create balanced service territories for a set of customers. Criteria for balancing can be based on the number of customers in each cluster, the service revenue in each cluster, or the delivery/pickup quantity in each cluster. Computational results demonstrate the efficacy of our new procedures.

2 - Design and Implementation of Optimization Solvers for Load Planning Problem in LTL Carrier Industry

Na An, Operations Research Analyst, ESRI, Inc., 380 New York Street, Redlands, CA, 92373, United States of America, nan@esri.com, Ding Yuan, Buyang Cao

This presentation introduces optimization solvers developed for the load planning problem for less-than-truckload (LTL) motor carriers. It explains the major challenges that these carriers are facing in practice. Optimization algorithms are presented. Algorithms use the real cost information which is a function of flow assigned to the path. Some complicated practical business constraints are also considered.

3 - Integrating Location-Allocation within a GIS

Jay Sandhu, Senior Software Engineer, Environmental Systems Research Institute, Inc., 380 New York Street, Redlands, CA, 92373, United States of America, jsandhu@esri.com

Integrating Location-Allocation into a GIS builds on the synergy of GIS's spatial and network analysis capabilities. Our first integration of these two technologies was done in the early 90's which made GIS useful to many businesses. Building on that experience, we re-integrate Location-Allocation within the current generation of GIS. This paper describes the new integration and shows sample scenarios where this integration helps improve the location modeling process.

4 - A GIS-Based Optimization Framework for the Competitive Location-Routing Problem

Burcin Bozkaya, Asst. Professor, Sabanci University, Faculty of Management, Orhanli Tuzla, Istanbul, 34956, Turkey, bbozkaya@sabanciuniv.edu, Seda Yanik, Selim Balcisoy, Billur Engin

Competitive location-routing problem involves simultaneous decisions on opening and closing of service facilities and calculation of delivery routes to the open facilities, in the presence of competitors. In this paper, we propose a heuristic optimization approach that uses a genetic algorithm in conjunction with a Tabu Search-based VRP algorithm available in a commercial GIS. We use this approach to solve real as well as randomly generated problem instances and report our results.

■ TC03

Queens Quay II - CC Lev. 1

Mathematical Programming Models of Equilibrium

Cluster: Large Scale Optimization and Applications
Invited Session

Chair: David Fuller, University of Waterloo, Department of Management Sciences, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, dfuller@uwaterloo.ca

1 - Dantzig-Wolfe Decomposition Algorithms for an Equilibrium Model in Time of Use Electricity Markets

Emre Celebi, University of Waterloo, Department of Management Sciences, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, ecelebi@engmail.uwaterloo.ca, David Fuller

We examine variational inequality formulation of a Nash-Cournot model with linearized DC network constraints in electricity markets with time-of-use pricing. Dantzig-Wolfe decomposition algorithm split the model into subproblems for each player and a master problem that coordinates the communication between the subproblems. We analyze approximation methods and column dropping procedures to improve the performance of the decomposition algorithm with further testing on large and realistic models.

2 - Capacity Pricing in Electric Generation Expansion

Mehrdad Pirnia, University of Waterloo, #1205, 125 Lincoln Rd, Waterloo, N2J2N9, Canada, mpirnia@gmail.uwaterloo.ca, David Fuller

We explore a mechanism to incentivise investment in deregulated electricity markets, involving a long term planning model, which maximizes the social welfare by choosing new generation capacities which, along with still existing capacities, can meet demand. It includes binary variables for the building of large new facilities, i.e. it becomes a mixed integer linear/nonlinear program and capacity payments are associated with the binary variables. Finally, the result will be compared with IPSP.

3 - Coordination of SPP's Distributed Generation Proposals within Electric Distribution Systems

Steven Wong, University of Waterloo, Department of Elec. and Comp. Engineering, 200 University Avenue West, Waterloo, ON, N2L3G1, Canada, sm2wong@gmail.uwaterloo.ca, David Fuller, Kankar Bhattacharya

In some jurisdictions, electric distribution systems have been opened to investments in distributed generation (DG) technology by small power producers (SPPs). Given adequate incentives, this policy can be very effective, so much in fact that the number of DG unit proposals SPPs may exceed the capacity of the distribution system. This presentation proposes an open and transparent method for distribution system operators to work with SPPs to approve and revise these project proposals.

4 - Simplicial Decomposition and Dantzig-Wolfe Decomposition of a Class of Variational Inequalities

William Chung, City University of Hong Kong, Kowloon Tong, Kowloon, Hong Kong - ROC, mswchung@cityu.edu.hk, David Fuller

This paper presents a generalized approach of applying the Dantzig-Wolfe decomposition method to a class of variational inequalities. We show that the simplicial decomposition method is a special case of the Dantzig-Wolfe decomposition of VI. An illustrative example of asymmetric traffic assignment problems is given.

TC04

Bay Room - CC Lev. 1

NSERC Information Session

Cluster: NSERC

Invited Session

Chair: Liping Fang, Professor, Department of Mechanical and Industrial Engineering, Ryerson University, 350 Victoria Street, Toronto, ON, M5B 2K3, Canada, lfang@ryerson.ca

1 - NSERC News

Serge Villemure, Director of Engineering, NSERC, Louise Benoit

During this session, NSERC staff will present the following topics: (1) NSERC Updates: Representatives from NSERC will provide information on the most recent federal budget and will give an update on the recent changes brought to the Discovery Grants Program. A description of the changes to the structure to be implemented for the 2010 competition will also be presented; (2) Discovery Grants Competitions Results 2009: NSERC will present a report on the results of the most recent Discovery Grants competition; and (3) Question Period.

TC05

Yonge - CC Lev. 1

Operations Management

Contributed Session

Chair: Hassan Farsijani, Professor, Shahid Beheshti University, Evin, Tehran, 1983963113, Iran, farsijani2000

1 - A Reliable and Valid Instrument for Measuring Bank Service Quality in the Context of a Transition Economy

Anupam Das, Post Doctoral Research Fellow and Part-time Instructor, Sprott School of Business, Carleton University, 307 Dunton Tower, 1125 Colonel By Drive, Ottawa, ON, K1S 5B6, Canada, adas@connect.carleton.ca, Uma Kumar, Vinod Kumar

Over the last few years the banking industry in transition economies has been experiencing tremendous growth due to its major transformation process started in the 1990s. This study proposed an instrument for measuring service quality of these banks. A sample of retail banking customers was surveyed for testing the reliability and validity of this instrument. This instrument comprises 29 items which span five dimensions: tangibility, reliability, empathy, responsiveness and service process.

2 - The Antecedents and Consequences of Plant Closing Announcements

Bogdan Bichescu, Assistant Professor, The University of Tennessee, 618 SMC, 916 Volunteer Blvd, Knoxville, TN, 37996, United States of America, bbichescu@utk.edu, Amitabh Raturi

We provide an empirical investigation of the implications of plant closings on operational performance. Using event study methodology, we find that the decision to close a plant occurs after a period of statistically significant declines in sales, operating income, and return on assets. The ex-ante decline in operating performance is strongest for small firms. This erosion in performance continues after plant closure, indicating either inadequate timing or deeper structural problems.

3 - Aligning Strategic Framework to Designing World-Class Eco-efficiency Programs for Manufacturing

Hassan Farsijani, Professor, Shahid Beheshti University, Evin, Tehran, 1983963113, Iran, farsijani2000

The question in this paper is which problems the management may encounter when it wants to organise the globalization management more systematically for world-class eco-efficiency. These problems such as, determining world-class eco-efficiency norms, developing a world-class eco-efficiency methodology for world market society, the demonstrability of world-class eco-efficiency in the professional organization and implementing effective management systems.

TC06

Wellington - CC Lev. 1

Operations and Production Scheduling

Contributed Session

Chair: Abdolkarim Khormali, Tarbiat Moallem University, No49, Mofateh Ave, Tarbiat Moallem Univer, Tehran, Iran, khormali.abdolkarim@gmail.com

1 - Problem Generators and Benchmark Instances for 2D Rectangular Cutting Problems

Jose Oliveira, Professor, University of Porto, Faculty of Engineering, Rua Dr. Roberto Frias, Porto, 4200-465, Portugal, jfo@fe.up.pt, Gerhard Waescher

Although in the last years the number of papers published on cutting and packing problems has increased significantly, there still exists a need for a common set of problem generators and benchmark instances that allow and induce fair and demanding computational experiments and that may be used both by authors and reviewers. In this talk we propose a set of problem generators and benchmark instances for the 2D rectangular cutting problem, organized accordingly to Waescher's et al typology.

2 - A Genetic Algorithm for Solving Large-scale Non-linear Multi-dimensional Knapsack Problem

Maw-Sheng Chern, Professor, National Tsing Hua University, Department of IEEM, Hsinchu 300, Taiwan - ROC, chern@ie.nthu.edu.tw, Chin-Jung Lin

We propose a hybrid genetic algorithm (GA) for solving the large-scale non-linear multi-dimensional knapsack problem. Computational study is conducted on the medium-scale problem sets taken from literatures. We also test the proposed GA on several sets of randomly generated large-scale problems.

3 - Single Batch Processing Machine with Non-identical Job Size and Fuzzy Processing Times

Abdolkarim Khormali, Tarbiat Moallem University, No49, Mofateh Ave, Tarbiat Moallem Univer, Tehran, Iran, khormali.abdolkarim@gmail.com

This paper considers the scheduling problem of a batch processing machine processing a batch of jobs simultaneously as long as the machine capacity is not exceeded. Processing times is considered as fuzzy. The processing time of batch is equal to the largest processing time among all jobs in the batch. A schedule defines the way how the batches are created from the jobs with the objective of minimum make span. We solved an example by simulated annealing.

■ TC07

Metro Grand West - CC Lev. 2

Tutorial: Optimization, Operations Research and the Engineering Sciences

Cluster: Tutorials

Invited Session

Chair: Tamas Terlaky, Professor, Chair, Lehigh University, 200 Packer Ave. West, H. Mohler Lab., Bethlehem, PA, 18015, United States of America, terlaky@lehigh.edu

1 - Tutorial: Optimization, Operations Research and the Engineering Sciences

Tamas Terlaky, Professor, Chair, Lehigh University, 200 Packer Ave. West, H. Mohler Lab., Bethlehem, PA, 18015, United States of America, terlaky@lehigh.edu

Mathematical, quantitative modeling of physical problems is in the core of engineering methodology. Let it be design, process or systems modeling, the models usually include parameters or system variables to optimize for performance, strength, cost of operation or other objectives. The need for powerful and easy to use optimization methodology is evident. On the other hand, optimization methods and tools have been developed by quantum steps in the last decades. Here we survey some notable successes, review what optimization methods and tools enable us to optimize today in the area of engineering optimization that was not possible before the interior point revolution.

■ TC08

Pier 2 - H Conv. Lev.

Joint Session APS/Queueing: Control of Queueing Systems

Sponsor: Applied Probability Society & Queueing

Sponsored Session

Chair: Eser Kirkizlar, Assistant Professor, Binghamton University, School of Management, P.O. Box 6000, Binghamton, NY, 13902, United States of America, eser@binghamton.edu

1 - Dynamic Control of Parallel Heterogeneous Flexible Servers Under Distruption

Bora Kolfal, University of Alberta School of Business, Dept of Finance & Management Science, Room 3-40H Business Building, Edmonton, AB, T6G 2R6, Canada, bora.kolfal@ualberta.ca, Mark Van Oyen, Soroush Saghafian

We consider the problem of allocating servers to different job types in a parallel queueing system with a "W" structure, under the objective of minimizing average holding cost. We allow for stochastic disruptions and repairs of the servers. We show that the cmu policy is optimal under some conditions, and a monotone threshold type policy is optimal under some other conditions. We develop a powerful and yet very simple to implement heuristic policy to control the servers in real time.

2 - Admission Control in Multiclass Queueing Networks with Blocking

William Millhiser, Assistant Professor, Baruch College/CUNY, 55 Lexington Ave, Box B9-240, New York, NY, 10010, William.Millhiser@baruch.cuny.edu

We review and apply dynamic programming "event operators" to the problem of showing the optimal admission policies when multiple classes of customers desire access to a tandem queueing network with blocking after service. Event-based DP allows new generality to these problems, both in terms of the scope of the networks analyzed and the number of sensitivity analysis questions that can be answered.

3 - Flexible Workforce in Tandem Lines

Eser Kirkizlar, Assistant Professor, Binghamton University, School of Management, P.O. Box 6000, Binghamton, NY, 13902, United States of America, eser@binghamton.edu, Sigrun Andradottir, Hayriye Ayhan

We consider a tandem line with an infinite supply of jobs in front of the first station and infinite room for storage after the last station. We study the dynamic allocation of flexible servers to stations with the objective of maximizing throughput. In particular, we concentrate on how the optimal assignment policies for infinite-buffered systems can be used in finite-buffered systems.

■ TC09

Pier 3 - H Conv. Lev.

Inventory Management

Contributed Session

Chair: Jennifer Ryan, Associate Professor, RPI, 110 8th St, CII, Suite 5015, Troy, NY, 12180, United States of America, ryanj6@rpi.edu

1 - Inventory Control with Uncertainty Supply and Fixed Setup Cost

Yuyue Song, Memorial University of Newfoundland, Faculty of Business Administration, St. John's, NF, Canada, ysong@mun.ca, Yunzeng Wang

We consider the basic single item single location inventory control problem with random yield. In the literature, the common assumption for this type of systems is zero fixed setup cost for any replenishment. In this work, we will investigate the impact of positive fixed setup cost on the optimal inventory control policy.

2 - On Optimal Joint Inventory-Pricing Control with a Positive Leadtime

Frank Chen, Associate Professor, The Chinese University of Hong Kong, Department of Systems Engineering & Eng. Mgmt, Shatin, N.T., Hong Kong, China, yhchen@se.cuhk.edu.hk, James Pang

This talk addresses the joint inventory-pricing control problem for a single-item inventory system with a positive order leadtime. Pricing and ordering decisions are made simultaneously in each period. The objective is to maximize the total expected discounted profit over a finite horizon. With a new approach we are able to partially characterize the structure of the optimal joint strategies. Heuristic methods will also be proposed.

3 - Sourcing and Joint Product Replenishment in Dynamic Lot Sizing

Ram Rachamadugu, Professor, University of Toledo, Bancroft Road, Toledo, OH, 43606, United States of America, rracham@utoledo.edu, Ying Liao

We consider two practical issues in determining order policies in ERP/MRP systems - multiple sources and joint products. Issues relating to cost measures, performance metrics, optimal ordering policies, and computational results for extensions of well known heuristics will be presented.

4 - The Value of Information Sharing In a Serial Supply Chain

S Kalpakam, Professor, Indian Institute of Technology Madras, Department of Mathematics, IIT Madras, Chennai, 600036, India, kalpakam@iitm.ac.in, C Rajendran, Aditi Apte

In this paper we examined the impact of information sharing at each stage in a multi-stage serial supply chain with non-stationary end demand and deterministic lead times under two scenarios- no information sharing and complete information sharing. It is observed that the benefits of information sharing increases with increase in the number of stages in the supply chain.

5 - A Bayesian Inventory Model Using Condition Monitoring Information

Jennifer Ryan, Associate Professor, RPI, 110 8th St, CII, Suite 5015, Troy, NY, 12180, United States of America, ryanj6@rpi.edu, Rong Li

We develop a framework for incorporating real-time condition monitoring information into inventory management decisions for spare parts for a manufacturer who periodically replenishes inventory for a machine part that is subject to deterioration under the assumption that the deterioration process can be captured via condition monitoring and modeled using a Wiener process. We demonstrate that the optimal policy is a dynamic base-stock policy.

■ TC10

Salon A - H Conv. Lev.

Assortment Planning

Sponsor: Manufacturing and Service Operations Management

Sponsored Session

Chair: Dorothee Honhon, Assistant Professor, University of Texas at Austin, McCombs School of Business, 1 University Station, Austin, TX, 78712, United States of America, dorothee.honhon@mcombs.utexas.edu

1 - Making the Most of Choice: Product Selection Under Heterogeneous Consumer Preferences

Dorothee Honhon, Assistant Professor, University of Texas at Austin, McCombs School of Business, 1 University Station, Austin, TX, 78712, United States of America, dorothee.honhon@mcombs.utexas.edu

We consider the problem of a firm choosing an assortment of products in a make-to-order setting when the customer population is heterogeneous. First, we consider a general consumer choice model and show that there is very little structure to the optimal assortment(s). Second, we consider ten special cases and obtain an efficient method to get the optimal assortment for eight of them. Finally, we suggest a number of heuristics and test their performance numerically.

2 - The Role of Component Commonality in Product Assortment Decisions

Gurhan Kok, Duke University, One Towerview Drive, Durham, NC, 27708, United States of America, gurhan.kok@duke.edu, Fernando Bernstein, Lei Xie

We consider a firm that produces multiple variants of a product. Each product is assembled from a common component and a dedicated component. We characterize the optimal assortment and derive the inventory levels for the common and dedicated components. We investigate the effect of commonality on product variety and compare its benefits under different demand characteristics.

3 - Dynamic Assortment Planning

Rene Caldenteu, New York University, Leonard N. Stern School of Business, 44 West Fourth Street, KMC Suite 8-77, New York, NY, 10012, rcaldent@stern.nyu.edu, Felipe Caro

We investigate optimal assortment planning strategies for a retailer with limited shelf space. The retailer can choose among basic and fashion items with low and high risk (and return) respectively. Our motivation is in the apparel industry, and we explicitly model the vogue as a stochastic process that the retailer tries to follow. The objective is to maximize the long-term value of the retail business by dynamically adjusting the menu of products on display.

TC11

Salon C - H Conv. Lev.

Diseases and Operations Research

Sponsor: Health Applications Section
Sponsored Session

Chair: Dionne Aleman, University of Toronto, Department of Mechanical and Industrial Engineering, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, aleman@mie.utoronto.ca

1 - A Non-homogenous Agent-Based Simulation Approach to Simulate Disease Spread in a Pandemic Outbreak

Dionne Aleman, University of Toronto, Department of Mechanical and Industrial Engineering, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, aleman@mie.utoronto.ca, Theodorus Wibisono, Brian Schwartz

The need for accurate disease spread data was highlighted during the Severe Acute Respiratory Syndrome (SARS) outbreak in 2002-2003. Previous studies of disease spread make overly simplistic assumptions and assume that all people are identical. We propose an agent-based simulation model that treats each member of the population as unique. The results of the model are output to geographic information system (GIS) software for visualization. A pilot study of the model is tested on Toronto, Canada.

2 - Predicting Individual Nosocomial Pneumonia Risk with Data Mining

Louis Duclos-Gosselin, Applied Mathematic (Data Mining) Consultant at Sinapse, 1170 Boul. Lebourgneuf, Bureau 320, Qu'Ébec (Qu'Ébec), QC, G2K2E3, Canada, louis.gosselin@hotmail.com, Rene Y. Darmon, Benny Rigaux-Bricmont

In this paper, the authors explain how managers can use a new data mining technique to solve their problems related to individual nosocomial pneumonia risk. The researchers use the genetic algorithm to provide the practitioner with an optimal choice of parameters for gini boosting type decision tree models. Thus, managers can choose better models. This technique has been tested with good results on health data (predicting the risk related to nosocomial pneumonia) during the INFORMS2008 challenge.

3 - Optimizing Patient-Specific Mammography Schedule Using POMDPs

Turgay Ayer, University of Wisconsin, 3233 Mechanical Engineering Building, 1513 University Ave., Madison, WI, 3706, United States of America, tayer@wisc.edu, Natasha Stout, Oguzhan Alagoz

When detected early through screening, the mortality risk for breast cancer, the most common cancer among the US women, decreases significantly. There is strong evidence that current screening policies are suboptimal. We develop a finite-horizon partially observable Markov decision processes (POMDP) model for mammography screening. We optimally solve this POMDP using real data. Unlike current clinical guidelines, our POMDP model provides a personalized screening strategy for women.

4 - Contact Tracing for Chronic Viral Diseases

Benjamin Armbruster, Northwestern University, 2145 Sheridan Road (Tech Bldg), Evanston, IL, United States of America, armbrusterb@gmail.com

We develop a compartmental model of a chronic infectious disease to evaluate the cost and effectiveness of different levels of screening and contact tracing. The optimal strategy is to get infected individuals into treatment at the maximal rate until one reaches the equilibrium. At the optimal mix the marginal cost-effectiveness of the two interventions is equal. We simplify the model to gain insight about the equilibrium. We apply our methods to a numerical example of Hepatitis B virus.

TC12

Pier 4 - H Conv. Lev.

GDN Keynote Session II

Sponsor: Group Decision and Negotiation Section: GDN 2009
Sponsored Session

Chair: Marc Kilgour, Professor, Wilfrid Laurier University, Department of Mathematics, 75 University Avenue West, Waterloo, ON, N2L 3C5, Canada, mkilgour@wlu.ca

1 - Connectedness Capitalism: An Approach to Crises and Sustainability I

Melvin F. Shakun, New York University, New York, NY, 10012, mshakun@stern.nyu.edu, Ephraim Sudit

As an approach to attenuating economic crises and enhancing sustainability in capitalism, the keynote speakers present connectedness capitalism. In doing so, they consider purpose connectedness, people connectedness, common ground, right action and other key ideas of connectedness problem solving, and apply these to problems in current capitalism.

2 - Connectedness Capitalism: An Approach to Crises and Sustainability II

Ephraim Sudit, Rutgers University, Graduate School of Business, Newark, NJ, United States of America, ephraimsudit@aol.com

A continuation of the previous presentation. Audience discussion will follow.

TC14

Pier 7 - H Conv. Lev.

Simulation

Sponsor: INFORMS Simulation Society
Sponsored Session

Chair: Saeed Zolfaghari, Ryerson University, 350 Victoria Street, Toronto, Canada, zolfaghari@ryerson.ca

1 - Simulation Study on the Effectiveness of Tiered Reward Programs

Saeed Zolfaghari, Ryerson University, 350 Victoria Street, Toronto, Canada, zolfaghari@ryerson.ca, Amir Gandomi Sereshki

Companies use different strategies to increase consumer loyalty. The most popular among them is the loyalty programs. Many industries have implemented this strategy in different ways. However, it is not clear whether loyalty programs are profitable in all cases. In this study, we use simulation to analyse the impact of tiered point system on the customer decision to buy. Our simulation model includes a firm who adopts the reward program and a competing firm who lowers the price instead.

2 - The "Virtual" Restaurant Simulation Will Lead to Profitable Restaurant Operations

Bernard McEvoy, Professor, Ryerson University, 350 Victoria Street, Toronto, on, m5b 2k3, Canada, bmcevoy@ryerson.ca, David Martin

The Simulation for Profitable Restaurant Operations replicates the operation of a restaurant over up to six years. It networks teams in a scenario city and focuses on the competitiveness of restaurants, emphasizing profitability. A year may take from 25 minutes to 2 hours and teams operate in competition with the computer and the other teams. The simulation is written in microsoft visual studio based on an excel blueprint and provides the illusion of operating a "real" restaurant in "real" time.

3 - Human Factors in Simulation to Secure Performance, Safety and Quality in Design

Patrick Neumann, Ryerson University, Toronto, ON, Canada, pneumann@ryerson.ca, Jorge Perez

This paper reports on the views of participants to a series of workshops on the use of Human Factors (HF) simulation tools to secure performance, quality, and safety in production system design. HF in flow simulation, predetermined motion-time analysis, and digital human modelling will be presented and discussed in terms of utility to design teams. Utility was seen to be influenced by designers' knowledge, priorities, and skill as well as the design of the simulation tool itself.

4 - Design of Simulation Experiments for Metamodel Construction

Corinne MacDonald, Assistant Professor, Dalhousie University, P.O. Box 1000, 5269 Morris St., Halifax, NS, B3J 2X4, Canada, cmacdon6@Dal.CA, Eldon Gunn

Metamodeling produces discrete functions which approximate the expected value functions of the simulation output. We discuss experiments conducted to determine the best approach for generating the training dataset used to construct such metamodels, using neural networks. Simulation models generate noisy data, so we explore whether better neural network metamodels can be built by obtaining better estimates of output through multiple replications of the simulation, or, through equal simulation effort, using a larger number of input combinations and a single observation of the output.

TC15

Pier 8 - H Conv. Lev.

Statistical Applications

Contributed Session

Chair: Petar Cisar, Telekom Srbija, Prvomajska 2-4, Subotica, Serbia-Montenegro, sanjam@vts.su.ac.yu

1 - Comparing Prediction Power and Model Dependencies of A-, D-, E-, and G- Optimal Designs

Navid Omidbakhsh, University of Waterloo, 6618 Ganymede Road, Mississauga, ON, L5N 4S8, Canada, nomidbak@gmail.uwaterloo.ca, Park A. Reilly, Thomas A. Duever, Abdunnaser Younes, Ali Elkamel

A numerical comparison of the predictive power of different types of alphabetic optimal designs under various linear multiple regression model assumptions is investigated here. Our numerical results indicate that A-, D-, and E- optimal designs are more robust to the model selection than G-optimality and result in greater predictive capability, especially when the choice of the model is incorrect.

2 - Expressing Confidentiality Problems with Statistical Data as Optimization Problems

Paul Massell, U.S. Census Bureau, 4600 Silver Hill Road, SRD Room 5K114A, Washington, DC, 20233-0001, United States of America, paul.b.massell@census.gov

When statistical agencies release statistical data products (e.g. tables) they usually are concerned about protecting the values of the contributed data in some sense. Sometimes these problems can be expressed as optimization problems. In those cases, operations research methods may be applicable. We discuss some examples.

3 - Modeling Enrollment Decisions for Wingate University Applicants

Rebecca Dalrymple, Student, Wingate University, 122 Sleepy Hollow Rd., Pittsburgh, PA, 15216, United States of America, beccadal@comcast.net, Barry Cuffe, Thomas Brown

Wingate University applicants are classified according to the size of their respective merit awards that are based upon an applicant's unweighted high school GPA and composite SAT Math and Verbal score. For each of seven groups of applicants, a set of variables collected during the application process is tested for significant impact on the likelihood of enrollment. Models are developed that will allow Admissions staff to project a recruiting class from an applicant pool.

4 - Parameter Estimation for a CBM Model Using Residuals of Vector Autoregressive Observations

Michael Kim, University of Toronto, 5 King's College Road, Toronto, Canada, kimmi@mie.utoronto.ca, Viliam Makis

We consider an estimation problem for a CBM model. System deterioration is described by an unobservable continuous-time Markov chain. Vector data is sampled at discrete times, which is stochastically related to the system state. We propose an estimation procedure based on the method of least squares and the EM algorithm which closely approximates the maximum likelihood estimates in the case of a limited number of data histories. Numerical examples are developed using real spectrometric oil data.

5 - The Implementation of Optimized EWMA Charts in Intrusion Detection Systems

Petar Cisar, Telekom Srbija, Prvomajska 2-4, Subotica, Serbia-Montenegro, sanjam@vts.su.ac.yu, Zita Boshnjak, Sasa Bosnjak, Sanja Maravic Cisar

Intrusion detection is used to monitor and capture intrusions into computer and network systems which attempt to compromise their security. Because of the ability of exponentially weighted moving average control charts to monitor the rate of occurrences of network events based on their intensity, this technique is specially suitable for implementation in intrusion detection systems. The performance of this method can be made more effective by proper optimization of used parameters.

TC16

Pier 9 - Convention Level

Emerging Methods for Technology Innovation

Sponsor: Military Applications
Sponsored Session

Chair: Ann-Marie Lamb, PhD Student, Department of Engineering & Technology Management, Portland State University, PO Box 751, Portland, OR, 97207-0751, United States of America, ajlamb@pdx.edu

1 - TFDEA: A New Technology Forecasting Method for NPDP

Timothy Anderson, Associate Professor, Department of Engineering & Technology Management, Portland State University, P.O. Box 751, Portland, OR, 97207-0751, United States of America, tima@etm.pdx.edu, Ann-Marie Lamb

Recent Technology Forecasting Data Envelopment Analysis (TFDEA) studies continue to provide intriguing ways in which strategists can plan for (or even drive) technology frontiers. A TFDEA research example will be shown; as well as plans for extending the method further for roadmapping and solving industry/military business problems.

2 - Technology Roadmapping to Promote Innovation Planning

Irene Petrick, Professor of Practice & Director, Enterprise Informatics & Integration Center, Penn State University, 102T IST Building, University Park, PA, 16802, United States of America, ipetrick@ist.psu.edu

In the US Military, it is imperative to rationalize the activities of multiple organizations. Strategic roadmapping helps organizations execute over the horizon - jointly considering solution needs and technology opportunities. This presentation will introduce the ways that roadmapping is being used to integrate complex systems, to refresh existing platforms, and to create a diverse and compelling portfolio of projects that will support near, mid and long term needs of the warfighter.

3 - A Center for Innovation in Logistics Systems (CILS)

Greg Parlier, PhD, COL USA Ret, SAIC, 255 Avian Lane, Madison, AL, 35758, United States of America, greg.h.parlier@saic.com

Fully engaged in the Global War on Terror, the US Army is also committed to a comprehensive and ambitious "Transformation" endeavor. An analytical architecture is presented which consists of several "catalysts for innovation" and four complementary modeling approaches collectively referred to as Dynamic Strategic Logistics Planning. An organizational construct is presented to sustain continual improvement for Army supply chain management - a "Center for Innovation in Logistics Systems".

TC18

Dockside 1 - H Lower Lev.

Sustainable Development

Contributed Session

Chair: Cory Searcy, Assistant Professor, Ryerson University, 350 Victoria Street, Toronto, ON, M5B2K3, Canada, cory.searcy@ryerson.ca

1 - Optimization Model for Ontario Regional Energy Supply Systems

Cheng Wang, Environment Canada, 96 Pallister Private, Ottawa, ON, K2G0E8, Canada, cheng.urot@gmail.com, Brad Bass

We developed Ontario Regional Energy Analysis Model (REAM) to analyze, optimize and predict the energy supply from 2005 to 2030, by controlling environment impact, satisfying different conditions and minimizing total costs. Using this model, we can quantify the system-wide effects of changes in energy demand, technology availability, and energy and environmental policies. Some future work on exergy measurement, residential sector and thermal energy will also be introduced.

2 - Creating Eco-Efficient Supply Chains: Vertical Integration Analysis Study

Kingsley Reeves, University of South Florida, 4202 E. Fowler Avenue, ENB118, Tampa, FL, 33620, United States of America, oozcan@mail.usf.edu, Ozan Ozcan

Firms, which have eco-efficient processes, tend to control their suppliers and these suppliers' production systems. In this study, we will examine the relationship between having vertically integrated organization structure and pursuing sustainability-focused organizational strategy. We will measure the vertical integration level of the companies which are pursuing sustainability-focused organization strategies.

3 - An Assessment of Sustainability Indices

Cory Searcy, Assistant Professor, Ryerson University, 350 Victoria Street, Toronto, ON, M5B2K3, Canada, cory.searcy@ryerson.ca

This paper presents a critical review of composite indices for measuring progress towards sustainability. Indices are reviewed on the basis of their underlying theoretical framework, variables included in the index, method used for normalization of the data, weighting, aggregation methodology, and other factors.

TC19

Dockside 2 - H Lower Lev.

Industrial Applications

Contributed Session

Chair: Choy Leong Yee, Senior Lecturer, Universiti Putra Malaysia, Faculty of Economics and Management, UPM, Serdang, 43300, Malaysia, yee@econ.upm.edu.my

1 - Thermal Comfort in the Textile Industry:

A Sample in Mondai, Brazil

Jonas Pedro Fabris, Engeneer, Fabris, Rua Josue de Carvalho Cunha 395, Aracaju, SE, 49035490, Brazil, jpfabris@hotmail.com, Maria Emilia Camargo, Suzana Russo

The climatic change that happened in the last years in the earth has caused concern to the researchers. Studies of Humphreys and Nicol showed the non need to uniform the internal temperatures of the atmospheres and showing the importance of the acclimatization in relation to external temperature. The objective of this serach is to follow a methodology of prediction of the workers' thermal sensations in a textile industry, when they are carrying out their activities in their daily routine.

2 - Optimizing Cash Management for Large Scale Bank Operations

Jeff Kennington, Professor, Southern Methodist University, Lyle School of Engineering, P.O. Box 750123, Dallas, TX, 75275-0123, United States of America, jlk@lyle.smu.edu, Mark Frost

The Fed provides currency services to banks. These services include sorting currency and repackaging bills for redistribution. To reduce the cost of operations, many banks would make Fed deposits and withdrawals during a given week. In 2007, the Fed introduced cross-shipping fees to encourage banks to recycle currency. Fiserv initiated a project to optimize cash inventories. We present the IP model developed. It has been implemented using CPLEX and has been successfully applied.

3 - Toolism: Generating Mode 2 Knowledge in Research

Choy Leong Yee, Senior Lecturer, Universiti Putra Malaysia, Faculty of Economics and Management, UPM, Serdang, 43300, Malaysia, yee@econ.upm.edu.my

A new research methodology, toolism, is proposed for generating Mode 2 knowledge to improve industrial relevance of business research. An industrial case is presented to demonstrate the development of research protocols of toolism and how it could be used for theory development. The philosophical foundation of toolism is also discussed.

TC20

Dockside 3 - H Lower Lev.

Pricing and Revenue Management

Contributed Session

Chair: Samuel Huang, University of Texas at Austin, IROM, 1 University Station B6500, Austin, TX, 78712, United States of America, SamuelHuang@mail.utexas.edu

1 - Decision Support Revenue Management System for Customer Groups in Hotels

Jose Quadix, University of Seville, Industrial Engineering School, Camino de los Descubrimientos, s/n, Seville, 41092, Spain, quadix@esi.us.es, Pablo Cortes, Jesus Muñuzuri, Luis Onieva

The paper describes a new decision support system that sets the revenue maximization criteria for a hotel. A general case considering independent guest and customer groups is addressed. The system also incorporates deterministic and stochastic mathematical programming models. A simulation engine is used to set a comparison between different heuristics of room inventory control: the results include performance indexes such as occupancy, efficiency and yield. The system is tested with real data.

2 - Tools for Precise Markdown Optimization

Anna Engelson, JDA Software, 9715 Key West Ave, Rockville, MD, 20852, United States of America, Anna.Engelson@jda.com, Helen Xu, Stephen Haas

Retailers increasingly rely on clearance markdowns to make way for new inventory, maximize revenues and increase customer traffic. Taking a markdown too late or too soon can be costly in both the short and the long term. JDA Markdown Optimization helps retailers develop and implement optimal markdown strategies at any level of their product and location hierarchy. Our presentation will focus on tools that aid in the precise formulation of the business problem and review of optimization results.

3 - Analysis and Forecasting of Product Bundling in Retail Sales

Stephen Haas, JDA Software, 9715 Key West Ave, Rockville, MD, 20852, United States of America, Stephen.Haas@jda.com, Anna Engelson, Helen Xu

Forecasting the impact of changing a product's price is a key requirement for demand planning and price optimization. Customer response modeling using own- and cross-price elasticities addresses this requirement. When the retailer's actions involve incentives which bundle several products, such as "buy A and get B at a discount" or "spend at M dollars and get gift G", modeling becomes much more challenging. We address the data issues and modeling challenges of product bundling.

4 - Optimal Dynamic Pricing and Inventory Policies for Fashion Retailers

Samuel Huang, University of Texas at Austin, IROM, 1 University Station B6500, Austin, TX, 78712, United States of America, SamuelHuang@mail.utexas.edu, Genaro Gutierrez, Edward Anderson

We study the problem of dynamic pricing and inventory policies of a fashion retailer who faces the challenge of having short product life cycle but long production lead time. We show how the retailer can make coordinated pricing and inventory decisions when facing uncertain demand. Closed-form solutions are found for special demand distributions and an approximation is provided for the general demand distribution.

TC21

Dockside 4 - H Lower Lev.

Multicriteria Decision Making I

Contributed Session

Chair: Belaid Aouni, Professor, Laurentian University, School of Commerce and Administration, Faculty of Management, Laurentian University, Sudbury, On, P3E 2C6, Canada, baouni@laurentian.ca

1 - Multi-Objective Decision Making as a Tool to Resolve Problems and Conflicts in Engineering Ethics

Hakan Ozaktas, Assistant Professor, Atilim University Industrial Engineering Department, Kizilcasar Mahallesi, Incek, Ankara, 06836, Turkey, hozaktas@atilim.edu.tr

Ethical problems confronting engineers can be difficult to resolve. Apart from straightforward cases with easy solutions, contradicting obligations can result with complications. In some cases certain moral obligations override the others. However, for some other cases compromise solutions should be sought. Aspects of decision making such as weighted objectives, priorities, dominating solutions can be very useful for resolving cases in Engineering Ethics.

2 - Random Outranking Digraphs

Raymond Bisdorff, Professor, University of Luxembourg, 6, Rue Richard Coudenhove-Kalergi, Luxembourg, L-1359, Luxembourg, raymond.bisdorff@uni.lu

In order to advance the empirical knowledge concerning outranking digraphs instances, we shall present here a model of random outranking digraphs generated from random cost benefit performance tableaux. Comparison with standard random digraphs illustrates the specific characteristics of genuine outranking digraphs. Our results are meaningful for discussing algorithmic complexity issues when exploiting outranking relations for selecting, ranking and sorting decision actions.

3 - Manager's Preferences Modeling within Multi-Criteria Flow Shop Problem: A Metaheuristic Approach

Belaid Aouni, Professor, Laurentian University, School of Commerce and Administration, Faculty of Management, Laurentian University, Sudbury, On, P3E 2C6, Canada, baouni@laurentian.ca, Mohamed Anis Allouche, Abdelwaheb Rebai

The multi-criteria scheduling problem requires the aggregation of conflicting objectives. To obtain the best scheduling sequence, the manager needs to make some compromise among the different objectives. The Compromise Programming model and the concept of satisfaction functions will be utilized to integrate explicitly the manager's preferences. A metaheuristic based on tabou search algorithm will be developed to solve the proposed model for large size multi-criteria scheduling flow shop problem.

Tuesday, 3:30pm - 5:00pm

■ TD01

Frontenac - CC Lev. 1

Trucking and Container Models

Sponsor: Transportation Science & Logistics

Sponsored Session

Chair: Roy Kwon, University of Toronto, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, rkwon@mie.utoronto.ca

1 - Improved Load Plan Design Through Integer Programming Based Local Search

Mike Hewitt, PhD, Georgia Tech ISYE, 765 Ferst Drive NW, Atlanta, United States of America, mhewitt@isye.gatech.edu, Martin Savelsbergh, Alan Erera

We consider an extension of the traditional load planning problem faced by LTL carriers, namely the generation of day-of-week differentiated load plans, which are necessary to remain competitive in the current market. We investigate heuristics that utilize exact optimization and present results indicating significant savings for a national carrier.

2 - JIT Logistics and the Defect Bullwhip Effect

Young Ro, Assistant Professor of Management, University of Michigan Dearborn, yro@umd.umich.edu

Little work has been done on modeling the propagation pattern of quality defects in the extent supply chain literature. We quantitatively model a defect bullwhip effect in supply chains and consider its causes and effects. This defect bullwhip effect can be addressed logistically by the reduction of time intervals between product shipments via trucking, rail, and other logistical means.

3 - Stochastic Winner Determination for Truckload Procurement

Roy Kwon, University of Toronto, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, rkwon@mie.utoronto.ca, Allan Ma, Chi-Guhn Lee

We propose a stochastic integer programming model for the winner determination problem (WDP) in combinatorial auctions to hedge the shipper's risk under shipment uncertainty. The shipper allows bids on combinations of lanes and solves the WDP to determine which carriers are to be awarded lanes. In addition, many other important comprehensive business side constraints are included in the model. We demonstrate the value of the stochastic solution.

4 - Parallel Versus Perpendicular Yard Layouts for Seaport Container Terminals

Matthew Petering, Assistant Professor, University of Wisconsin-Milwaukee, P.O. Box 784, Milwaukee, WI, 53201, United States of America, mattpete@uwm.edu

We perform the most comprehensive analysis to date comparing storage yard layouts for seaport container terminals in which the storage blocks are parallel to the berthed vessels versus perpendicular to the vessels. Simulation experiments consider dozens of layouts and scenarios that are designed to reproduce the microscopic, stochastic, real-time environment at a multiple-berth facility.

■ TD02

Queens Quay I - CC Lev. 1

Game Theoretical Learning

Cluster: Optimization/Metaheuristic

Invited Session

Chair: Carlos Paternina, Chairman, Universidad del Norte, Km 5 Via Puerto Colombia, Barranquilla, Colombia, cpaterni@uninorte.edu.co

1 - Rational Swarms: A Bio-inspired Method for Global Optimization

Alfredo Garcia, Associate Professor, Systems & Information Engineering, University of Virginia, Charlottesville, VA, 22904, United States of America, agarcia@virginia.edu, Chenyang Li

We present a novel bio-inspired methodology for parallelizing meta-heuristics for global optimization. In the scheme proposed, independent computational agents implement local search strategies using "scent marks" associated with their search activity in order to avoid duplication. Convergence analysis in the case when the scheme is combined with greedy local search shows how n agents are able to identify n different locally optimal solutions. We present our preliminary computational tests.

2 - Game-theoretical Learning Algorithms Applied to Retailer's Replenishment

Carlos Paternina, Chairman, Universidad del Norte, Km 5 Via Puerto Colombia, Barranquilla, Colombia, cpaterni@uninorte.edu.co

Game-theoretical learning algorithms can be used for developing models to characterize conditions in supply chain. The focus of this paper is on using a learning algorithm to analyze the performance of a two-echelon supply chain, highlighting one-echelon retailers' processes for making decisions about replenishments. The methodology creates equilibrium policies to improve the systems' performance. Results are competitive to other learning methods.

3 - Game Theoretic Approaches to Large-Scale Coordination

Enrique Campos-Nanez, Assistant Professor, The George Washington University, 1776 G Street NW, Suite 161, Washington, DC, 20052, United States of America, ecamposn@gwu.edu

We look at large-scale coordination problems and introduce of a game-theoretic algorithm that converges to an equilibrium strategy. We illustrate our approach using examples from wireless sensor network, in particular energy-efficient coverage. We compare our approach to other methodologies, such as reinforcement learning.

■ TD03

Queens Quay II - CC Lev. 1

Conic Optimization - Algorithms and Applications

Cluster: Large Scale Optimization and Applications

Invited Session

Chair: Miguel Anjos, Professor, University of Waterloo, Department of Management Sciences, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, manjos@uwaterloo.ca

1 - Solving Quadratic Unconstrained Binary Optimization Problems Using Polynomial Programming

Bissan Ghaddar, University of Waterloo, Dept of Management Sciences, 200 University Avenue West, Waterloo, ON, N2L3G1, Canada, bghaddar@uwaterloo.ca, Juan Vera, Miguel Anjos

We present several formulations for the Max-Cut problem based on polynomial programming and a solution scheme to solve them. Comparisons based on bounds and computational time will be presented.

2 - A Robust Optimization Approach to the Self-scheduling Problem Using Semidefinite Programming

Jason Landry, University of Waterloo, Department of Management Sciences, 200 University Avenue NW, Waterloo, ON, N2L 3G1, Canada, jlandry@uwaterloo.ca, Miguel Anjos

In deregulated electricity markets, generating companies submit bids which are derived from a self-schedule. We present a semidefinite programming relaxation for the self-scheduling problem and discuss a class of triangular inequalities used to improve the quality of the schedule. The model provides the profit-maximizing generation quantities of a single generator over a multi-period horizon and accounts for uncertainty in prices using robust optimization. Computational results will be reported.

3 - A Hybrid Interior-Point Cutting-Plane Method for Conic Relaxations of Discrete Optimization Problems

Alexander Engau, Postdoctoral Researcher, University of Waterloo, Department of Management Sciences, 200 University Avenue West, Waterloo, ON, N2G1Y3, Canada, aengau@uwaterloo.ca, Anthony Vannelli, Miguel Anjos

We describe a new technique for using an interior-point method for the solution of linear and semidefinite programming relaxations of discrete optimization problems. The approach combines an infeasible interior-point algorithm with a cutting-plane scheme that adds and removes cuts at intermediate iterates based on indicators of the cut violation and warm starts of the new variable slacks. Computational results are reported for instances of the maximum-cut problem and single-row facility layout.

■ TD04

Bay Room - CC Lev. 1

NSERC Discovery Grant Program Workshop

Cluster: NSERC
Invited Session

Chair: Saeed Zolfaghari, Ryerson University, 350 Victoria Street, Toronto, Canada, zolfaghari@ryerson.ca

1 - NSERC Workshop: How to Prepare a Discovery Grant Application

Michel Gendreau, CIRRELT/University of Montreal, C.P. 6128, succ. Centre-ville, Montreal, QC, H3C 3J7, Canada, michel.gendreau@cirrelt.ca

Dr. Michel Gendreau, a member of the Industrial Engineering Grant Selection Committee, will make a presentation to familiarize researchers with the peer review process and the way in which selection committees function. Advice will be given on how to prepare a Discovery Grant application. While the workshop will be most helpful to new faculty members and those preparing applications this fall, all researchers are welcome to attend. The workshop will cover topics such as Discovery Grants, Selection Groups, criteria for evaluation and ratings, application forms and Research Tools and Instruments Grants. A question period will follow the presentation.

■ TD05

Yonge - CC Lev. 1

Pricing, Marketing and Operations

Contributed Session

Chair: Chunming Shi, Assistant Professor, Wilfrid Laurier University, School of Business and Economics, 75 University Avenue West, Waterloo, ON, N2L6C1, Canada, cshi@wlu.ca

1 - Assortment Selection and Pricing for Configurable Products Under Demand Uncertainty

Betzabe Rodriguez, PhD Student, University of Michigan, Department Industrial and Operations Eng., 1205 Beal Ave., Ann Arbor, MI, 48109-2117, United States of America, betzabe@umich.edu, Goker Aydin

Consider a firm selling a configurable product (e.g., a computer), which is a combination of components (e.g., computer tower and monitor). Each component's assortment allows the consumer to choose from several variants (e.g., processing speed and resolution). We explore the firm's assortment and pricing decisions in the presence of inventory considerations. We show the importance of a variant's surplus, which combines many demand- and supply-side parameters in one package.

2 - Cooperative Advertising in a Dynamic Durable Goods Supply Chain

Anshuman Chutani, PhD Student, Operations Management, University of Texas at Dallas, School of Management, SM30, 800 W. Campbell Road, Richardson, TX, 75080, United States of America, axc059000@utdallas.edu, Suresh P. Sethi

This paper analyzes dynamic advertising and pricing policies in a durable goods supply chain with co-operative advertising. We consider a Stackelberg game where manufacturer announces the wholesale price and its share in the retailer's advertising expenditure. The retailer responds with its optimal advertising and pricing policies. The sales dynamics in this paper follow the model suggested by Sethi, Prasad and He (2008). We analyze two different demand specifications, linear and iso-elastic.

3 - Price and Service Rate Competition via Dynamic Demand Allocation

Li Li, Department of Logistics and Maritime Studies, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, Hong Kong, Hong Kong - ROC, 07900649r@polyu.edu.hk, Liu Liming

We consider a service system in which two servers compete for market share. Customers, upon arrival, choose servers based on the queue lengths and prices at the two servers; and can switch servers while waiting in queue. We first derive the joint queue-length probabilities under given prices and service rates. We then analyze both price and service rate decisions by a two-stage game. With explicit equilibrium solutions, we explore the complete equilibrium scenario and generate further insights.

4 - Pricing and the Target Oriented Newsvendor

Chunming Shi, Assistant Professor, Wilfrid Laurier University, School of Business and Economics, 75 University Avenue West, Waterloo, ON, N2L6C1, Canada, cshi@wlu.ca, Xuan Zhao, Shilei Yang

This paper is the first to study pricing and target oriented decision making together in the newsvendor model. To be more specific, this paper presents the first study on a newsvendor who decides on order quantity and selling price to achieve targets on both profit and revenue simultaneously. Our results will provide managerial insights for individuals and firms engaging in target oriented decision making, which is a common business practice.

■ TD06

Wellington - CC Lev. 1

Warehouse Operations

Contributed Session

Chair: Gerhard Wascher, Professor of Management Science, Otto-von-Guericke-Universität, Postfach 4120, Magdeburg, 39016, Germany, gerhard.waescher@ovgu.de

1 - Entertainment Product Packaging for Distribution to Maximize Revenue

Bruce Wang, Professor, Texas A&M University, 3136 TAMU, Texas A&M University, College Station, TX, 77843, United States of America, bwang@tamu.edu, Yihua Li, Kai Yin

We study a product packaging and distribution problem in which we decide what products should be in each package and which package to distribute to each store for revenue maximization. A column generation method is proposed to solve this large scale optimization problem. Two heuristic methods are tested for the nonlinear sub-problem. The algorithm developed shows promising with partial data from a chain store which has several thousand retail locations.

2 - Developing an Efficient Warehousing Operation System: An Expert System Approach

Andrew Yao, CSU, Northridge, 18111 Nordhoff St., Northridge, CA, 91330, United States of America, cyao@csun.edu

Distribution for miscellaneous case goods stored and retrieved in warehousing offer an excellent opportunity to study some rules for efficient warehousing operation. A study of a large Dis. Center having 100000+ storage locations for merchandise was conducted. The warehouse contained both storage for general merchandise and segregated areas for items requiring special handling. The study included documenting & developing decision rules depending on the product handled & palletization.

3 - Picking and Placing Items in a Chaotic Warehouse Using RFID

Francisco Ballestin, Universidad Publica De Navarra, Campus De Arrosadia, Pamplona, Spain, francisco.ballestin@unavarra.es, Angeles Perez, Vicente Valls, Maria Quintanilla, Pilar Lino

We consider a multi-parallel-aisle warehouse where different types of forklifts are used to store or retrieve products. Radio Frequency Identification (RFID) technology (active tags throughout the warehouse and readers placed in forklifts) indicates, in real time, the position of each forklift. After heuristically determining the location of the most adequate pallet, we select a forklift and a route with the objective of minimizing the total material handling cost.

4 - Metaheuristics for the Order Batching in Manual Order Pickings Systems

Gerhard Wascher, Professor of Management Science, Otto-von-Guericke-Universität, Postfach 4120, Magdeburg, 39016, Germany, gerhard.waescher@ovgu.de

Order picking deals with the retrieval of articles from their warehouse storage location in order to satisfy a demand specified by customer orders. The order batching problem consists of combining these - indivisible - orders into picking orders, given that the size of each picking order is limited and that the total length of all picking tours is to be minimized. For this problem, two types of meta-heuristic approaches (Iterated Local Search, Rank-Based Ant Systems) are proposed and evaluated.

■ TD07

Metro Grand West - CC Lev. 2

Tutorial: Numerical Inversion of Transforms Occurring in Queueing and Other Stochastic Processes

Cluster: Tutorials
Invited Session

Chair: Mohan Chaudhry, Professor, Royal Military College of Canada, P.O. Box 17000, Station, Kingston, ON, K7K 7B4, Canada, chaudhry-ml@rmc.ca

1 - Numerical Inversion of Transforms Occurring in Queueing and Other Stochastic Processes

Mohan Chaudhry, Professor, Royal Military College of Canada, P.O. Box 17000, Station, Kingston, ON, K7K 7B4, Canada, chaudhry-ml@rmc.ca

We consider the numerical inversion of three classes of GFs: classes of probability generating functions (PGFs) that are given in rational and non-rational forms, and a class of GFs that are not PGFs. Particular emphasis is on those PGFs that are not explicitly given but contain a number of unknowns. We show that the desired sequence can be obtained to any given accuracy, so long as enough numerical precision is used.

■ TD08

Pier 2 - H Conv. Lev.

Joint Session APS/Queueing: Stochastic Processes and Queueing

Sponsor: Applied Probability Society & Queueing
Sponsored Session

Chair: Myron Hlynka, University of Windsor, Department of Math. & Stat., Windsor, ON, N9B 3P4, Canada, hlynka@uwindsor.ca

1 - Approximations for Low Latency Queueing Systems

John Shortle, George Mason University, SEOR Department, MS4A6, 4400 University Drive, Fairfax, VA, 22030, United States of America, jshortle@gmu.edu, Martin Fischer

Low latency queueing is an Internet Protocol router discipline that combines two disciplines: priority queueing and class-based weighted fair queueing. It gives high priority to some traffic classes while also ensuring a fair balance of bandwidth use among less performance-sensitive traffic. This talk discusses model approximations to analyze the performance of this discipline. We discuss theoretical foundations for the approximations and present numerical results on accuracy.

2 - A Disaster Queue with Markovian Arrivals and Impatient Customers

Srinivas Chakravarthy, Professor, Kettering University, Industrial and Manufacturing Engineering, Flint, MI, 48504, United States of America, schakrav@kettering.edu

We consider a single server queueing system with a Markovian arrival process. The system is subject to disastrous failures removing all customers in the system. Arrivals during system downtime are stored in a buffer of finite capacity, and can leave due to impatience. There is no limit on the number when the system is up. The model is analyzed in steady state by exploiting the special structure. A number of useful performance measures along with some illustrative examples are reported.

3 - A Renewal Problem with a Barrier

Percy Brill, University of Windsor, 401 Sunset Avenue, Windsor, ON, N9B 3P4, Canada, brill@uwindsor.ca

We derive analytical and asymptotic formulas for the expected number of renewals required to exceed a barrier. The method of analysis can be used to determine the expected number of demands during an ordering cycle of an inventory system, and related quantities in queues and other stochastic models.

4 - Queueing Control and Laplace Transforms

Myron Hlynka, University of Windsor, Department of Math. & Stat., Windsor, ON, N9B 3P4, Canada, hlynka@uwindsor.ca

We consider a queueing control problem of Lin and Ross(2003) and generalize some of their results. We use the probabilistic interpretation of Laplace transforms in the analysis.

■ TD09

Pier 3 - H Conv. Lev.

Shipping and Supply Chains

Contributed Session

Chair: Anthony Pang, Assistant Professor, The Hong Kong Polytechnic University, M613 Li Ka Shing Tower, LMS Department, The Hong Kong Polytechnic University, Hung Hom, HKG, Hong Kong - ROC, lgtapang@inet.polyu.edu.hk

1 - Inventory Policies to Cope with Border Crossing Uncertainty

Sapna Isotupa, Associate Professor, Wilfrid Laurier University, School of Business and Economics, Wilfrid, Waterloo, ON, N2L3C5, Canada, sisotupa@wlu.ca, Michael Haughton

Although safety inventory as a way to hedge against inbound uncertainty is a well established policy in the literature, its role in the specific context of trans-border supply chains remains largely untreated. The issues of interest surround delay uncertainty that arises when border inspection times are unpredictable. We consider alternative means of using inventory to cope with delay uncertainty and model how they impact the cost of trans-border supply chain operations.

2 - Profit Maximization in the LNG Value Chain

Kristin Tolstad Uggen, Research Scientist, SINTEF, S. P Andersens veg 5, Trondheim, 7465, Norway, ktu@sintef.no, Marte Fodstad, Frode Romo, Arnt-Gunnar Lium, Geert Stremersch

We will present a rich MIP model for the LNG value chain. The value chain spans from production trains to consumers including spot markets for natural gas. The focus will be on modeling as much of the real-world constraints as possible and to obtain reasonable computation times. We propose a time-decomposition heuristic to solve this problem. The model includes production, transportation by vessels, consumption and different contract types. Results from real-life cases will be presented.

3 - Ship Routing Problem with Time Clash Avoidance Constraints

Anthony Pang, Assistant Professor, The Hong Kong Polytechnic University, M613 Li Ka Shing Tower, LMS Department, The Hong Kong Polytechnic University, Hung Hom, HKG, Hong Kong - ROC, lgtapang@inet.polyu.edu.hk, Chung-Lun Li, Zhou Xu

We consider a ship routing problem with time clash avoidance constraint in which the loading and unloading time of cargoes at customers's locations is significant. This problem is motivated by the operations of feeder vessels and cargo terminals, where the company wishes to coordinate the routing and the berthing time of the vessels. We develop heuristic algorithm for the model using column generation techniques. The effectiveness of the heuristic is tested via computational experiments.

■ TD10

Salon A - H Conv. Lev.

Vehicle Routing

Contributed Session

Chair: Jose Brandao, Professor, University of Minho, Largo do Paco, Braga, 4704 - 553, Portugal, sbrandao@eeg.uminho.pt

1 - A General Model and Solution Approaches for Dynamic Vehicle Re-routing

Chase Murray, PhD Candidate, University at Buffalo (SUNY), 308A Bell Hall, Dept of Industrial & Systems Engineering, Buffalo, NY, 14260, United States of America, cmurray3@buffalo.edu, Mark Karwan

We consider the problem of re-routing vehicles in response to changes in the operating environment (eg., identification of new tasks or loss of resources). A general modeling framework for this problem is presented, along with the proposal and comparison of a variety of solution approaches. Although motivated by airborne military surveillance operations, our model and solution approaches are applicable to a wide array of re-routing problems, such as disaster relief operations.

2 - A Heuristic Algorithm for the Multi-depot Vehicle Routing Problem with Outsider Carrier Selection

Ching-Wu Chu Chu, Professor, National Taiwan Ocean University, 2 Pei-Ning Road, Keelung, 202, Taiwan - ROC, cwchu@mail.ntou.edu.tw

The purpose of this paper is developing a heuristic algorithm not only to route a limited number of trucks from different depots to customers with simultaneously pickup and delivery, but also to make a selection of outsider carriers by minimizing a total cost function. Both the mathematical model and the heuristic algorithm are developed. A few test problems were examined with encouraging results.

3 - The Packing and Vehicle Routing for Circular Items

Ciro Alberto Amaya, Assistant Professor, University of Los Andes, KR 1E # 19A-40, ML 425, Bogot, DC, UniAndes, Colombia, ca.amaya@uniandes.edu.co, Leonardo Martinez

This paper presents a dynamic vehicle routing problem with time windows, multiple trips and loading constraints for circular objects. This problem arises in the delivery of a kind of food in which each product has a circular form with different sizes. After introducing the problem, a mathematical formulation and solution methods are presented.

4 - A Tabu Search Algorithm for the Open Vehicle Routing Problem with Time Windows

Jose Brandao, Professor, University of Minho, Largo do Paco, Braga, 4704 - 553, Portugal, sbrandao@eeg.uminho.pt

The problem studied here, the open vehicle routing problem with time windows (OVRPTW), is different from the vehicle routing problem with time windows in that the vehicles do not return to the distribution depot after delivering the goods to the customers. We have solved the OVRPTW using a tabu search algorithm with embedded local search heuristics, which take advantage of the specific properties of the OVRP. The performance of the algorithm is tested using a large set of benchmark problems.

TD11

Salon C - H Conv. Lev.

Scheduling and Planning in Healthcare

Sponsor: Health Applications Section

Sponsored Session

Chair: Michael Magazine, University of Cincinnati, College of Business, Cincinnati, OH, 45221-0130, United States of America, mike.magazine@uc.edu

1 - The Effect of Service Interruptions and Server/Client Unpunctuality in Outpatient Scheduling

Kenneth J Klassen, Brock University, Department of Finance, Operations & IS, 500 Glenridge Avenue, St Catharines, ON, L2S 3A1, KJklassen@brocku.ca, Reena Yoogalingam

There has been limited research and empirical data on the effect of interruptions and server/client unpunctuality on appointment system design. Interviews and time studies were conducted in outpatient clinics. A simulation optimization approach is used to develop and improve appointment scheduling practice in the presence of interruptions and server/client unpunctuality.

2 - Scheduling Surgical Pathologists into Sub-specialties

Greg Dobson, Associate Professor, University of Rochester, Simon Graduate School of Business, Rochester, NY, 14627, United States of America, greg.dobson@simon.rochester.edu, Edieal Pinker

The pathologists in the Department of Surgical Pathology were working as generalists handling cases from any of the sub-specialties. To improve quality and productivity the pathologists wanted to schedule their work in just a few sub-specialties. We developed a scheduling model so the department could see if current demand matched the pathologists desired areas for sub-specialization and could understand the impact that sub-specialization would have on the pathologists research time.

3 - Drum-Buffer-Rope for an Outpatient Cancer Facility

Somayah Sadat, University of Toronto, Centre for Research in Healthcare Engineering, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, sadat@mie.utoronto.ca, Michael Carter

To improve outpatient experience, we proposed the adoption of a scheduling policy based on theory of constraint's drum-buffer-rope (DBR) technique. Using a discrete event simulation model populated with historical data, we compared DBR against "high constraint utilization" and "low wait time" scenarios. DBR proved to be an effective mechanism in balancing the tradeoff between the two performance measures of instances of delayed treatment and average patient wait time.

4 - Long Term Capacity Planning for a Residential Care Facility

Martin Puterman, University of British Columbia, 2053 Main Mall, Vancouver, BC, V6T 1Z2, Canada, Martin.Puterman@sauder.ubc.ca, Marc Levine

As board members of a residential care facility in Vancouver, we faced the challenge of planning capacity expansion to meet the needs of constituents through 2021. To this end, we developed forecasting and queuing models to investigate the sensitivity of capacity to model inputs. Finding that capacity projections were most sensitive to length of stay (LOS), we used censored data methods to forecast LOS. Results were presented to the board and implementation planning has begun.

TD12

Pier 4 - H Conv. Lev.

Panel Discussion: Finding Common Ground Through Negotiation Dialogue

Sponsor: Group Decision and Negotiation Section: GDN 2009

Sponsored Session

Chair: Bilyana Martinovski, Dr, Goteborg University, Box 200, Goteborg, Sweden, bilyana.martinovski@gmail.com

Co-chair: Melvin F. Shakun, New York University, New York, NY, 10012, mshakun@stern.nyu.edu

1 - Panel Discussion: Finding Common Ground Through Negotiation Dialogue

Moderator: Bilyana Martinovski, Dr, Goteborg University, Box 200, Goteborg, Sweden, bilyana.martinovski@gmail.com,
Panelists: Jens Allwood, Amer Obeidi, Melvin F. Shakun

The panel discusses finding common ground through negotiation dialogue to promote negotiation agreement. In this regard, the session will consider a number of topics including cognition, emotion, culture, linguistics, theory of mind, connectedness, creative problem restructuring, etc. Panelists will make opening remarks followed by discussion with audience participation.

TD13

Pier 5 - H Conv. Lev.

Preferences in Negotiations

Sponsor: Group Decision and Negotiation Section: GDN 2009

Sponsored Session

Chair: Rudolf Vetschera, Professor, University of Vienna, Department of Business Administration, Bruenner Strasse 72, Vienna, 1230, Austria, rudolf.vetschera@univie.ac.at

1 - On the "Dance of the Packages" with Incomplete Information

Paula Sarabando, INESC Coimbra / ESTV, Rua Antero de Quental, 199, Coimbra, 3000-033, Portugal, psarabando@mat.estv.ipv.pt, Rudolf Vetschera, Luis Dias

In Bilateral Negotiation Analysis, the literature often considers the case with complete information. In this context it is not difficult to calculate the Pareto frontier. However, these approaches are not applied in practice when the parties do not have complete information. We propose to obtain information regarding the preferences of negotiators during the negotiation process, in order to be able to propose alternatives close to the Pareto frontier.

2 - Automated Negotiation - Simulation Results

Michael Filzmoser, Mag., Department of Labor Science and Organization Vienna University of Technology, Theresianumgasse 27, Vienna, A-1040, Austria, filzmoser@imw.tuwien.ac.at

We present simulation results of automated negotiation (AN) with various AN-systems and using problems derived from negotiation experiments as input. The AN-systems are combinations of software agents, that follow different offer generation and concession algorithms, and different protocols, that govern the agents' interaction. We analyze the performance of AN-systems, on various outcome dimensions, for the different configurations and compare it to the results humans reached in the experiments.

3 - When Group Members Frame Decisions Differently:**Escalation of Commitment Based on Prospect Theory**

Ali Fehmi Unal, Research Assistant, Uludag University, Economics & Administrative Sciences Fac., Department of Business Administration, Bursa, 16059, Turkey, afunal@uludag.edu.tr, Gul G. Emel

Escalation of commitment, which refers to the tendency to support a failing course of action, is a well-known decision bias that occurs both at group and individual level. Adopting a Prospect Theory approach, our research investigates escalating commitment in small groups with members framing decisions differently. The experimental design manipulated three factors: decision frame, decision-making process and group composition. Relying on the results, this study extends previous findings.

■ TD14

Pier 7 - H Conv. Lev.

Input Model Uncertainty in Stochastic Simulations

Sponsor: INFORMS Simulation Society

Sponsored Session

Chair: Bahar Biller, Assistant Professor, Carnegie Mellon University Tepper School of Business, 5000 Forbes Ave., Pittsburgh, PA, 15213, United States of America, billerb@andrew.cmu.edu

1 - A Bayesian Model for Sampling NORTA-J Parameters

Canan Gunes, PhD Student, Carnegie Mellon University, 5000 Forbes Ave., Pittsburgh, PA, 15213, United States of America, cgunes@andrew.cmu.edu, Bahar Biller

We consider large-scale stochastic simulations with correlated inputs that have Normal-To-Anything distribution with marginals from the Johnson translation system (NORTA-J). Using marginal-copula representation and copula-vine specification, we develop a Bayesian model for the fast sampling of the NORTA-J parameters. Incorporating this model into the formulation of the BMA approach improves both the fill-rate estimator accuracy and the confidence interval coverage in inventory simulations.

2 - An Interval-based Discrete Event Simulation Mechanism

Yan Wang, University of Central Florida, 4000 Central Florida Blvd., Orlando, FL, 32816, United States of America, wangyan@mail.ucf.edu, Ola Batarseh

Traditionally the maximum likelihood estimator is used to estimate the input parameters of simulation models, which does not capture the uncertainty associated with models and parameters. In this presentation, we discuss a new reliable and efficient simulation mechanism to help improve simulation robustness based on intervals. The new mechanism incorporates variabilities and uncertainties in systems based on imprecise probabilities, where the distribution parameters are intervals.

3 - Simulation Model of Biomass Energy Supply Chain

Mahmood Ebadian, University of British Columbia, Department of Wood Science, 2424, Main Mall, Vancouver BC V6T1Z4, Canada, mebadian@interchange.ubc.ca, Shahab Sokhansanj, Taraneh Sowlati

A typical biomass energy supply chain incorporates different business units including suppliers, pre-processing units, storage facilities, and bioenergy plants. To make this supply chain economically viable, a logistics system which can provide adequate supply of low cost biomass with desirable characteristics for bioenergy plants should be constructed. In this regard, a simulation model of the biomass energy supply chain is developed and different logistics system scenarios are analyzed.

4 - Bayesian Sequential Sampling Policies and Sufficient Conditions for Convergence to a Global Optimum

Peter Frazier, Princeton University, ORFE Department, Sherrerd Hall, Princeton, NJ, 08544, United States of America, pfrazier@Princeton.EDU, Warren Powell

We consider sequential sampling policies in a general Bayesian framework that includes simulation optimization. We give sufficient conditions for the best implementation decision discovered to converge to a global optimum, a condition that has also been called asymptotic optimality. We then apply these sufficient conditions to show asymptotic optimality of a large class of knowledge-gradient policies, and to three other ranking and selection policies: OCBA for linear loss, LL(S), and LLI.

■ TD16

Pier 9 - H Conv. Lev.

Tutorial: Simulation-based Optimization for Military Applications

Sponsor: Military Applications

Sponsored Session

Chair: Ray Hill, Air Force Institute of Technology, 2950 Hobson Way, WPAFB, OH, 45433, United States of America, rhill@afit.edu

1 - Simulation-based Optimization for Military Applications

Raymond Hill, Professor, Air Force Inst. of Tech., 7861 Chambersburg Road, Huber Heights, OH, 45424, United States of America, raymond.hill@afit.edu

Simulation has become a common and popular analytical method. Unfortunately, simulations are descriptive while decision making often want prescriptive models. The coupling of optimization search and simulation is now referred to as simulation-based optimization. This tutorial introduces simulation-based optimization, covers the basic concepts, and provides overviews of the various optimization components used. Recent examples are provided to demonstrate the usefulness of the method.

■ TD18

Dockside 1 - H Lower Lev.

Project Management: Past and Present

Contributed Session

Chair: Edieal Pinker, Associate Professor, University of Rochester, Simon Graduate School of Business, Rochester NY 14627, United States of America, ed.pinker@simon.rochester.edu

1 - On the Origins of the Program Evaluation Review Technique and the 'Critical Path' Method

Chris Smith, Adjunct Professor, University of Maryland College Park, Department of Civil & Env. Engineering, Glenn L. Martin Hall, College Park, MD, 20742, United States of America, Itccsmith@yahoo.com, Greg Baecher

This research questions commonly accepted historical accounts which provide that two network scheduling methodologies; the Program Evaluation Review Technique (PERT) and the Critical Path Method (CPM), were prepared independently and represent separate theoretical contributions to operations research. Described are PERT and CPM's reliance upon concepts and terminology provided within the earlier works of Warren McCullough, Walter Pitts, John von Neumann, George Dantzig and others.

2 - Information System Projects Coherent Risk Measures

Zoran Ciric, Assistant Professor, Faculty of Economics Subotica, Segedinski Put 9-11, Subotica, 24000, Serbia-Montenegro, zotisz@tippnet.rs, Otilija Sedlak

The measure of risk must be applied to many different situations, for example the numbers involved are used to compare and control portfolio investments, project of information system development. Coherent risk measures can build in the operational practice, when there are multiple financial instruments to hedge against risk.

3 - Managing a Secret Project

Edieal Pinker, Associate Professor, University of Rochester, Simon Graduate School of Business, Rochester, NY, 14627, United States of America, ed.pinker@simon.rochester.edu, Vera Tilson, Joseph Szmerekovsky

A primary objective in traditional project management is to schedule the project in order to complete it as quickly as possible. When a goal is to complete a project secretly it may be optimal to sequence tasks differently. We illustrate with an example of nuclear weapons development.

■ TD19

Dockside 2 - H Lower Lev.

Service Industry Applications

Contributed Session

Chair: Juneseuk Shin, Professor, Sungkyunkwan University, Systems Management Engineering, Chunchung dong, Changan-gu, Kyunggi-do, Suwon, Korea, Republic of, jsshin@skku.edu

1 - A Typology Framework of Loyalty Rewards Programs

Yuheng Cao, PhD Candidate, Spott School of Business, Carleton University, 1125 Colonel By Drive, Ottawa, ON, K1S5B6, Canada, ycao2@connect.carleton.ca, Aaron Luntala Nsakanda

Loyalty rewards programs (LRPs), initially developed as marketing programs to enhance customer retention, now have become an important part of customer-focused business strategy. However, academic research in this field is far behind its practical application. In this paper, we propose a comprehensive framework for LRP classification, which provides a foundation for further study on LRP design and planning issues.

2 - Measuring Retail Service Quality in the Context of Thailand

Nanda Lal Banik, Head, Department of Management in Business Administration, St. Theresa Inti College, 1 Moo 6, Rangsit-Nakornnayok Road, Klong 14, Ongkarak, Thailand, anupam.das@gmail.com, Anupam Das, Vinod Kumar

The modern and vibrant retail landscape of Thailand has evolved from a traditional and backward industry. Due to change in consumer behavior, modern trade stores have gained very high popularity and a high retail market share. To examine the service areas for improvement, this study evaluates applicability of the Retail Service Quality Scale (RSQS) in Thailand. Confirmatory factor analyses indicate that the RSQS has the diagnostics ability to identify areas requiring strategic focus.

3 - Optimum Scheduling and Routing of Mass Transit in Emergency Evacuation

Hossam Abdelgawad, University of Toronto, 30 Charles St West,
Apt 924, Toronto, Canada, h.abdel.gawad@utoronto.ca, Baher
Abdulhai

In this research we investigate how public transit systems can be utilized to evacuate transit-dependent travelers in no-notice evacuation events. This paper presents how the capacity of mass transit can be optimally harnessed to alleviate congestion pressure during the evacuation of congested urban areas.

4 - Productivity Improvement and Innovation in Services: FMEA Approach

Juneseuk Shin, Professor, Sungkyunkwan University, Systems
Management Engineering, Chungchung dong, Changan-gu,
Kyunggi-do, Suwon, Korea, Republic of, jsshin@skku.edu

This paper provides a systematic way to improve service productivity, and further drive innovation. With the clear presentation of the service process by service blueprint, a modified FMEA (failure mode and effect analysis) highlights key sub-processes, and further identify opportunities of potential productivity improvement and innovation. Conjoint analysis is used to measure the effect of our approach. A healthcare service is presented to illustrate the empirical application of our method.

■ TD21

Dockside 4 - H Lower Lev.

Multicriteria Decision Making II

Contributed Session

Chair: Michelle Munro, MBA Candidate, Laurentian University, School of Commerce, Laurentian University, Sudbury, ON, P3E 2C6, Canada, mm@unitz.ca

1 - AHP and MACBETH Methods: A Comparative Study

Mischel Belderrain, Instituto Tecnológico de Aeronautica, Praca
Marechal Eduardo Gomes, 50, Sao Jose dos Campos, Brazil,
carmen@ita.br, Marcelo Zawadzki, Leila Nascimento

MCDM help decision makers in complex problems with conflicting multiple criteria. Among various methods of MCDM, the AHP and MACBETH, both belonging to the American School, have the model of aggregation with multicriteria single criterion of synthesis. However, those methods differ in the structure and form of evaluation. This paper aims to conduct a study of comparison between methods AHP and MACBETH applied to select post-graduate students in the Aeronautical Technologic Institute (ITA).

2 - Identification and Characterization of a Cost-effective Combination of Arctic Surveillance Systems

Noosha Tayebi, M.Sc. Candidate, University of Ottawa - Systems
Science, Ottawa ON, K2A 3S1, noosha.tayebi@gmail.com

The objective of this study is to identify and characterize combinations of sensors and systems that will provide cost-effective options for Arctic maritime surveillance at a strategic choke-point for the Northern Watch project. It will report on the success of the Multi-Criteria Decision Making (MCDM) methods applied to this problem. Using MCDM, the results will be a set of options for combinations of sensors, ranked on the basis of the measures of effectiveness and performance of each sensor.

3 - Multiobjective Optimization via Parametric Programming: Algorithms and Financial Applications

Oleksandr Romanko, PhD Candidate, McMaster University,
1280 Main St. West, Hamilton, ON, L8S4K1, Canada,
romanko@mcmaster.ca, Tamas Terlaky, Alireza Ghaffari-Hadigheh

We highlight the relationships between multiobjective optimization and parametric programming that is used to solve such problems. The solution of a multiobjective problem is the set of Pareto efficient points that can be obtained by weighting the objectives or using hierarchical method. We can formulate those models as parametric programming problems and compute their efficient solution set numerically. Our methodology is illustrated by financial applications from portfolio and risk management.

5 - Group Decision-Makers' Preferences Modelling in Goal Programming Model

Michelle Munro, MBA Candidate, Laurentian University, School
of Commerce, Laurentian University, Sudbury, On, P3E 2C6,
Canada, mm@unitz.ca, Belaid Aouni

The Goal Programming (GP) model is one of the first models that have been developed to deal with managerial decision-making problems where several incommensurable and conflicting objectives are involved. The GP variants integrate differently the Decision-Maker's (DM) preferences. This model has also been applied to group decision-making situations. The aim of this paper is to propose a new typology based on the DM's preferences articulation through the GP model.

Wednesday, 8:00am - 9:30am**■ WA02**

Queens Quay I - CC Lev. 1

Applications of Metaheuristics in Vehicle Routing

Cluster: Optimization/Metaheuristic

Invited Session

Chair: Michel Gendreau, CIRRELT/University of Montreal, C.P. 6128, succ. Centre-ville, Montreal, QC, H3C 3J7, Canada, michel.gendreau@cirrelt.ca

1 - SR-GCWS-CS: A Simulation-Based Methodology to Assist Decision-Makers in Real Vehicle Routing Problem

Francisco Arcelus, Professor Emeritus, University of New Brunswick, P O Box 4400, Faculty of Business Administration, Fredericton E3B 5A3, Canada, arcelus@unb.ca, Javier Faulin, Barry Barrios, Scott Grasman, Angel A. Juan

We present a simulation-based algorithm that not only provides a competitive solution for the Capacitated VRP, but is also able to efficiently generate a full database of alternative good solutions. In order to provide high-quality solutions, our algorithm combines a CVRP classical heuristic, (Clarke and Wright), with Monte Carlo simulation. The resulting algorithm is tested against some well known benchmarks and the results obtained are promising in real-life scenarios.

2 - Management of Material Flows Within a Hospital:**A Two Levels Interconnected Vehicle Routing Problem**

Yannick Kergosien, PhD Student, Université François Rabelais de Tours, 64 av. Jean Portalis, Tours, 37200, France, yannick.kergosien@univ-tours.fr, Christophe Lente, Jean-Charles Billaut

The Hospital Centre of Tours (France) is reorganizing the logistic services between its hospital units. We focus on the vehicles routing problem (VRP) between these units and on the definition of a warehousemen team inside a particularly large hospital. The design of this team (composition, planning, ...) is strongly related to the routes of vehicles between hospital units. The whole problem can be seen as a two-level pickup and delivery problem with time windows, where two VRP interact.

3 - A Tabu Search with Vocabulary Building Approach for the Vehicle Routing Problem with Split Demands

Rafael Aleman, Wright University, rafael.enrique.aleman@gmail.com, Raymond Hill

The Split Delivery Vehicle Routing Problem (SDVRP) is a relaxation of the Vehicle Routing Problem (VRP) where single customers can be visited by multiple vehicles. This work presents a tabu search that uses an initial set of solutions and their attributes to create new solutions and evolve the set. Computational results are provided on existing benchmark problems and demonstrate the effectiveness of the presented approach. New best solutions are found in some of the tested problems.

4 - Large Neighborhood Search for the Double Traveling Salesman Problem with Multiple Stacks

Pascal Van Hentenryck, Professor, Brown University, 115 Waterman Street, Providence, RI, 02912, United States of America, pvh@cs.brown.edu, Russell Bent

We consider a complex real-life short-haul/long haul pickup and delivery application, modeled as a double TSP with multiple stacks whose pickups and deliveries take place in reserve (LIFO) order. The goal is to minimize the total travel time. We present a large neighborhood search algorithm which improves the best-known results on 65% of the available instances and is always within 2% of the best-known solutions.

■ WA03

Queens Quay II - CC Lev. 1

Heuristics for Large-Scale Combinatorial Optimization

Cluster: Large Scale Optimization and Applications

Invited Session

Chair: Roy Kwon, University of Toronto, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, rkwon@mie.utoronto.ca

1 - Large-Scale Investment Programming for the Current Economy

Stephen Stoyan, University of Toronto, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, stoyan@mie.utoronto.ca, Roy Kwon

We present a large-scale combinatorial optimization problem posed from a stock-bond portfolio selection model. The solution strategy involves a model-specific decomposition and iterative penalty heuristic that takes advantage of problem structure and various constraints used in the formulation. Due to model

complexity and market uncertainties, the result is a combination of a mixed-integer Stochastic and Goal Program. We provide computational results and solutions.

2 - Branch & Price Approach to Constraint-Directed Search

Mike Hewitt, PhD, Georgia Tech ISYE, 765 Ferst Drive NW, Atlanta, United States of America, mhewitt@isye.gatech.edu

We present a variant of constraint-directed search which integrates column generation into the process of creating and selecting restrictions of the original MIP. We see that the use of column generation leads both to tighter dual bounds on the original problem and a natural scheme for generating local search neighborhoods of incumbent solutions.

3 - Combinatorial Auction-based Heuristics for Large-scale Job Shops

Roy Kwon, University of Toronto, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, rkwon@mie.utoronto.ca, J. Christopher Beck, Judy Geng

We present a combinatorial auction decomposition of the weighted tardiness version of the job shop scheduling problem. Computational results over a wide suite of well known test instances indicate that the heuristic is effective compared to the ATC dispatch rule and CPLEX MIP over limited time durations, especially for instances with 30 to 50 jobs and up to 20 machines.

■ WA04

Bay Room - CC Lev. 1

Design Optimization

Cluster: Design Optimization under Uncertainty

Invited Session

Chair: Masoud Mahootchi, mmahootchi@gmail.com

1 - Distribution Company Power Procurement Under Uncertainty of DG Operation

Yousef El-Mabrou Saad, Kumaraswamy Ponnambalam, R. A. El-Shatshat, M. M. A. Salama

This paper presents a methodology for addressing non-utility owned distributed power generating units (NUG) for a distribution company working in a restructured power system. Although, the lack of ability to schedule the NUG units has been noticed, researchers have only applied traditional models. Previously, either a perfect prediction or a full control has been assumed to implement the operating level of NUG units in short-term operational plans. Both strategies void the proper representation of NUG units characteristics and lead to impractical conclusions. This paper is an outcome of research toward proper consideration of the NUG units in the evaluation of the operational activities of a distribution company or a retailer. The expectations of the NUG units random behavior are represented and analyzed in several ways. Investigations concerning the ability of deterministic algorithms to solve such situation are reported. Some recommendations for the utilities that have NUG units connected to their networks are suggested and conclusions about the applications of deterministic approaches to consider the NUG units operation are elicited from the studies conducted in this paper.

2 - Refining and Petrochemical Industry Integration: Optimization Under Uncertainty

Khalid Alqahtani, University of Waterloo, 431 Beaver Creek Rd, Waterloo, On, N2V 2J8, Canada, qahtanky@yahoo.com, Saudi Aramco, Ali Elkamel

We propose a model for the design of an integration refinery and petrochemical systems under uncertainty. The model was formulated as a two-stage stochastic mixed-integer problem. Uncertainties considered in this study were in terms of imported crude oil price, refinery product price, petrochemical product price, refinery market demand, and petrochemical lower level product demand.

3 - Warehousing Management Problem Using Nonlinear Models

Masoud Mahootchi, mmahootchi@gmail.com, Kumaraswamy Ponnambalam

The purpose in the management of warehouses is to achieve an optimal order policy, the quantity of products to be ordered or bought from a supplier or other storage spaces, such that it minimizes the total cost. The problem becomes more complex if such a policy is to be extracted in a stochastic situation where, for example, the demand or lead time period are random variable with unknown distributions. Many optimization or simulation techniques are utilized to tackle this type of storage management application; however, most of them relied on simplifications of stochastic variables (e.g., using only the mean of stochastic variables to cover the stochasticity). Moreover, most of these techniques cannot cope well with a multi-echelon warehouse problem, a system including multiple warehouses and retailers having bidirectional connections. In our proposed methodology, a nonlinear optimization model for reservoir management is utilized for modeling the warehouse problems. The operating policy in this method is a function of storage at the beginning of each period and the demand distributions can be non-Gaussian. Moreover, risk can be imbedded into the model formulation.

■ WA05

Yonge - CC Lev. 1

Marketing I

Contributed Session

Chair: Hsiu-Lan Wu, Fortune Institute of Technology, No.1-10, Nwongchang Rd., Lyouciyou Villa, Kaohsiung County, Taiwan - ROC, sharen6133@gmail.com

1 - An Integrated Framework for the Design of Optimal Banners

Lan Zhao, Professor, SUNY/ College at Old Westbury, Math Department, Old Westbury, United States of America, zhaol@oldwestbury.edu, Anna Nagurney, Lili Hai

In this paper, we present an integrated framework for the optimization of Internet banner advertising. The framework consists of three parts: statistical predictive modeling on web data, optimization through mixed integer programming, and the use of information repository technology. The integrated, quantitative approach allows for the automatic improvement of banner advertising strategies and nonintrusive personalized advertising at a variety of banner display levels.

2 - Personality and Message Appeal Effectiveness

Ching-I Teng, Associate Professor, Chang Gung University, Taiwan, 259, Wenhua 1st Rd, Gueishan Shiang, Taoyuan, 333, Taiwan - ROC, chingit@mail.cgu.edu.tw

Personality characterizes individual customer and enable mass customization. Research is required to know how personality affects message appeal effectiveness. However, the existing literature is sparse on this issue, indicating the need to have propositions for examinations. This study thus constructed propositions basing on theories of personality and message appeals. The propositions identified in this study can be examined in online shopping and online auctions.

3 - Research on the Pricing Strategy of Digital Music in the Long Tail Market

Hyunsik Park, Graduate School of Culture Technology, KAIST, Yuseonggu Guseongdong KAIST, Graduate School of Culture Technology, Daegeon, 305-701, Korea, Republic of, hsp@kaist.ac.kr, Wonjoon Kim

This research aims to analyze price elasticity of digital music and to develop new marketing strategy for the long tail market. We designed an online music experiment and analyzed the relationship between the price and the popularity of digital music. Then, we estimated both demand and cross price elasticity to suggest an optimal price strategy. Empirical evidence shows that unpopular songs have significantly low price elasticity when the price of popular songs increases.

4 - Effects of Utilitarian and Hedonic Value of Social Network Services on Satisfaction and Loyalty

Hsiu-Lan Wu, Fortune Institute of Technology, No.1-10, Nwongchang Rd., Lyouciyou Villa, Kaohsiung County, Taiwan - ROC, sharen6133@gmail.com

Social network services(SNS) have simplified social interactions between users. Some SNS attract many users in the early stages, but suffer from turn over later. SNS of practice aims to retain its existing users and attract potential users by providing superior customer value which leads to greater satisfaction and loyalty. This empirical study applied SEM to explain the impacts of hedonic and utilitarian value on satisfaction and loyalty by providing an integrated model within SNS context.

■ WA07

Metro Grand West - CC Lev. 2

Tutorial: Introduction to Optimization in Radiotherapy

Cluster: Tutorials

Invited Session

Chair: Dionne Aleman, University of Toronto, Department of Mechanical and Industrial Engineering, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, aleman@mie.utoronto.ca

1 - Introduction to Radiotherapy Optimization

Dionne Aleman, University of Toronto, Department of Mechanical and Industrial Engineering, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, aleman@mie.utoronto.ca

In this hands-on tutorial, the basics of radiation therapy treatment techniques will be discussed. Specifically, optimization methods for external beam radiotherapy will be presented. There are numerous competing theories on the appropriateness of various approaches of radiotherapy optimization in the literature, and the merits and difficulties of each approach will be examined. Participants will gain an understanding of a broad range ideologies regarding radiotherapy optimization techniques.

■ WA08

Pier 2 - H Conv. Lev.

Queueing in Communication

Cluster: Queues

Invited Session

Chair: Winfried Grassmann, Professor Emeritus, University of Saskatchewan, 110 Science Place, Saskatoon, SK, S7N 5C9, Canada, grassman@cs.usask.ca

1 - Differential Allocation of Bilingual Agents in Call Centres

David Stanford, Professor, University of Western Ontario, Department of Statistical & Actuarial Sciences, 1151 Richmond St. N, London, ON, N6A 5B7, Canada, stanford@stats.uwo.ca, Guy Latouche, Xiaohui Feng

Bilingual Call Centres with customers of two language types and three agent pools (bilingual, and unilingual servers for each language type) are considered. An efficient way to allocate bilingual servers is based on the difference between the queue lengths. A matrixgeometric model is presented for such a call centre's stationary distribution. The state space is constructed in a manner that facilitates the computation of the state probabilities. Numerical examples will be presented.

2 - On Accommodating Customer Flexibility in Service Systems

Douglas Down, Associate Professor, McMaster University, Department of Computing and Software, 1280 Main Street West, Hamilton, ON, L8S 4L7, Canada, downd@mcmaster.ca, Yu-Tong He

We consider parallel queueing models in which a proportion of arriving customers are flexible, i.e. they are willing to receive service at any one of some subset of the parallel servers. For the case of two parallel servers, we show that as the servers become fully utilized, the maximum improvement in mean waiting times is achieved for arbitrarily small levels of flexibility. The potential implications of these results for two motivating examples are discussed.

3 - Finite and Infinite Buffer Queues

Winfried Grassmann, Professor Emeritus, University of Saskatchewan, 110 Science Place, Saskatoon, SK, S7N 5C9, Canada, grassman@cs.usask.ca, Javad Tavakoli

One would expect that as the buffer size of a queueing system goes to infinity, the expected number of visits to the states with moderate queue lengths will be the same whether there is a buffer or not. This is true if the traffic intensity is below 1, but not if it is above 1. The implications of this for numerical stability and matrix analytic methods will be explored.

■ WA09

Pier 3 - H Conv. Lev.

Intelligent Traffic Management

Contributed Session

Chair: Amir Hosein Ghods, Graduate Student, University of Waterloo, Department of Civil Engineering, 200 University Ave West, Waterloo, ON, N2L 3G1, Canada, ahghods@uwaterloo.ca

1 - A Process Model For Traffic Incident Management

Mahmoud Osman Abou-Beih, PhD Student, University of Toronto, 35 Saint George Street, Toronto, ON, M5S1A4, Canada, mahmoud.abou.beih@utoronto.ca, Baher Abdulhai, Tamer El-Diraby

This paper models traffic incident response process using process re-engineering techniques to achieve overall processes integration. It outlines key processes, participating actors and their roles. The output process model will point out the bottlenecks in the processes work flow, allowing the restructuring of current processes and the removal of idle ones. In addition, this model can be used to plan new capabilities, benchmark performance, alleviating the overall performance.

2 - Traffic Congestion Minimization by Rapid Heuristic Solution

Shabbir Choudhuri, Assistant Professor, Grand Valley State University, 225 Kennedy Hall, 301 W. Fulton St, Grand Rapids, MI, 49504-6495, United States of America, choudhus@gvsu.edu, Md. Ashfaq-Ur Rahman, Charles Standridge

Unplanned distress conditions on a major highway causes congestion on the surrounding network. Dynamic models, based on traffic sensors feedback, are developed and heuristic algorithms are deployed for rapid solution of alternate routes to bring the traffic back to the highway at the downstream of the disturbance zone. Simulated cases for single and multiple incidences on the same network are solved based on the historical traffic data to demonstrate dynamic routing.

3 - Investigation of Accident Rates on Scottish and English Roads

Mojtaba Moharrer, Napier University, 18 Moat Place, Edinburgh, EH14 1PP, United Kingdom, mo_moharrer@yahoo.com, Wafaa Saleh

This research analysis the effect of Variable Message Signs on accident rates on thirteen Scottish and fourteen English roads in a seven year period of time. As results show, changes in accident rates differ from one site to another and surprisingly in some sites there are increases in accident rates after installation of VMS.

4 - An Efficient Optimization Approach to Real-time Coordinated Freeway Traffic Control

Amir Hosein Ghods, Graduate Student, University of Waterloo, Department of Civil Engineering, 200 University Ave West, Waterloo, ON, N2L 3G1, Canada, ahghods@uwaterloo.ca, Liping Fu

This paper tackles the problem of real-time control of traffic in a freeway network. One popular approach to this problem is model predictive control. This approach is only viable for small sized problems due to its computational complexity. A game theoretic approach is proposed to solve this problem. The efficiency of the proposed method is tested in a stretch of freeway network. The speed and accuracy of the proposed algorithm is examined and compared with the conventional optimization method.

WA11

Salon C - H Conv. Lev.

Health Care Operations

Sponsor: Health Applications Section

Sponsored Session

Chair: Kumar Rajaram, Professor, UCLA Anderson School, 110 Westwood Plaza, Los Angeles, CA, 90085, United States of America, krajaran@anderson.ucla.edu

1 - Planning for HIV Screening and Treatment at the Veterans Administration (VA)

Kumar Rajaram, Professor, UCLA Anderson School, 110 Westwood Plaza, Los Angeles, CA, 90085, United States of America, krajaran@anderson.ucla.edu, Sarang Deo, Uday Karmarkar

Routine HIV screening has been shown to be cost-effective in a variety of settings and is now recommended by the CDC. However, these studies typically ignore resource constraints at an organizational level that can impede implementation. We formulate a dynamic optimization model combining a disease progression model with a patient flow model under constrained resources. We apply this model to a VA facility and demonstrate the impact of resource constraints on the optimal screening policy.

2 - A Conceptual Framework for the Role of Collaboration in Hospital Value Chains

Kannan Sethuraman, Associate Professor, Melbourne Business School, 200 Leicester Street, Carlton, Australia, k.sethuraman@mbs.edu, Ramaswami Sridharan, Devanath Tirupati

The proposed framework provides a systematic characterization of collaboration process in hospital value chains and its impact on performance. Collaboration is conceptualized to comprise of four attributes: a collaborative performance system, information sharing, synchronization and incentive alignment. We offer propositions "emanating from the posited relationships in the framework" that form the bases for future research and theory building.

3 - Does Practice Make Perfect: An Empirical Analysis of Learning-by-doing in Cardiac Surgery

Subramaniam Ramanarayanan, Assistant Professor, UCLA Anderson School, 110 Westwood Plaza, Los Angeles, CA, 90095, United States of America, subbu@anderson.ucla.edu

This paper examines a mechanism through which workers acquire and maintain competence: task experience. I analyze whether cardiac surgeons who have performed more procedures in the recent past experience an improvement in performance. Using surgeon exits from hospitals as exogenous identifiers, I find evidence indicating a strong learning-by-doing effect. This effect is weaker for high volume surgeons, and is partly specific to firm and task settings.

4 - Real-Time Drug-surveillance

Margret Bjarnadottir, Stanford University, Graduate School of Business, 518 Memorial Way L238, Stanford, CA, 94305, margret@stanford.edu

After the withdrawal of Vioxx from the pharmaceutical market in 2004, post-FDA-approval drug safety and surveillance has come under serious scrutiny. We build a mathematical framework for a real-time drug surveillance system that uses claims-data and run an experiment across the full spectrum of possible side effects. Our work shows that a successful drug-surveillance system can be built,

based on claims data analysis and could become one of FDA's standard tools for post-marketing surveillance.

WA12

Pier 4 - H Conv. Lev.

Negotiation Support and Applications

Sponsor: Group Decision and Negotiation Section: GDN 2009 Sponsored Session

Chair: Danielle Morais, Assistant Professor, Federal University of Pernambuco, Cx. Postal 7462, Recife, PE, 50630-970, Brazil, dcmorais@ufpe.br

1 - A Workflow System to Support Negotiations

Melise Paula, Professor, UNIFAL/MG, Computer Science Department, Federal University of Alfenas, MG, Alfenas, MG, Brazil, melisepaula@gmail.com, Danilo Lima, Sergio Rodrigues, Luis Camargo, Jano Souza

Negotiators often attempt to resolve their conflict through the use of intrinsic activities and their own skills. This work presents a system workflow approach, titled W-Neg. We suggest a set of workflow models to tackle issues that may be conflicting during the negotiation table. As any decision-making process, negotiations arise from some well known steps. Therefore, the management of activities realized from these steps can be considered an alternative to improve negotiator's preparation.

2 - An Approach to Visualize the Negotiation Preparation Step

Sergio Rodrigues, Project Manager, COPPE / Federal University of Rio de Janeiro, Av. Visconde do Rio Branco, 661 / 601, Niteroi, 24020005, Brazil, sergio@cos.ufrj.br, Jano Souza

Experienced negotiators claim that the preparation step is crucial to lead successful negotiations. Negotiation Systems that support the preparation step have been increasingly used as tools for the management of negotiation knowledge. One of the major issues faced by negotiators is to know when the preparation is well done. This work presents a system that manages the negotiation knowledge and uses mining reports to quantify externalized information and, then, to generate performance graphs.

3 - A Group Decision Support System to Aid Activities of Hydrographic Basin Committees

Vanessa Silva, Federal University of Pernambuco, Cx. Postal 7462, Recife, PE, 50630-970, Brazil, vanessa_eletrica@yahoo.com.br, Danielle Morais, Adiel Teixeira Almeida

In Brazil, the hydrographic basin committees are the centre of decision for water resource management. Their members must decide about complex issues, requesting the consideration of multiple aspects. It is advantageous to have a decision support system that guarantees transparency, rapidness and a structured analysis of the problem. This paper presents a group decision support system based on multi-criteria analysis and Borda's method.

4 - Selection of Leakage Reduction Alternative Based on Group Decision Making

Danielle Morais, Assistant Professor, Federal University of Pernambuco, Recife, PE, Brazil, daniellemorais@yahoo.com.br

Among many causes of water losses, leakage represents a significant portion of the high index found and is one of the crucial issues to be dealt in order to improve the efficiency and effectiveness of water supply services. This paper presents a group decision model to aid the organization to reach a transparent process to select a leakage reduction alternative, considering technical, socio-economic and environmental aspects to achieve sustainable development.

WA13

Pier 5 - H Conv. Lev.

Group Decisions and Coalitions

Sponsor: Group Decision and Negotiation Section: GDN 2009 Sponsored Session

Chair: Keith W. Hipel, Professor, University of Waterloo, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, kwhipel@uwaterloo.ca

1 - Coalitions and Attitudes in Brownfield Redevelopment

Sean Walker, Doctoral Student, University of Waterloo, 200 University Ave., Waterloo ON N2L 3G1, Canada, sgwalker@engmail.uwaterloo.ca, Keith Hipel

COalitions and ATtitudes (COAT) are used within the Graph Model for Conflict Resolution to develop strategies for resolving brownfield redevelopment conflicts. Historically, brownfield projects have been completed through cooperation amongst brownfield stakeholders. A COAT analysis is implemented to examine the tenuous, yet necessary, collaborations which occur within this disparate group.

2 - An OWA-TOPSIS Method for Multiple Criteria Decision Analysis

Ye Chen, Professor, Nanjing University of Aeronautics and Astronautics, School of Economics and Management, Nanjing University of Aeronautics and As, Nanjing, JS, China, chenye@nuaa.edu.cn, Kevin Li, Si-feng Liu

A hybrid approach integrating OWA aggregation into TOPSIS is proposed to tackle multiple criteria decision analysis problems. The setting of ideal and anti-ideal points in TOPSIS is redefined and extended for handling the multiple extreme points situation where a decision maker (DM) or multiple DMs can provide more than one pair of extreme points. Three aggregation schemes are designed to integrate OWA into the TOPSIS analysis procedure.

3 - A Matrix Approach to Coalition Analysis in Group Decision Support

Quanyuan Jin, Director of International Office, Nanjing University of Aeronautics and Astronautics, 30 Yudao Street, Nanjing, JS, 210016, China, jinquanyuan@nuaa.edu.cn, Haiyan Xu, Keith W. Hipel, Marc Kilgour

A novel matrix approach to coalition analysis in group decision support is designed for efficiently calculating stabilities. This advancement permits the construction of an effective Decision Support System for strategically studying a rich range of coalition situations arising in the real world.

WA14

Pier 7 - H Conv. Lev.

Agent-Based Simulation in Diffusion Processes

Cluster: Special Invited Session
Invited Session

Chair: Christian Stummer, University of Vienna, Department of Business Administration, Bruenner Str. 72, Vienna, 1210, Austria, christian.stummer@univie.ac.at

1 - An Agent-based Simulation of the Impact of Marketing Activities on the Adoption of a Biomass Fuel

Christian Stummer, University of Vienna, Department of Business Administration, Bruenner Str. 72, Vienna, 1210, Austria, christian.stummer@univie.ac.at, Markus Guenther, Elmar Kiesling, Lea M. Wakolbinger, Stefan Fuernsinn

When introducing new products into market, (costly) marketing activities are applied to further the adoption of these products. Obviously, managers want to learn about the impacts of these activities beforehand. To this end, we have developed a computer simulation where customers are represented by agents with individual preferences while marketing activities influence the customers' notions about the new product and, thus, their purchase decisions. This is illustrated by means of a case study.

2 - Modeling Social Interaction in an Agent-based Simulation of New Product Diffusion

Elmar Kiesling, University of Vienna, Department of Business Administration, Bruenner Str. 72, Vienna, 1210, Austria, elmar.kiesling@univie.ac.at, Rudolf Vetschera, Christian Stummer, Markus Guenther, Lea M. Wakolbinger

Word-of-mouth effects play a major role in the diffusion of innovations. Thus, the proper consideration of social interactions becomes crucial when modeling diffusion processes. In this talk, we present an agent-based approach for simulating the spread of information about a new product in the setting of a geographically dispersed social network formed by heterogeneous consumers.

3 - An Innovation-oriented View on Intra-firm Knowledge Diffusion

Markus Guenther, University of Vienna, Bruenner Str. 72, Vienna, 1210, Austria, markus.guenther@univie.ac.at, Christian Stummer, Kurt Heidenberger

The availability and allocation of knowledge within a company is crucial for the ability to innovate and so for long-term success. Although intra-firm knowledge diffusion is focused by some models, its impact on the innovativeness of a firm has hardly received attention. Thus, we extend the (purely) knowledge-based approaches by an innovation-oriented view using an agent-based model and compare different intra-firm network structures, information decays and knowledge enhancing activities.

4 - Agent-based Modeling of Multi-channel Choice Behavior Across the Phases of the Purchasing Process

Lea M. Wakolbinger, University of Vienna, Department of Business Administration, Bruenner Str. 72, Vienna, 1210, Austria, lea.wakolbinger@univie.ac.at, Stefan Katzensteiner, Christian Stummer

Analyzing consumer channel choice behavior is of high relevance when managing an integrated multi-channel retail environment. We propose an agent-based tool capable of simulating the impact of various marketing activities on consumer channel choice behavior across the phases of the purchasing process. Interactions between consumers in a social network are taken into account.

WA16

Pier 9 - H Conv. Lev.

Military Applications

Contributed Session

Chair: Jichang Sha, Professor, Key Lab, School of Information System and Management, National University of Defense Technology, No 47, Road Deya, Borough Kaifu, Changsha, 410073, China, jichangsha@hotmail.com

1 - Framing the Picture: How Optimization Contextualized a Heuristic-based Allocation solution

Ross Jackson, Chief Operations Research Analyst for Acquisition, U.S. Air Force, 4375 Chidlaw Road, Wright-Patterson AFB, OH, 45433-5006, United States of America, ross.jackson@wpafb.af.mil

When confronted with ambiguity decision makers often rely on heuristics. Since heuristic-based solutions appear to make sense, senior leaders might infer these solutions are quasi-optimal. Analysts must demonstrate that a better solution exists to move senior leaders away from the heuristic-based solution. Optimization theory was applied to an Air Force personnel project to "frame the picture" for senior leaders and to improve a measure of enterprise health vis-avis standard practice.

2 - Priority Spatial Queues: Study of Target and Unmanned Aerial Vehicle Initiated Dispatch Rules

Noah Bednowitz, University at Buffalo, North Campus, 438 Bell Hall, Buffalo, NY, 14260, United States of America, NHB@Buffalo.edu, Rajan Batta, Rakesh Nagi

We consider a system with multiple unmanned aerial vehicles (UAVs) assigned to respond to frequently arising fixed location surveillance tasks. In an environment where all tasks cannot be handled, dispatching rules must be followed to insure rapid service for high priority targets and effective management of medium priority levels. We discuss the design of a study of multiple dispatching rule combinations under a variety of conditions, and evaluate their performance through simulation.

3 - Simultaneous Sensor Selection and Routing of Unmanned Aerial Vehicles

Frank Mufalli, University at Buffalo, 339b Bell Hall, Buffalo, NY, 14260, United States of America, fmufalli@buffalo.edu, Rajan Batta, Rakesh Nagi

We present an integrated model that selects sensors for each vehicle of an unmanned aerial vehicle fleet and routes them through known targets. The sensor to target benefit is assumed to be given. The mathematical model developed solves optimally for simple missions, but more complex missions require heuristics. Results from a performance study are provided and indicate a significant advantage of using the integrated decision model over models that route vehicles based on fixed sensor slates.

4 - The Construction of a Reliable Maritime Tactical Picture Based on Fuzzy Knowledge

Cleber Oliveira, Instituto Tecnológico de Aeronautica, Praca Marechal Eduardo Gomes, 50, Sao Jose dos Campos, Brazil, cleberamo@yahoo.com.br, Mischel Belderrain

This paper presents the results of a maritime tactical picture, which was assembled from inaccurate and uncertain data collected from multiple sensors of a Brazilian Frigate. The decision-making process relies on fuzzy logic techniques for data fusion, allowing the visualization of all data in only one layer of information. The decision-making process also allows for additional inferences about the sensors data.

5 - War Design Engineering

Jichang Sha, Professor, Key Lab, School of Information System and Management, National University of Defense Technology, No 47, Road Deya, Borough Kaifu, Changsha, 410073, China, jichangsha@hotmail.com, Chao Chen, Fei Xie, Yong Zhang

To start with, we analyze 8 factors and their hierarchical structure that impact the complexity of warfare systems. After discussing the technical and methodological challenges of learning such systems, we finally identify 4 major integration issues and a theory called War Design Engineering (WDE) to deal with them.

■ WA19

Dockside 2 - H Lower Lev.

OR Education I

Cluster: OR Education

Invited Session

Chair: Peter Bell, Professor, University of Western Ontario, Richard Ivey School of Business, Management Science and Information Systems, London, ON, N6A 3K7, Canada, pbell@ivey.uwo.ca

1 - Experienced Based Learning: An Example with Multi-functional Teams with Graduates and Undergraduates

Gajanan Hegde, Associate Professor, University of Pittsburgh, 348 Mervis Hall, University of Pittsburgh, Pittsburgh, PA, 15238, United States of America, HEGDE@katz.pitt.edu

Under the Katz's experienced based learning (EBL) initiatives, we offered a project course where upperclassmen undergraduates and MBA students were asked to serve as "consulting" company for a health care technology client. This talk reports the modeling and EBL experiences of this multi-functional team. The win-win results include review of existing integration software solutions & final recommendation which resulted in the company buying multi-million dollar recommended software.

2 - Teaching More "Analytics" in an OR Course

Peter Bell, Professor, University of Western Ontario, Richard Ivey School of Business, Management Science and Information Systems, London, ON, N6A 3K7, Canada, pbell@ivey.uwo.ca

Many OR people see OR and "analytics" as being very similar, but "OR" does not appear to be experiencing the spin-off that might be expected from the current wave of interest in "analytics" from the business world. This presentation will address the differences between OR and analytics and suggest ways that an OR course might include more "analytics" (while keeping the OR).

■ WA20

Dockside 3 - H Lower Lev.

Energy Markets

Cluster: Energy and Markets

Invited Session

Chair: Lindsay Anderson, Cornell University, Riley-Robb Hall, Ithaca, NY, 14853-5701, United States of America, landerson@cornell.edu

1 - Pricing of Binary Variables in Energy Market Equilibrium Models

David Fuller, University of Waterloo, Department of Management Sciences, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, dfuller@uwaterloo.ca

In market equilibrium models with only continuous variables, prices are usually extracted as dual variables of constraints. However, many models require some binary variables — on/off decisions in short term models, or build/don't build decisions in long term capacity planning models. There is no established way to define prices of discrete activities, so equilibrium is difficult to define. I present a two-part pricing approach to resolve some difficulties. Applications will be suggested.

2 - A Stochastic Programming Model for a Day-Ahead Electricity Market with Real Time Shortage Pricing

Jichen Zhang, University of Waterloo, 200 University Avenue West, Waterloo, ON, N2L3G1, Canada, j36zhang@cngmail.uwaterloo.ca, J. David Fuller, Samir Elhedhli

We present a multi-period stochastic MIP model for planning power generation in a day-ahead electricity market. The model considers various scenarios and a reserve demand curve. We propose a heuristic solution methodology to obtain good quality feasible solutions within reasonable computation time. We then extend the existing ideas of pricing LP models to propose pricing schemes for the stochastic MIP model; the properties of the pricing schemes are discussed. Numerical examples are provided.

3 - Characterizing the Cost of Wind Power Variability on a Network

Judith Cardell, Associate Professor, Smith College, EGR 105b, Clark Science Center, Northampton, MA, 01063, United States of America, jcardell@email.smith.edu, Lindsay Anderson, Chin Yen Tee

When higher wind penetrations are achieved in an existing power system, it is expected that average electricity costs will decrease. However, when network considerations are included in the analysis, uncertainty associated with wind forecasts could have a significant impact. It is likely that variability in electricity costs will increase due to sub-optimal dispatch in real-time. In this work, a simulation approach is taken to quantify the magnitude of this variability on a test system network.

4 - Complementarity of Hydro and Wind Power: Improving the Risk Profile of Energy Inflows

Michel Denault, Associate Professor, HEC, 3000 Ch. de la Coté-Sainte-Catherine, Montreal, Canada, michel.denault@hec.ca, Sebastien Couture-Cardinal, Debbie Dupuis

The complementarity of two energy sources is investigated. We consider the diversification effect of wind power to reduce the probability of water inflow shortages, an energy security concern for hydropower-based economies. We examine whether the production deficit risk level of a hydro-and-wind portfolio of generating assets improves on the risk of an all-hydro portfolio, by attenuating the impact of droughts. A proportion of wind up to 30% improves the risk profile of an all-hydro system.

■ WA21

Dockside 4 - H Lower Lev.

DEA Theory

Contributed Session

Chair: Wade Cook, Professor, Schulich School of Business, York University, 4700 Keele Street, Toronto, On, M3J1P3, Canada, wcook@schulich.yorku.ca

1 - TOPSIS FDH for Efficiency Assessment

Shinn Sun, Professor, Fo Guang University, Department of Management, No. 160, Linwei Road, Jiaosi, Yilan, 26247, Taiwan - ROC, ssun@mail.fgu.edu.tw

The purpose of this paper is two folds: to propose TOPSIS FDH by introducing ideal decision making unit (DMU) and anti-ideal DMU into FDH model and to examine the tie-breaking ability of A&P FDH, 0-1 LP FDH, and TOPSIS FDH by using three numerical examples.

2 - The Anomalies of Non-Archimedean Infinitesimal in DEA

Hsuan-Shih Lee, Professor, National Taiwan Ocean University, No. 2, Pei-Ning Rd, Keelung, Taiwan - ROC, hslee@mail.ntou.edu.tw

Since 1978, DEA has enjoyed both rapid growth and widespread and almost immediate acceptance. Two most frequently used models are CCR model and BCC model, both of which involve the non-Archimedean infinitesimal, ϵ , a theoretical construct bounding the multipliers away from zero. We find that anomalies may occur when ϵ is replaced by a small positive number. In this paper, we are going to investigate these anomalies including unit-variant anomaly and nonoptimal multipliers anomaly.

3 - Fuzzy Development of Multi Criteria Data Envelopment Analysis

Hadi Mohebalizadeh, Tarbiat Moallem University, No49, Mofateh Ave, Tarbiat Moallem Univer, Tehran, Iran, hadi.mohebalizadeh@gmail.com, Mohammad Rasuli

Multi criteria data envelopment analysis (mcdea) was proposed to avoid two major flaws in the classic form of it. In this paper fuzzy mcdea is developed by using a two-phase approach. In this approach, a mixed 0-1 multi objective programming is obtained by using the modified fuzzy parametric programming and then the later model is solved by simple weighting method. As an example of the application of the developed model, it is exploited in the location-allocation problems.

4 - Component-Specific Returns to Scale in Data Envelopment Analysis

Wade Cook, Professor, Schulich School of Business, York University, 4700 Keele Street, Toronto, On, M3J1P3, Canada, wcook@schulich.yorku.ca, Joe Zhu

Returns to scale in DEA is assumed to apply to the entire (input, output) bundle. In many settings, however, it may be that output bundles can be separated into distinct components wherein the RTS behavior may differ from one to another. In the current paper we introduce DEA-based tools that address those situations.

Wednesday, 10:00am - 11:30am**■ WB02**

Queens Quay I - CC Lev. 1

Recent Developments in Metaheuristics

Cluster: Optimization/Metaheuristic

Invited Session

Chair: Jean-Paul Watson, Sandia National Laboratories, P.O. Box 5800, MS 1318, Albuquerque, NM, 87185-1318, United States of America, jwatson@sandia.gov

1 - Gender-Specific Genetic Algorithms

Zvi Drezner, Professor, California State University-Fullerton, Department of ISDS, 800 N. State College Blvd., Fullerton, CA, 92834, United States of America, zdrezner@Exchange.FULLERTON.EDU, Tammy Drezner

We propose to incorporate gender in genetic algorithms. Existing genetic algorithms are gender-neutral. Every genetic algorithm which is gender-neutral can be easily constructed as a gender-specific genetic algorithm. We compared the performance of the gender-neutral and its gender-specific counterpart on four optimization problems and the gender-specific algorithm exhibited superior performance. A statistical analysis allows this conclusion to be stated with 99.5% confidence.

2 - A Hybrid Constraint Programming / Local Search Approach to the Job-Shop Scheduling Problem

J. Christopher Beck, University of Toronto, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, jcb@mie.utoronto.ca, TK Feng, Jean-Paul Watson

Despite the powerful inference of constraint programming, local search has consistently represented the state-of-the-art for classical job-shop scheduling. We introduce a simple hybrid that leverages both the capabilities of modern tabu search and constraint programming. The hybrid significantly improves the performance of a state-of-the-art tabu search and represents the first instance in which constraint programming obtains performance competitive with the best local search algorithms.

3 - Assessing Metaheuristic Implementations for Massively Multi-Threaded Compute Architectures

Jean-Paul Watson, Sandia National Laboratories, P.O. Box 5800, MS 1318, Albuquerque, NM, 87185-1318, United States of America, jwatson@sandia.gov

Recently, high-performance computing vendors have developed novel architectures that support both a very large memory footprint and number of concurrent threads, e.g., SUN's Niagara and the Cray XMT. These architectures contrast with traditional distributed memory alternatives, and promise to offer distinct advantages in the parallelization of metaheuristics. We explore the implementation of parallel metaheuristics on these architectures, reporting on case studies and lessons learned.

■ WB03

Queens Quay II - CC Lev. 1

Process Optimization and Control

Cluster: Large Scale Optimization and Applications

Invited Session

Chair: Ali Elkamel, Professor, University of Waterloo, 200 University Avenue West, Waterloo, N2L3G1, Canada, aelkamel@cape.uwaterloo.ca

Co-Chair: Abdunnaser Younes, University of Waterloo, Department of Chemical Engineering, Waterloo, ON, Canada, ayounes@engmail.uwaterloo.ca

1 - Fault Detection in Chemical Processes: Observability and Economic Considerations

Mohamed Bin Shams, Department of Chemical Engineering, University of Waterloo, Waterloo, On, Canada, m3shams@engmail.uwaterloo.ca, Hector Budman, Thomas A. Duever

Process disturbances or faults if unobserved have a serious impact on process economy, product quality, safety, productivity, and pollution level. Efficient and advanced automated diagnostic systems that can detect, diagnose, and consequently correct these abnormal process behaviors are of great importance to modern complex chemical industries. In this talk, we will present a framework that will quantify and assess different levels of fault observability.

2 - Mixed-integer Dynamic Optimization: A Hybrid Genetic Control Vector Parameterization Approach

Wongphaka Wongrat, University of Waterloo, Department of Chemical Engineering, Waterloo, ON, Canada, wwongrat@engmail.uwaterloo.ca, Abdunnaser Younes, Ali Elkamel

Harvested rice needs to be dried to bring the moisture contents to safe storage levels. Drying systems normally use alternating sequences of drying, cooling and tempering units. Thus, finding the best configuration of the units and their optimum parameters involves a mixed-integer dynamic optimization. We present a hybrid technique that uses a GA to search for the best configuration and a CVP to solve the NLP problem arising from the differential equations governing heat and mass balance.

3 - The Role of Convex Optimization with Linear Matrix Inequalities in the Application of DMPC

Walid Al-Gherwi, University of Waterloo, Chemical Engineering Department, Waterloo, Canada, walidgherwi@yahoo.com, Hector Budman, Ali Elkamel

Convex optimization with Linear Matrix Inequalities (LMIs) has been widely used in control and systems engineering. In this work, we show by illustrating several case studies the role of convex optimization in designing robust distributed model predictive control (DMPC) schemes with different coordination strategies and subject to model errors.

■ WB04

Bay Room - CC Lev. 1

Design of Classification Methods for Diagnostics

Cluster: Design Optimization under Uncertainty

Invited Session

Chair: Jacek Wojciechowski, Warsaw University of Technology, Institute of Radioelectronics ul., Nowowiejska 15/19, Warsaw, 00-665, Poland, jwojc@ire.pw.edu.pl

1 - Application of the Rough Sets Algorithms to the Diagnostics of Complex Analog Systems

Piotr Bilski, Warsaw University of Life Sciences Address: ul. Nowowiejska, Nowowiejska 159, Poland, piotr_bilski@sggw.pl, Jacek Wojciechowski

The paper presents the application of the rough sets to the diagnostics of the complex analog systems. The latter contain numerous, possibly faulty parameters, which are difficult to detect. The aim of the research was to implement algorithms exploiting rough sets to process the learning data set (taken from simulations of the diagnosed objects model), obtaining diagnostic rules. The latter were used to detect, identify and locate faults in the eighth-order lowpass filter. The experiments determined the diagnostic efficiency and scalability of rough sets, which were successfully used to the diagnostics of smaller systems.

2 - Epileptic Seizure Prediction Using Classification Methods

Kumaraswamy Ponnambalam, University of Waterloo, 200 University Ave, Waterloo ON, Canada, ponnu@uwaterloo.ca, A Dorai

Epilepsy is a serious neurological disorder that is characterized by recurrent unprovoked seizures caused by an imbalance in the central nervous system. With early and accurate detection of seizures, doctors can gain valuable time to administer medications and other such anti-seizure countermeasures to help reduce the damaging effects of this crippling disorder. The time-varying dynamics and high inter-individual variability make the early prediction of the seizure state a very difficult task. Many studies have shown that EEG signals do have valuable information that, if correctly analyzed, could help in the prediction of seizures in epileptic patients before its occurrence. New algorithms and features are presented here to help clarify, monitor, and cross-validate the classification of EEG signals to predict pre-ictal, inter-ictal, and post-ictal states in the brain.

3 - Module of the Data Processing for the Classification of the Geotechnical Layers

P Bilski, S Rabarijoely

The paper presents the automated module for the soil layers classification. It is based on the supervised and unsupervised learning methods (i.e. graph clustering and decision trees). The geotechnical data obtained from the test fields using the probes (such as Dilatometer of Marchetti Test, where the probe is inserted into the ground) are processed to generate decision rules about the soil categories. The rules are then used on the new measurement data to make decision about the soil type. Two methods of rules generation are applied and their results compared.

■ WB05

Yonge - CC Lev. 1

Marketing II

Contributed Session

Chair: Chaim Ehrman, Marketing Professor, Loyola University, 820 N. Michigan Ave., Chicago IL 60611, United States of America, Cehrman@luc.edu

1 - Selling Status Indices: Practical Tools to Manage Sales at Time of Crisis

Aziz Guergachi, Ryerson University, 350 Victoria Street, Toronto, Canada, a2guerga@ryerson.ca, Pouyan Hosseinizadeh, Peng Sheng

Sales management is among the most crucial functions in the enterprise. It is even more so at a time of crisis, such as the one that we currently experience. So, how could we help salespeople to gauge their interactions with their customers, generate meaningful sales forecasts, and develop a team-oriented environment for sales management? In this paper, we propose a set of three indices that help address the above questions - the relating status, the attitude, and the confidence indices.

2 - The Effect of Media Advertising on Brand Consideration and Choice

Nobuhiko Terui, Professor, Tohoku University, Kawauchi Aoba-ku, Sendai, Japan, terui@econ.tohoku.ac.jp, Greg Allenby, Masataka Ban

The nature of the effect of media advertising on brand choice is investigated in two product categories in analysis that combines household scanner panel data with media exposure information. We find strong support for advertising effects on choice through the route of consideration set formation.

3 - Using Residuals for Market Segmentation

Chaim Ehrman, Marketing Professor, Loyola University, 820 N. Michigan Ave., Chicago, IL, 60611, United States of America, Cehrman@luc.edu

Residuals typically indicate an error with a Regression Line. However, a high negative residual can indicate a Marketing Opportunity. The Regression Line predicted a higher value for the dependent variable, and a marketing campaign can bring the response closer to the regression estimated value. This technique will be demonstrated with a Data Set from a Harvard Business Case.

■ WB07

Metro Grand West - CC Lev. 2

Tutorial: The Formal Design of Modeling Languages for Mathematical Programming

Cluster: Tutorials

Invited Session

Chair: Joseph Young, Universitetet i Bergen, PB. 7803, Bergen, 5011, Norway, joseph.young@ii.uib.no

1 - The Formal Design of Modeling Languages for Mathematical Programming

Joseph Young, Universitetet i Bergen, PB. 7803, Bergen, 5011, Norway, joseph.young@ii.uib.no

We introduce the formal theory of modeling language design. The key to this approach lies in the development of rigorous mathematical semantics tailored specifically to mathematical programs. Based on this framework, we show how to use this methodology to insure the correctness of many advanced modeling features such as symbolic manipulation. Finally, we explain how to use this process to produce a clear blueprint for a language that can be rapidly implemented using readily available tools.

■ WB08

Pier 2 - H Conv. Lev.

Joint Session Queues/Healthcare: Queues and Congestion in Health Care

Cluster: Queues & Healthcare

Invited Session

Chair: David Stanford, Professor, University of Western Ontario, Department of Statistical & Actuarial Sciences, 1151 Richmond St. N, London, ON, N6A 5B7, Canada, stanford@stats.uwo.ca

1 - Value-Added Waiting: Improving Patient Outcomes with Managed Queues

Sherry Weaver, PhD Student, University of Toronto, 9735 Austin Rd. SE, Calgary, AB, T2J0Z1, Canada, sweaver@ucalgary.ca, Michael Carter

When is it actually beneficial to have patients join a queue for health services? We'll examine the "prehabilitation" process for hip/knee arthroplasty. Research shows that if patients are allowed time for functional and medical "optimization" prior to surgery, outcomes may be significantly improved, while some patients often opt to delay surgery for personal reasons. Queueing theory is used to help demonstrate how optimal queue sizes may be determined in these types of situations.

2 - A Simulation Model for Liver Transplantation

Monali Malvankar, PhD Candidate, Ivey School of Business, 1151 Richmond St N, London, ON, N6A3K7, Canada, mmalvankar@ivey.uwo.ca, David Stanford, Greg Zaric

The liver transplantation wait list in London, Ontario, serves a wider region including parts of Northern Ontario, and shares responsibility for Manitoba. We present a simulation model for operation of the wait list, and use it to investigate the delay impact of factors such as blood type and various patient selection rules.

3 - Scheduling Multi-Priority Patients in the Presence of Patient Preferences

Jonathan Patrick, University of Ottawa, 55 Laurier Ave, Ottawa, ON, K1N 6N5, Canada, Patrick@telfer.uottawa.ca

The allocation of long term care beds is a complex problem due to the non-homogeneity of long term care beds (different facilities and types of bed), the presence of client choice and the need to balance keeping the wait times for community demand short while also controlling the census of patients waiting in the hospital. We present a markov decision model of the scheduling of LTC beds and a simulation model used to compare the MDP policy vs current practice.

4 - A Birth-Death Model for the Performance of an EMS System with Re-positioning

Ramon Alanis, University of Alberta, School of Business, Edmonton, AB, T6G 2R6, Canada, ramon@ualberta.ca, Bora Kolfal, Armann Ingolfsson

This paper analyzes a Markovian birth-death model for the behavior of an EMS system, and how it can be used to estimate the distribution of the response time. We validate the model with field data and we demonstrate how it can be used to estimate the effects of changes in repositioning policies.

■ WB09

Pier 3 - H Conv. Lev.

Structural Analysis of Systems

Contributed Session

Chair: Ibrahim Mustafa, Mr, University of Waterloo, Chemical Engineering department, DWE, 200 University Avenue West, Waterloo, On, N2L3G1, Canada, i2hassan@engmail.uwaterloo.ca

1 - Structural Analysis of Object Oriented Designs Using Interpretive Structural Modeling Tool

Sanjay Saini, Dr., Department of Physics and Computer Science, Dayalbagh Educational Institute, Dayalbagh, Agra, UP, 282005, India, sanjay.s.saini@gmail.com, Gursaran Srivastava

Interpretive structural modeling exploits the fact that most complex systems have some form of structure associated with them. In this paper we describe an object-oriented design modeling tool called ISM Analyzer, which provides extensive support in the structuring and analysis of object-oriented designs. The applicability of the tool is described by developing an object-oriented design for a modest application system.

2 - 3D Solids Reconstruction From Measurements Obtained by a Sensor

Miri Weiss-Cohen, Dr., ORT Braude College, Snunuit 78, Karmiel, Israel, miri@braude.ac.il

A comprehensive method for automatically constructing a 3D solid model from orthographic views obtained by a moving sensor is suggested. The views are constructed from sensors in an automatic fashion using estimation techniques. The outcome of the estimation process is a set of explicit contour equations is suitable for creating a 3D model by a graph theoretic approach.

3 - Mathematical Modeling and Bifurcation Analysis of Acetylcholine Neurocycle

Ibrahim Mustafa, Mr, University of Waterloo, Chemical Engineering department, DWE, 200 University Avenue West, Waterloo, On, N2L3G1, Canada, i2hassan@engmail.uwaterloo.ca, Ali Elkamel, Gamal Ibrahim, Said Elnashaie, Pu Chen

The model is proposed to explore the dynamics characteristics of the acetylcholine (ACh) neurocycle. The effects of hydrogen ion, feed concentrations and acetylcholinesterase (AChE) activity on the system performance are studied. It is found that hydrogen ions play an important role, where they create potential differences through the plasma membranes.

■ WB10

Salon A - H Conv. Lev.

Urban and Regional Transportation Planning

Contributed Session

Chair: Amir Hajimiragha, University of Waterloo, 200 University Avenue West, Waterloo, Canada, ahajimir@uwaterloo.ca

1 - Fareplay: An Examination of Taxicab Drivers' Response to Dispatch Policy

Mike von Massow, McMaster University, 1280 Main Street West, Hamilton, ON, Canada, vonmassm@mcmaster.ca, Mustafa Canbolat

We explore how individual taxi drivers respond to the specific dispatch policy employed and the implications for customer wait times. We show that there may be equitable dispatch policies that reduce customer wait. We suggest the creation of 'super zones' with secondary queues to reduce the incentive to wait at the boundary between zones. This research is, to our knowledge, the first to explicitly address the strategies of drivers in response to a dispatch policy.

2 - Curbside Parking Time Limits

John Rowse, Professor of Economics, University of Calgary, 2500 University Drive N.W., Calgary, AL, T2N 1N4, Canada, rowse@ucalgary.ca, Richard Arnott

We investigate the economics of curbside parking time limits with a stylized model of downtown parking and traffic congestion exhibiting curbside (onstreet) parking, more expensive offstreet garage parking, and heterogeneity in driver parking duration and driver value of time. We find that imposing a curbside parking time limit subsidizes short-term onstreet parking while eliminating or reducing socially wasteful driver cruising for parking.

3 - A Mixed Integer Programming Model to Help in Decision Making Towards Low Emission Transportation

Amir Hajimiragha, University of Waterloo, 200 University Avenue West, Waterloo, Canada, ahajimir@uwaterloo.ca, Ali Elkamel, Michael Fowler, Claudio Canizares

Plug-in Hybrid Electric Vehicle (PHEV) is an emerging vehicle technology that integrates the electric power and transport sectors. The surplus effective generation capacity of Ontario's electricity network is suggested to be utilized for charging the batteries in PHEVs. A developed mixed integer linear programming model to find the maximum possible number of PHEVs in Ontario is presented. The model is illustrated through a representative case study.

■ WB11

Salon C - H Conv. Lev.

Optimization in Radiation Therapy Treatment Planning II

Sponsor: Health Applications Section

Sponsored Session

Chair: Dionne Aleman, University of Toronto, Department of Mechanical and Industrial Engineering, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, aleman@mie.utoronto.ca

1 - Convex Robust Optimization for IMRT Treatment Planning

Yuriy Zinchenko, University of Calgary, 2500 University Drive NW, MS 446, Calgary, AB, T2N 1N4, Canada, yzinchen@ucalgary.ca

To reduce computational burden associated with IMRT planning, we propose a convex optimization model that incorporates dose distribution requirements via moment constraints. To minimize negative impact of uncertainties inherently present in the problem, we propose a convex robust counterpart to our model. Our model falls within the framework of structured convex optimization and is amenable to Interior Point Methods. We discuss present computational challenges and ways to overcome those.

2 - A Robust Approach to Intensity Modulated Proton (not Photon) Therapy Under Range Uncertainty

Timothy Chan, University of Toronto, 5 King's College Rd, Toronto, Canada, tcychan@mie.utoronto.ca, Thomas Bortfeld, John Tsitsiklis

Unlike traditional photon-based radiation therapy treatments, proton-based treatments are witness to significant uncertainty in the location of maximum dose deposition by the beamlets of radiation. In this talk, we present a robust formulation to optimize intensity-modulated proton therapy treatments. We demonstrate that optimal robust solutions use specific physical characteristics of the proton beam to create dose distributions that are far less sensitive to the underlying uncertainty.

3 - An Optimization Model for Perfexion Treatment Planning

Hamid Ghaffari, Assistant Professor, Associate Head of Radiation Physics, University of Toronto, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, ghaffari@mie.utoronto.ca

Stereotactic radiosurgery (coined Gamma Knife by Elekta) has been used to treat brain tumors and lesions for four decades. Perfexion is the newest generation of Elekta's Gamma Knife machines, and allows for the size and shape of each radiation shot to be dynamically changed, as well as for the position of the patient to be moved in three dimensions. We present an optimization model that fully incorporates the capabilities of Perfexion units. Performance results using test data are presented.

4 - Non-coplanar Beam Orientation Optimization for Total Marrow Irradiation Using IMRT

Velibor Mistic, Department of Mechanical and Industrial Engineering, University of Toronto, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, velibor.mistic@utoronto.ca, Dionne Aleman, Michael Sharpe

We consider the beam orientation optimization (BOO) problem for total marrow irradiation (TMI) treatment planning using intensity modulated radiation therapy (IMRT). We implement several versions of a neighborhood search algorithm to solve the BOO problem when non-coplanar beam orientations obtained from gantry rotation and couch translation are considered. Our methods lead to treatment plans which are potentially more effective than conventional approaches to TMI.

■ WB12

Pier 4 - H Conv. Lev.

Group Decision Models and the Strategic Problems of Organizations

Sponsor: Group Decision and Negotiation Section: GDN 2009
Sponsored Session

Chair: Adiel Teixeira Almeida, Professor, Federal University of Pernambuco, Cx Postal 7462, Recife, PE, 50630-970, Brazil, almeidaatd@gmail.com

1 - IT-Governance: A Negotiation Approach

Ana Paula Cabral, Assistant Professor, Federal University of Pernambuco, Cidade Universitaria, Recife, PE, 50910470, Brazil, apcabral@ufpe.br, Danielle Morais

This paper presents a negotiation model in the context of IT Governance. The proposed negotiation model was applied in one of the phases foreseen in the IT Governance model is the design of IT relational architectures, which is considered as the base for implementing the others. Precisely at this moment that the form of relationship will be established between the IT function and the other functions of the organization.

2 - A Real Case Study on Municipal Socio-demographical Comparison

Juan Carlos Leyva Lopez, Universidad de Occidente, Blvd. Lola Beltran y Blvd Rolando Arjona, Culiacan, Mexico, jleyva@culiacan.udo.mx, Maria Leal Sandoval

This paper presents a real case study dealing with the comparison of municipal socio-demographical situations: The case of Sinaloa State, Mexico. The paper presents the problem situation and an appropriate problem formulation. Moreover, a detailed version of the multicriteria evaluation model is presented in the paper. The model consists of a complex hierarchy of evaluation models enabling us to take into account the multiple dimensions involved in the evaluation.

3 - The VFT Methodology Applied to Environmental Problems in the Buildings Sites

Luciana Alencar, Federal University of Pernambuco, Rua Manoel Bezerra, 197, Madalena, Recife, Brazil, alencarlh@gmail.com, Caroline Mota, Marcelo Alencar

It is each time greater the interest to find solutions that attend the professionals and, at the same time, that decrease the impact in the environment. With the aim to structuring and provide support to environmental problems related to the waste generated by a construction project in a building site, the Value Focus Thinking (VFT) methodology was applied. There were many decision-makers (DMs) involved in the process, being necessary many interactions across the stages of the methodology.

4 - A New Preference Aggregation Technique for Reaching a Consensus Decision in a Water Utility Context

Suzana F Dantas Daher, Federal University of Pernambuco, R. Margina Pontual 147/ 401A, Boa Viagem, Recife, PE, 51021510, Brazil, sfdd@uol.com.br, Adiel Teixeira Almeida

Considering traditional unique synthesis criterion approaches, decisionmakers have to deal with problems caused by the compensatory effect when their individual preferences are aggregated. Conflicts may emerge in such situations. Using an investment problem for a Water Utility, a new preference aggregation technique is proposed. For that two different metrics are introduced: the similarity degree and the magnitude of the projection of one vector onto another using a vector model.

■ WB13

Pier 5 - H Conv. Lev.

Community-based Group Decision Systems: Methods and Issues

Sponsor: Group Decision and Negotiation Section: GDN 2009 Sponsored Session

Chair: Norio Okada, Professor, DPRI, Kyoto University, Research Center for Disaster Reduction S, Uji, Kyoto University, Gokasho, Uji, Kyoto, 611-0011, Japan, okada@drs.dpri.kyoto-u.ac.jp

1 - A New Group Decision Approach: The Yonmenkaigi System Method

Norio Okada, Professor, DPRI, Kyoto University, Research Center for Disaster Reduction S, Uji, Kyoto University, Gokasho, Uji, Kyoto, 611-0011, Japan, okada@drs.dpri.kyoto-u.ac.jp, Jong il Na, Liping Fang

The Yonmenkaigi system method is presented as an effective group decision making approach. The Yonmenkaigi method consists of the following steps: carrying out a SWOT analysis, completing the Yonmenkaigi chart, debating between groups, and presenting the group action plan. Comparisons with other group decision making methods are discussed.

2 - Collaborative Action Planning for Community Disaster Reduction Using the Yonmenkaigi System Method

Jong il Na, Kyoto University, Graduate School of Engineering, Gokasho, Uji, 611-0011, Japan, njiworld@drs.dpri.kyoto-u.ac.jp, Norio Okada, Liping Fang

The Yonmenkaigi system method is presented as an approach for developing collaborative actions for community disaster reduction. A case study carried out in a community in the city of Kyoto demonstrates the method's usefulness and effectiveness in making a collaborative action plan for a local community's disaster preparedness and mitigation.

3 - Experimental Study on Negotiation Process in Participatory Decision Making Process in Communities

Hiroyuki Sakakibara, Associate Professor, Yamaguchi University, Ube, Japan, sakaki@yamaguchi-u.ac.jp

Participatory decision making process is necessary to solve local problems in a community. On the other hand, participants involved in such process have different concerns, and a conflict between participants can occur. Therefore, it is necessary to coordinate negotiation between participants appropriately. In this paper, game experiment is designed to analyze people's behaviors in negotiation process. Win-Win situation, Trade-off situation and Unilateral situation are assumed.

4 - Psychological Variables Underlying Cooperative Behavior Toward Local Community

Satoshi Fujii, Professor, Tokyo Institute of Technology, Japan, fujii@plan.cv.titech.ac.jp, Tsuyoshi Hatori, Tetsushi Suminaga

The problems of local community contain typically a structure of social dilemmas where individuals have to choose between cooperative behavior that promotes collective benefit and defective behavior that promote individual benefit. In this study, we implemented a survey to investigate psychological variables underlying such cooperative behaviors. The data analysis indicated that moral obligation and perceived benefit regarding cooperation were direct important variables underlying the cooperative behavior.

■ WB14

Pier 7 - H Conv. Lev.

Simulation and Optimization

Contributed Session

Chair: Abdessamad Ben Hamza, Concordia University, 1515 Ste-Catherine Street West, EV7.631, Montreal, QC, H3G 2W1, Canada, hamza@ciise.concordia.ca

1 - The Effect of Setup-Time Reduction on Optimal Lot-Sizing

Silvanus T. Enns, University of Calgary, Department of Mech. and Mfg. Engineering, Calgary, AB, T3E 6T3, Canada, enns@ucalgary.ca, Chandandeep S. Grewal, Anubhuti Parajuli

A discrete-event simulation model was used to study the effects of demand and setup times on optimal lot sizes in a single-stage batch production scenario. Replenishment was controlled using reorder points. Design of experiments and OptQuest were used to obtain optimal lot sizes at different delivery service levels for each combination of demand and setup time levels. Response surfaces were generated. It was observed that optimal lot sizes decrease linearly with reduced setup times.

2 - A Combined Procedure for Selecting the Best Simulated System

Mahmoud Alrefaei, Associate Professor, Qatar University, Department of Math and Physics, P.O. Box 2713, Doha, Qatar, malrefaei@qu.edu.qa

We consider the problem of selecting the simulated system with the best performance measure for large scale problems. The idea is to sample the design space and then search for the best. We present a sequential procedure that combines the simulated annealing with constant temperature to sample the design space with ranking and selection procedures to search for the best with a pre specified confidence level. We also present extensive numerical evaluation for testing the combined procedure.

3 - Introducing A Novel Activation Function For Back Propagation Neural Networks

Hamed Hashemini, PhD Student, Sauder School of Business (UBC), Box 226-2205 Lower Mall, Vancouver, BC, V6T1Z4, Canada, hamed.hashemini@sauder.ubc.ca, Hessam Bavafa

This paper introduces a novel activation function for BP NNs. The learning speed of this activation function is significantly faster than all well-known ones. To prove learning performance of this activation function a unique statistical experiment is developed. This method not only established a unique tool for measuring and comparing the learning speed of different activation functions but also showed in what order of magnitude it is faster than its well-known and wildly accepted rivals.

4 - Optimal Software Testing and Maintenance via Neural Networks

Abdessamad Ben Hamza, Concordia University, 1515 Ste-Catherine Street West, EV7.631, Montreal, QC, H3G 2W1, Canada, hamza@ciise.concordia.ca

We present a novel stochastic discrete-time model to tackle the problem of optimal software release and maintenance times based on fault correction processes, which takes into account not only the environmental factor but also the imperfect software defect removal. In the experimental results, we demonstrate how to reliably estimate the joint optimal testing and maintenance policy using real software data.

■ WB19

Dockside 2 - H Lower Lev.

OR Education II

Cluster: OR Education

Invited Session

Chair: John Wilson, Ivey School of Business, University of Western Ontario, London, Canada, jwilson@ivey.ca

1 - Order and Chaos: The Art of Leading a Case Discussion

Brian Coulter, University of Western Ontario, Richard Ivey School of Business, 1151 Richmond Street North, London, ON, N6A 3K7, Canada, bcoulte@uwo.ca

A good case discussion involves both order and chaos. My talk will focus on how to make them co-exist. I will also offer tips for navigating the traps and pitfalls that one frequently encounters in a case discussion.

2 - Teaching an Undergraduate Management Science Course Using a Mobile Computer Lab

Janice Eliasson, Instructor, University of Calgary, 2500 University Drive NW, Haskayne School of Business, Calgary, AB, T2K 5M5, Canada, janice.eliasson@haskayne.ucalgary.ca, Snider Brent, Diane Bishcak

Feedback from employers, faculty, and students indicated that our required third-year B. Comm. management science course was not successful in teaching applied or even basic spreadsheet modeling skills. To improve students' understanding and retention, we implemented a mobile computer lab in a regular classroom. We discuss the classroom logistics, lab configuration, and the impact on student learning, including examples which allowed students to "discover" management science techniques.

3 - An Integrated Approach to Statistics for MBA's

John Wilson, Professor, University of Western Ontario, Richard Ivey School of Business, 1151 Richmond Street North, London, ON, N6A 3K7, Canada, JWilson@Ivey.uwo.ca

As part of an integrated MS course, we have successfully introduced statistical concepts through cases. The approach has been to present a general management problem, invite discussion before introducing sophisticated techniques, then ease the students into seeing why the methodology can be of great use in assisting with management cases. This approach is different to the traditional one where techniques are introduced and then applied and secures "buy-in" even from the weakest students.

■ WB20

Dockside 3 - H Lower Lev.

Modelling Windpower; Economics and Uncertainty

Cluster: Energy and Markets

Invited Session

Chair: Scott Rogers, Mechanical and Industrial Engineering, University of Toronto, Toronto, ON, Canada, scott.rogers@utoronto.ca

1 - A Real Options Approach to Valuing Wind as a Renewable Energy Source

Natasha Kirby, nkirby3@uwo.ca, Lindsay Anderson, Matt Davison

We value wind as a renewable energy source using a real options approach. Generation companies who provide wind power to the system face risk due to uncertain future wind speed and electricity prices, and there is optionality in making certain operating decisions based on power price, wind speed and storage options. We examine historical data, then bootstrap to make future predictions based on our simple model. We also discuss a PDE approach to solving the optimal control problem.

2 - Long-Term Electricity Market Equilibrium Taking into Account Wind Power Uncertainty

Majid Oloomi, Department of Electrical and Computer Engineering, University of Calgary, Calgary, AB, Canada, moloomib@ucalgary.ca, William Rosehart, Hamidreza Zareipour

This work examines how the intermittency of wind power will affect the long-term market equilibrium. A Load Duration Curve (LDC) and a probability density function (pdf) of wind power are combined to construct the Equivalent LDC. An agent based market model is used to determine market equilibrium for the ELDC. To examine the effect of wind uncertainty on market equilibrium, variance and mean of wind power are changed and the behavior of market equilibrium is observed using a test system.

3 - Optimizing the Amount of Wind Capacity in Competitive Electricity Markets Using Complementarity Programming

Paul Dabrowski, Department of Mechanical and Industrial Engineering, University of Toronto, Toronto, ON, Canada, paul.dabrowski@utoronto.ca, Scott Rogers

We describe a model for wind capacity expansion in imperfectly competitive electricity markets that uses complementarity programming. WCAPCOMP 1.0 represents a single-price wind capacity market (where genscos can purchase wind capacity) and separate single-price electricity market (where genscos can sell output). All genscos behave strategically, anticipating how other genscos will react to their decisions in each market. We illustrate this approach with an application to an "Ontario-like" system.

■ WB21

Dockside 4 - H Lower Lev.

DEA Non Profit Applications

Contributed Session

Chair: Walter Garrett, Instructor of Decision Sciences, Saint Louis University, 3674 Lindell Blvd, Suite 417, Saint Louis, MO, 63108, United States of America, wgarrett@slu.edu

1 - The Impact of Competition on Public High School Performance

Julie Harrison, Lecturer, The University of Auckland Business School, Private Bag 92019, Auckland Mail Centre, Auckland, 1142, New Zealand, j.harrison@auckland.ac.nz, Paul Rouse

School competition is popularly seen as a way to improve school performance. In the 1990s, with the removal of school zoning, NZ public schools competed with both private schools and each other. A categorical DEA model and regression analysis is used to examine the impact of competition on schools during this period. The results indicate that, longer-term, competition could result in the inefficient use of fixed resources, as public school survival is only indirectly related to performance.

2 - Rich and Poor in the Heartland: Performance Characteristics of Public Schools Using a DEA Approach

Walter Garrett, Instructor of Decision Sciences, Saint Louis University, 3674 Lindell Blvd, Suite 417, Saint Louis, MO, 63108, United States of America, wgarrett@slu.edu, N.K. Kwak

Public schools across America are funded using a combination of local direct revenues plus formula-based state and federal funds. There have long been questions about the equity of that approach, and its influence on education quality. This paper uses data envelopment analysis (DEA) to compare efficiencies of the six richest and six poorest school districts in Missouri, using standardized measures of district wealth and performance. The results are related to questions of funding equity.

Wednesday, 12:30pm - 2:00pm

■ WC02

Queens Quay I - CC Lev. 1

The Latest in Local Search

Cluster: Optimization/Metaheuristic

Invited Session

Chair: Meinolf Sellmann, Brown University, Department of Computer Science, P.O. Box 1910, Providence, RI, 02912, sello@cs.brown.edu

1 - Integrating Systematic and Local Search Paradigms: A New Strategy for MAX-SAT

Bart Selman, Professor, Cornell University, 4148 Upson Hall, Cornell University, Ithaca, NY, 14853-7501, United States of America, selman@cs.cornell.edu, Carla P. Gomes, Lukas Kroc, Ashish Sabharwal

Systematic search and local search paradigms for combinatorial problems are generally believed to have complementary strengths. Nevertheless, attempts to combine the power of the two paradigms have had limited success. We propose a hybrid strategy based on shared memory, ideally suited for multi-core processor architectures, enabling continuous information exchange between two solvers without slowing down either. This is surprisingly effective on many challenging MAX-SAT instances.

2 - Local Search and Computer-Aided Algorithm Design

Holger Hoos, University of British Columbia / CS, 2366 Main Mall, Vancouver, BC, V6T 1Z4, Canada, hoos@cs.ubc.ca

We describe a new approach for designing high-performance local search algorithms using automated procedures for exploring combinatorial spaces of candidate designs. We present applications to timetabling and satisfiability, and we describe how local search plays a key role in carrying out the complex configuration and tuning tasks arising in the computer-aided design of high-performance algorithms. (Based on work with C.Fawcett, F.Hutter, A.KhudaBukhsh, L.Xu and K.Leyton-Brown.)

3 - Dialectic Search

Meinolf Sellmann, Brown University, Department of Computer Science, P.O. Box 1910, Providence, RI, 02912, sello@cs.brown.edu, Serdar Kadioglu

We introduce Hegel's dialectic as a search meta-heuristic. Dialectic is an appealing mental concept for local search (LS) as it tightly integrates and yet clearly marks off of one another search space exploration and exploitation. We believe that this makes dialectic search easy to use for non-experts in optimization. We illustrate dialectic search, its simplicity and great efficiency on three problems from three different problem domains.

■ WC03

Queens Quay II - CC Lev. 1

Optimization of Energy Intensive Systems

Cluster: Large Scale Optimization and Applications

Invited Session

Chair: Ali Elkamel, Professor, University of Waterloo, 200 University Avenue West, Waterloo, N2L3G1, Canada, aelkamel@cape.uwaterloo.ca

1 - Incorporating Quality Constraints in the Scheduling Problem of Plastics Compounding

Abdunnaser Younes, University of Waterloo, Department of Chemical Engineering, Waterloo, ON, Canada, ayounes@engmail.uwaterloo.ca, Michelle Leung, Ali Elkamel, Costas Tzoganakis

In plastics compounding plants, quality is ensured by subjecting the final product to quality control testing. However, quality can be controlled by constraining the extruder flow rate. Hence, we propose to ensure quality of the final product a priori by incorporating it as a constraint in the optimization model. The resulting mixed integer nonlinear model is tested on several examples. Experimental results show that incorporating quality produce different optimal solutions for the same problem.

2 - Optimal Load Scheduling of Cryogenic Air Separation Processes Under Uncertainty

Carl Laird, Chemical Engineering Department, Texas A&M University, MS 3122, College Station, TX, 77843, carl.laird@gmail.com, Yu Zhu

Cryogenic air separation is a large-scale complex process, where inevitable load changes are frequently required because of two main factors: the variability of electrical pricing and uncertain multiple product demands. We develop a novel parallel interior-point solution approach to determine optimal decision-making strategies concerning the trade-off between profitability and customer satisfactory levels.

3 - A Carbon Dioxide Efficient Supply Chain Network

Ali Diabat, Assistant Professor, Assistant Professor, Engineering Systems and Management, MASDAR Institute of Science and Technology (MIST), P.O. Box: 54224, Abu Dhabi, UAE, adiabat@mist.ac.ae, David Simchi-Levi

Elevated atmospheric CO₂ concentrations have caused warming of the climate system. The increase in global temperature may have many harmful effects on human welfare and the environment. This risk of global warming has led to the development of carbon trading market with the aim of reducing CO₂ emission. In this paper, we present a novel mathematical program that deals with the design of carbon dioxide (CO₂) efficient supply chain networks.

WC04

Bay Room - CC Lev. 1

Dynamic Programming: Theory and Applications

Contributed Session

Chair: Oleksandr Shlakhter, PhD Candidate, University of Toronto, 171 Erskine Ave., # PH1, Toronto, ON, M4P 1Y8, Canada, shlakht@mie.utoronto.ca

1 - An Inventory System with Multiple Demand Classes Differentiated by Treatment for Shortages

Yun Zhou, Department of Industrial Engineering, Tsinghua University, Zijing Building 15#521b, Tsinghua, Beijing, 100084, China, stevenzhou05@gmail.com, Xiaobo Zhao

We consider an inventory system serving multiple demand classes. Shortages for some classes are treated as lost-sales, while those for the others are backlogged. Replenishing and inventory allocation decisions are made in each period, with a setup cost for replenishment. Structural results such as (s, S) replenishing policy and priority-based allocation policy are derived. We also study a special case for two demand classes and zero setup cost, but with different sequence of events.

2 - A Geometric Framework for Partially Observable Markov Decision Processes

Hao Zhang, Assistant Professor, University of Southern California, 3670 Trousdale Pkwy, Bridge Hall 401, Los Angeles, CA, 90024, United States of America, zhanghao@usc.edu

We present a novel framework for analyzing partially observable Markov decision processes (POMDPs). The new approach is based on future-reward vectors and future policies, which is more parsimonious than the traditional approach based on belief vectors. It reveals the connection of the problem with two computational geometry problems: finding the vertices of a convex hull and finding the Minkowski sum of convex polytopes. This new approach can help solve the POMDP problem more efficiently.

3 - Real Time Dynamic Shortest Path Problem Solution Algorithm Using Wavelets

Kaveh Farokhi Sadabadi, Faculty Research Assistant, Civil and Environmental Engineering Department, University of Maryland, 1173 Glenn L. Martin Hall, College Park, MD, 20742, United States of America, kfarokhi@umd.edu, Ali Haghani

A formulation for the dynamic shortest path problem is given. Wavelet functions are used to approximate time variant travel times. The approximate problem is a static quadratic program. Using the rolling horizon approach, a solution algorithm for the real time (RT) case is proposed. Performance of the proposed algorithm on experimental cases as well as large-scale networks is demonstrated and discussed.

4 - Acceleration Operators in the Modified Policy Iteration Algorithms for Markov Decision Processes

Oleksandr Shlakhter, PhD Candidate, University of Toronto, 171 Erskine Ave., # PH1, Toronto, ON, M4P 1Y8, Canada, shlakht@mie.utoronto.ca, Chi-Guhn Lee

We study the general approach to accelerating the convergence of the policy iteration method for Markov decision processes with the total expected discounted reward. We establish a class of operators that can be used in combination with a contraction mapping operators to reduce the computational efforts required to perform the policy evaluation. We then propose two such operators, which can be easily implemented as part of the policy iteration algorithm and its variants.

WC07

Metro Grand West - CC Lev. 2

Tutorial: A Feasibility Model for Healthcare Resource Planning: Applications and Potential Future Research Opportunities

Cluster: Tutorials

Invited Session

Chair: Murray Coté, University of Colorado Denver, Denver, CO, 80204, Murray.Cote@uchsc.edu

1 - A Feasibility Model for Healthcare Resource Planning: Applications and Potential Future Research Opportunities

Murray Coté, University of Colorado Denver, Denver, CO, 80204, Murray.Cote@uchsc.edu

Healthcare resource planning is the art and science of predicting the quantity and perhaps the specific attributes of the resources required to deliver healthcare (such as doctors, nurses, technicians, medical and clinical support staff, facilities, and equipment) at specified levels of quality and cost. We will use a generic formulation of the resource planning problem with four basic constraint sets: 1) budget for resources, 2) desired customer service metric or performance measures, 3) bounds on the capacity variables, and 4) integrality of the capacity variables. This model has several desirable characteristics. First, it allows for a compact representation of the resource planning problem that encompasses all the essential complexities of a healthcare delivery system. Second, the model is adaptive as it has both the budget and the customer service metrics or performance measure constraints. Third, the model is flexible as the model can be easily modified to model a variety of resource planning problems. Real-world applications of this model will be presented and areas for future research will be discussed.

WC08

Pier 2 - H Conv. Lev.

Queueing and Related Models

Cluster: Queues

Invited Session

Chair: Percy Brill, University of Windsor, 401 Sunset Avenue, Windsor, ON, N9B 3P4, Canada, brill@uwindsor.ca

1 - Performance Models for Overloaded Class Based Weighted Fair Queueing Systems

Martin Fischer, Noblis, 3150 Fairview Park Drive South, Falls Church, VA, 22042, United States of America, mfischer@noblis.org, John Shortle

In telecommunications systems the Class Based Weighted Fair Queueing Systems discipline allows multiple traffic classes to share the available bandwidth. Each class is assigned weights and the bandwidth is allocated via these weights. In this talk we discuss performance models for this system under overload conditions.

2 - Incorporating Autocorrelated Service Times in the Analysis of Delay Systems

Baris Balcioglu, University of Toronto, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, baris@mie.utoronto.ca, Mojtaba Araghi

We propose using renewal approximations to capture the characteristics of autocorrelated service times. We propose incorporating the server utilization in the approximation procedure, which provides a family of approximating renewal service times. We test the proposed approximation in optimizing make-to-stock queues when service times could be autocorrelated.

3 - Strategies for a Single Product Multi-Class M/G/1 Make-to-Stock Queue Serving Different Markets

Opher Baron, Rotman School of Management, University of Toronto, 105 St George St, Toronto, ON, M5S 3E6, Canada, opher.baron@rotman.utoronto.ca, Baris Balcioglu, Hossein Abouee Mehrizi

For an M/G/1 make-to-stock queue with prioritized customers and an identical product, we approximate the strict-priority and rationing policies when the inventory is centralized. For the case with decentralized inventory, we present the exact analysis of dispatching policy. We show that this policy is optimal in a make-to-order system. We also demonstrate the effectiveness of our approximations and dispatching rule numerically.

4 - The Moments of the Time of Ruin in Markovian Risk Models

Kaiqi Yu, Postdoctoral Fellow, University of Windsor, Windsor, ON, Canada, kyu@uwindsor.ca, David Stanford, Jiandong Ren

In this talk, we present an approach based on matrix-analytic methods for moments of the time of ruin of risk models. This approach is applicable to a class of rather general Markovian risk models. Based on a sample path equivalent fluid flow of the risk model, we established an algorithm to calculate the moments of the time of ruin, and prove that the algorithm is convergent. As examples show that the proposed approach is programmable and computationally stable.

WC09

Pier 3 - H Conv. Lev.

E-Commerce

Contributed Session

Chair: Lisha Liu, Beihang University, 2-713B, Beihang University, Beijing, China, Beijing, 100191, China, lisa.buaa@gmail.com

1 - Stock Ordering for a Dual Channel Retailer

Mohamed Mahaboob, McMaster University, 1280 Main St W, Hamilton, ON, Canada, mahabom@mcmaster.ca, Elkafi Hassini

We consider a problem faced by a retailer servicing two channels, a web channel and a traditional store channel, from the stock available at the store. We determine the optimal ordering and allocation of stocks between the two channels in a setting where there are two substitutable products.

2 - The Media's Role in the Dot-Com Bust: North American Newspaper Coverage 1992-2008

Peter Ryan, Research Associate, Ryerson University, 350 Victoria Street, Toronto, On, M5B 2K3, Canada, pryan@ryerson.ca, Wendy Cukier

The "dot-com" bust early in the new millennium left many investors and corporate operations wondering what lessons could be learned from the volatile transition to an e-commerce marketplace. This paper evaluates the role the media had in fostering what Robert Schiller describes as "irrational exuberance" in the marketplace.

3 - Information Sharing Decision and B2B Market Formation

Zhong Wen, Assistant Professor, Tsinghua University, School of Economics and Management, 438 Weilun, Beijing 100084, China, wenzh@sem.tsinghua.edu.cn

In a buyers-suppliers procurement network, buyers may choose to share their suppliers' information to find more efficient suppliers, by forming a common procurement platform (B2B market). However, a platform that accommodates all buyers and suppliers would eliminate any cost advantage a buyer may enjoy when the buyer resells products to end customers. In a Cournot competition setting, our model shows that the market equilibrium entails a mix of B2B markets and traditional procurement relationships.

4 - An E-commerce Market Growth Model: An Empirical Research in China

Lisha Liu, Beihang University, 2-713B, Beihang University, Beijing, China, Beijing, 100191, China, lisa.buaa@gmail.com, Siqing Shan

In this article, we explored the impact of the growth of e-commerce market based on the theory of economic growth and studied the difference factors between B2B and B2C in the same environment. The factors we identified are investment in ICTs, network infrastructure, globalization, urbanization and internet users. The data is collected from 2001 to 2007 in China. We got some interesting results through empirical research. And these results have never been raised in the previous study.

WC10

Salon A - H Conv. Lev.

Routing and Rails

Contributed Session

Chair: Martin Fuchsberger, PhD Student, ETH Zurich, Raemistrasse 101, HG G21.2, Zurich, 8092, Switzerland, martin.fuchsberger@ifor.math.ethz.ch

1 - A Tabu Search for a Deterministic Vendor Managed Inventory Routing Problem

Haihong Xiao, PhD Student, HEC, School of Management, Paris, 1, Rue de la Libération, Département de OM&IT, Jouy en Josas, 78350, France, haihong.xiao@mailhec.net, Laoucine Kerbache, Soumia Ichoua

We propose a tabu search heuristic to solve a deterministic Vendor Managed Inventory Routing Problem. Two methods are applied to find an initial solution: Shortest path (Bertazzi 2002, 2005) and Cluster-First Route-Second. Two types of

tabu moves will be evaluated: 1. exchange the sequence of the deliveries between two clients, considering their current roads; 2. exchange two clients between the current roads at the same period.

2 - Solving Reverse Logistics Vehicle Routing Problems

Mingyuan Chen, Professor, Concordia University, Department of Mechanical and Industrial, 1455 de Maisonneuve W., Montreal, H3G 1M8, Canada, mychen@encs.concordia.ca, Sally Kassem

Reverse logistics is a widely acknowledged issue due to increasing public concerns on environment protection and energy conservation. In this work we address reverse logistics incorporating the model of capacitated vehicle routing with time windows with simultaneous delivery and pick-up. The NP-hard problem was solved using simulated annealing with a heuristic method for generating initial and candidate solutions.

3 - Effective Marshalling at Rail Yards to Mitigate Risk of Derailments Involving Dangerous Goods

Morteza Bagheri, PhD Candidate and Research Assistant, University of Waterloo, Department of Civil Engineering, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, mbagheri@engmail.uwaterloo.ca, Liping Fu, Frank F. Saccomanno

Train derailments involving dangerous goods are important safety concerns. The risk of DG involvement in train derailments can be mitigated through effective placement of DG cars along a train consist. This research proposes a new modeling framework to investigate how the position of DG cars in a train affects its chances of being involved in a derailment. The underlying problem is formulated as a linear integer programming problem and solved using a genetic algorithm based heuristic.

4 - A Vehicle Routing Problem with Pickup, Delivery Time Windows and Coordinated Resources

CKY Lin, Assistant Professor, City University of Hong Kong, Department of Management Sciences, City University of Hong Kong, Kowloon, Hong Kong, China, mslincky@cityu.edu.hk

This study examines a pickup and delivery problem with time windows and two types of delivery resources with possible coordination: a heavy resource may carry both delivery items and one or more units of a lighter resource on its multi-route assignment. The objective criterion is the total cost, comprising the fixed cost and travelling cost of resources. The solution approach is a multi-exchange heuristic based on modifying the shortest path algorithm in a specially designed dynamic network.

5 - Fast Train Scheduling and Dispatching in Main Station Areas

Martin Fuchsberger, PhD Student, ETH Zurich, Raemistrasse 101, HG G21.2, Zurich, 8092, Switzerland, martin.fuchsberger@ifor.math.ethz.ch

We address the problem of generating and maintaining a conflict-free train schedule in main station areas. Our model is based on an integer multi-commodity flow formulation that incorporates the detailed railway topology, dynamics and delays of the trains as well as connection requirements. The resulting integer program is solved with a commercial solver. Tests with data from Berne, Switzerland show that with this model it is possible to find feasible solutions within seconds.

WC11

Salon C - H Conv. Lev.

Healthcare Operations Research Applications in the Region of Waterloo

Sponsor: Health Applications Section

Sponsored Session

Chair: Beth Jewkes, Professor, Department of Management Sciences, University of Waterloo, Faculty of Engineering, Waterloo, ON, N2L 3G1, Canada, emjewkes@uwaterloo.ca

1 - A Queuing Model of Ambulance Offload Delays

Eman Almehdawe, PhD Candidate, University of Waterloo, Department of Management Sciences, 200 University Avenue West, Waterloo, ON, N2L3G1, Canada, ealmehd@engmail.uwaterloo.ca, Beth Jewkes

Offload delays are common in Ontario, and are a concern to both the public and healthcare providers. The reasons for offload delays are many, most of which are related to downstream congestion in patient care. There are few analytical models available to assist decision-makers with understanding various resource allocation policies. This talk will present a queuing model an EMS-ER system whose results provides insight into how changes in the EMS or hospital system affect offload delays.

2 - Modeling Ambulance Deployment and Dispatch

Jay Hu, MASC Student, University of Waterloo, Department of Management Sciences, 200 University Avenue NW, Waterloo, ON, N2L 3G1, Canada, j23hu@uwaterloo.ca, Beth Jewkes, Miguel Anjos

The performance of an Emergency Medical Service (EMS) system is affected by many factors, including the number of ambulances deployed, their locations, and the dispatching strategy that is employed. The problem of allocating available ambulances among candidate stations is formulated as an optimization model that includes the priority of calls effect. Computational results using Kitchener-Waterloo region EMS data will be presented.

3 - Ambulance Relocation for Emergency Medical Services

Joe Naoum-Sawaya, University of Waterloo, Department of Management Sciences, 200 University Street West, Waterloo, ON, N2L 3G1, Canada, jnaoumsa@gmail.uwaterloo.ca, Samir Elhedhli

In this talk, we present our recent work on implementing a real time ambulance relocation system for the Region of Waterloo Emergency Medical Services. Our approach takes into account the current location of the ambulances as well as the time of the day to provide a relocation strategy. We formulate this problem as a mixed integer program and present computational results.

4 - Operating Rooms- Structural Implications for Planning and Scheduling

Kenneth McKay, Professor, Department of Management Sciences, University of Waterloo, Waterloo, ON, N2L 3G1, Canada, kmckay@uwaterloo.ca, Yawei Li

Operations Management has an extensive foundation of methods and approaches for manufacturing situations. Unfortunately, there appears to have been little transfer of these results to the specific topic of operating room planning and scheduling. We will present a number of structural characteristics which distinguish this problem and discuss possible implications for heuristics and modelling formulations.

WC12

Pier 4 - H Conv. Lev.

Strategic Analysis in Systems Management

Sponsor: Group Decision and Negotiation Section: GDN 2009
Sponsored Session

Chair: Keith Hipel, University Professor, University of Waterloo, Department of Systems Design Engineering, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, kwhipel@gmail.uwaterloo.ca

1 - An Integrated and Adaptive Framework for Achieving Global Food Security

Michele Heng, Doctoral Student, University of Waterloo, 200 University Ave., Waterloo, ON, N2L 3G1, Canada, mtheng@uwaterloo.ca, Keith W. Hipel, Liping Fang

A System of Systems (SoS) approach, based on values, risk, and complexity is proposed to achieve global food security. The global food system, which is a large-scale SoS, involves multiple participants with multiple objectives interacting in global markets. Critical interactions among human, ecological, and technological systems are explored.

2 - Flight Path Plan and Air-to-Air Combat Decision Making Using Multiagent Reinforcement Learning Metho

Ju Jiang, Professor, Nanjing University of Aeronautics and Astronautics, Nanjing, JS, China, jiangju63@hotmail.com, Min Zhao, Donghua Li

This research concentrates on the study of flight path plan and air-to-air combat decision using reinforcement learning (RL). The dimension disaster is a big problem of RL for path planning. In this paper, this problem has been solved by assigning different agents with different learning objectives and an RL algorithm is modified and then is applied to a two-flight coordinating combat case.

3 - Factors Influencing the Exchange Rate of Chinese Currency

YuanYuan Xi, Assistant Professor, Nanjing Audit University, 86 Yu Shan Road West, PuKou District, Nanjing, JS, 211815, China, nauxy@163.com, Keith Hipel

Factors affecting the exchange rate of the Chinese currency (RMB) are examined within the analytic hierarchy process (AHP) to predict whether the RMB should appreciate or depreciate. Among the twelve factors considered, macroeconomic policies, speculative capital flows, and the general public's expectations have the greatest influence. The resulting overall value of the RMB exchange rate evaluation is 0.8757, which indicates that the RMB will appreciate slowly in the upcoming 1 to 2 years.

4 - Ontario Nuclear Power Dispute

Motahareh Armin, Graduate Student, University of Waterloo, 304 - 235 ERB ST W, Waterloo, ON, N2L 1V9, Canada, marmin@gmail.uwaterloo.ca, Keith Hipel, Mitali De

This paper examines the current dispute about Ontario's nuclear contract. The Ontario government needs to buy nuclear reactors for its new plant. The only Canadian bidder is AECL, but some news indicates that the Federal government might sell AECL. In this study, the decision makers and their options are introduced, and by using GMCR II system, the feasible states and preferences are determined. At last, different methods are applied to analyze the current and future state of the conflict.

WC14

Pier 7 - H Conv. Lev.

VISUAL8 Workshop

Cluster: Simul8 Workshop
Invited Session

Chair: Saeed Zolfaghari, Ryerson University, 350 Victoria Street, Toronto, Canada, zolfaghari@ryerson.ca

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WC20

Dockside 3 - H Lower Lev.

Economic Modeling

Contributed Session

Chair: Jungsuk Oh, Associate Professor, College of Business Administration, Seoul National University, 599 Gwanangno, Gwanak-gu, Seoul 151-916, Korea, Republic of, joh@snu.ac.kr

1 - Characteristics of Poverty in Serbia

Tinde Dobrodolac S, Professor, Faculty of Economics, 9-11, Segedinski put, Subotica, 24000, Serbia-Montenegro, tinde@eccf.su.ac.yu

Poverty is a multidimensional worldwide problem. Half of the population is extremely poor, so their lives are endangered. Poverty in Serbia as a complex problem shows some similarities with the same problem in other countries in transition, but it has its own specific characteristics as well. These specificities are investigated in depth in this article. The government of Serbia is bringing in 2009 the Strategic directions and activities aimed at reducing poverty.

2 - Switch of Focus in New Business Enterprises: From Survival to Profit Maximization

Bahareh Ramezani Tehrani, Master Student, University of Waterloo, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, b2rameza@gmail.uwaterloo.ca, Moren Levesque

What objective should an entrepreneur focus on when starting a new business enterprise? Both survival and profitability are important for the continuity of the new venture, but a survival focus is the key in the hazardous early months or even years. We identify the conditions under which an entrepreneur should switch from maximizing the venture's likelihood of survival to maximizing its profitability.

3 - Model of Market with Asymmetric Information

Nada Trivic, Professor, Faculty of Economics, 9-11, Segedinski put, Subotica, Vo, 24000, Serbia-Montenegro, ntrivic@eccf.su.ac.yu

In relations between economic agents the situation in which one agent is better informed than the other is fairly common, when the problem of asymmetric information arises. Mainly, the seller is better informed than other agents. Agent, having lesser information, could expect unfavourable consequences. Models of markets with asymmetric information could help reduce these unfavourable consequences. In this sense state intervention could play an important role.

4 - A Modified Apex Game and its Application

Jungsuk Oh, Associate Professor, College of Business
Administration, Seoul National University, 599 Gwanangno,
Gwanak-gu, Seoul, 151-916, Korea, Republic of, joh@snu.ac.kr,
Byungwan Koh

There are many markets in which one dominant player possessing essential infrastructure and/or monopoly status and a number of other players providing complementary products and/or services coexist. We formulate such a market as a coalitional-form game. Referring to this as a Modified Apex Game (MAG), we derive its non-cooperative equilibrium outcome configuration and compare it with the outcome predicted by the Shapley value rule.

■ WC21

Dockside 4 - H Lower Lev.

DEA Applications

Contributed Session

Chair: Mohamed Dia, School of Commerce, Laurentian University,
935 Ramsey Lake Rd, Sudbury, ON, P3C 2C6, Canada,
mdia@laurentian.ca

1 - Deployment of DEA for the Effective Measurement and Improvement of Productivity

Kalinga Jagoda, Mount Royal College, Bissett School of Business,
Mount Royal College, Calgary, AB, T3E6K6, Canada,
kjagoda@mtroyal.ca, Pamini Thangarajah

The rapid changes in oil prices in last five years forced companies to rethink about their manufacturing process. This paper examines application of DEA and revenue management models for measuring and improving of productivity of a Canadian packaging company. The critical success failure factors are also highlighted.

2 - Technical Efficiency of Megaworld Realty Corporation Subsidiaries Measured by a Slack-based DEA

Vicente Reyes, Managing Director, Executive Decisions,
113 Kamuning Road, Quezon City, Metro Manila, 1108,
Philippines, vincerreyes@hotmail.com, Noli Hernandez,
Babeth Isa Fernando

The research measures technical efficiency scores of 7 Subsidiary Companies of Megaworld Realty Corporation for years 2007-2008. Three input-one output slack-based model DEA is employed to calculate overall performance. Findings show that around forty percent of the companies used inputs efficiently while fifty seven percent got the desired output level.

3 - Super-Efficiency Model for Electricity Efficiency in the Philippines

Ramon Posadas, Associate Professor/Dr, Graduate School,
University of Sto. Tomas, Espana St., Manila, 1008, Philippines,
ramoncposadas@yahoo.com

This paper analyzes the electricity efficiency in the Philippines. Super-efficiency model of the data envelopment analysis (DEA) is a new approach used to identify the best and worst performing electric cooperatives along the best-practice frontier. Empirical results suggest that out of 118 decision-making units, 28% are found to be super efficient and 76% are inefficient. The results have policy implications for the managerial decision-making of these firms and the electricity sector.

4 - A Portfolio Selection Methodology of Stocks Based on DEA

Mohamed Dia, School of Commerce, Laurentian University,
935 Ramsey Lake Rd, Sudbury, ON, P3C 2C6, Canada,
mdia@laurentian.ca

This research presents a methodology based on DEA for portfolio selection of stocks. Along the steps of the methodology, stocks efficiency ratios are computed; and then a generation of a portfolio is carried out by optimizing the weighted sum of the stocks efficiency ratios. The methodology is illustrated and compared to the Ben Abdelaziz et al. (2007)'s model. It was capable of reproducing similar results while being easier to apply and to understand for practitioners and decision makers.

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SB02	Combinatorial Optimization I
SB03	Nonlinear Programming and Applications
SB04	Various Applications
SB05	Airline Applications: Sloan Session I
SB06	Process and Capacity Planning
SB07	Tutorial: Exploring Best Practices in the Teaching of OR/MS
SB08	Emergent Care Operations
SB09	Decentralized Supply Chains
SB10	OM in Practice: Some Practical Operations Management Problems and Their Solutions
SB11	Health Care System Modeling
SB12	First Nations Negotiations in Canada: Action Research Using ESD and Smartsettle
SB13	Strategic Analysis of Brownfield Redevelopment Projects
SB14	Fuzzy Optimization
SB15	Graph and Network Optimization I
SB18	OR Applications in the Forest Products Sector
SB19	Technology Management and Applications
SB20	Financial Engineering
SB21	Decision Support Systems

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SC02	Combinatorial Optimization II
SC03	Graph and Network Optimization II
SC04	Modeling and Computation in Stochastic Programming
SC05	Airline Applications: Sloan Session II
SC06	Timetabling and Scheduling
SC07	Tutorial: Trajectory-based Methods
SC08	Health Care Applications
SC09	Supply Chain Performance I
SC10	Inventory Control and Management
SC11	Health Care Operations and Analysis
SC12	Perspectives on Electronic Negotiation Support
SC13	Strategic Analysis of Group Decisions
SC14	Online Social Networks
SC15	IT Value in Organizations
SC18	OR Applications in Forest Management
SC19	Innovation
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Sunday, 3:30pm - 5:00pm

SD01	Dynamic Traffic Assignment - Recent progress
SD02	Optimization and Networks
SD03	Network Design
SD04	Stochastic Programming: Computational Aspects and Applications in Finance
SD05	Topics in Aviation OR
SD06	Scheduling I
SD07	Tutorial: Queueing Systems with Flexibility
SD08	Queueing and Networks
SD09	Supply Chain Performance II
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SD11	Stochastic Models in Health Care
SD12	Negotiation Support and the Law
SD13	E-negotiation Simulation and Assessment
SD14	Economics of IS - Analytical and Empirical Approaches
SD15	Group Decision Making
SD17	Software Tutorial
SD18	Sustainability and Profitability
SD19	OR in Sports and the Public Sector
SD20	Risk Management II
SD21	Decision Support Applications II

Monday, 8:00am - 9:30am

- MA01 Sustainable Transport Planning and Assessment I
- MA02 Combinatorial Optimization
- MA03 Optimization I
- MA04 CORS Student Paper Competition I
- MA06 Scheduling II
- MA07 Tutorial: OR Applications in Forestry
- MA08 Joint Session APS/Health: Stochastic Models in Health Care
- MA09 Supply Chain Relationships
- MA10 Behavioral Studies in Operations Management
- MA11 Operating Room Scheduling
- MA12 Bidding and Bargaining in E-market Systems
- MA13 Game Theory in Group Decision and Negotiation
- MA14 Emerging Research Issues in Digital Media and Markets
- MA15 Hybrid Models and Tools
- MA16 Military Applications I
- MA17 Software Tutorial
- MA18 Modeling in Forest Management
- MA19 Applications in Transportation and Logistics
- MA20 Dynamic Pricing and Inventory Control
- MA21 Normative Models of Beliefs and Preferences

Monday, 11:00am - 12:30pm

- MB01 Sustainable Transport Planning and Assessment II
- MB02 Polyhedral Optimization
- MB03 Optimization II
- MB04 CORS Student Paper Competition II
- MB05 Innovations in OR at AD OPT
- MB06 Stochastic Location
- MB07 Tutorial: Correcting the Foundations of OR
- MB08 Analysis of Spare Part Provisioning Problems
- MB09 Supply Chain Management
- MB10 Service Process Outsourcing
- MB11 Modelling for Healthcare Applications
- MB12 Collaborative Information Technologies
- MB13 Negotiation and Game Theory
- MB14 Information Security and Risk
- MB15 Constraint Programming and Parallel Computing
- MB16 Naval Mine Hunting and Reconnaissance Operations
- MB17 Software Tutorial
- MB18 Modeling of Uneven-aged Forests
- MB19 Applications of OR in the Public Sector
- MB20 Pricing and Revenue Management with Strategic Customers
- MB21 Panel Discussion: Personal Decisions and Happiness

Monday, 1:30pm - 3:00pm

- MC01 VRPs Solved by Mathematical Programming Methods
- MC02 Approximation Algorithms for Network Design
- MC03 Portfolio Optimization
- MC04 Simulation Competition I
- MC05 Reliability I
- MC06 Location Analysis and its Applications
- MC07 Tutorial: Data Envelopment Analysis for Health Care Efficiency
Measurement: Recent Trends and Statistical Extensions
- MC08 Actuarial Ruin Theory
- MC09 Supply Chain Optimization I
- MC10 Supply Chain and Pricing Decisions
- MC11 OR in Public Health
- MC12 GDN Keynote Session I
- MC14 E-Business
- MC15 Novel Applications of Constraint Programming
- MC16 Naval Planning and Risk Analysis
- MC17 Software Tutorial
- MC18 Mine Operations
- MC19 Applications in Forecasting and Demand Planning
- MC20 Topics in Revenue Management & Pricing
- MC21 Behavioral Decision Making

Monday, 3:30pm - 5:00pm

- MD01 Models and Methods for Planning Railroad Operations
- MD02 Algorithmic Game Theory
- MD03 Financial Optimization
- MD04 Simulation Competition II
- MD05 Reliability II
- MD06 Generalized Facility Location Models
- MD07 Tutorial: Assessing Solution Quality in Stochastic Programs
- MD08 Analysis of Risk in Actuarial Science
- MD09 Supply Chain Optimization II
- MD10 Pricing and Capacity Management
- MD11 Optimization in Radiation Therapy Treatment Planning I
- MD12 Tools for GDSS Facilitators
- MD13 Preference, Strategy, and Consensus
- MD15 Integrating CP and OR
- MD16 Military Applications II
- MD17 Software Tutorial
- MD18 Energy and Natural Resources
- MD19 Cyberinfrastructure for OR
- MD20 Topics in Revenue Management
- MD21 Risk Informed Decision Making Models at Regulatory Agencies
- Applications in the Environment, Public Safety
and Health Sectors"

Tuesday, 8:00am - 9:30am

TA01	Transportation Chains in Latin America
TA02	Graph and Combinatorial Algorithms I
TA03	Large Scale Optimization and Decomposition Methods
TA04	CORS Competition on the Practice of OR I
TA05	Statistical Process Control and Testing
TA06	Facility Location: Theory and Applications
TA07	Tutorial: OR Challenges in Water Security Applications
TA08	Tail Asymptotics in Multi-Dimensional Stochastic Models I
TA09	Logistics and Supply Chains
TA10	Topics in Transportation
TA11	Scheduling and Capacity Planning
TA12	Collaboration Support for Requirements Engineering I
TA13	Phased-conflict Analysis Transformation and Resolution I
TA14	Data Mining - Theory
TA15	Advanced Search Techniques
TA16	Organizational Flexibility and Resilience: How Do You Get There From Here?
TA19	Optimization Modeling in Practice
TA20	Finance
TA21	Making Decisions

Tuesday, 11:00am - 12:30pm

TB01	Humanitarian Logistics
TB02	Graph and Combinatorial Algorithms II
TB03	Optimization in Logistics and Supply Chain Management
TB04	CORS Competition on the Practice of OR II
TB05	Forecasting Applications
TB06	Facility Territory Design
TB07	Tutorial: Semidefinite Programming and Application to Hard Combinatorial Optimization Problems
TB08	Joint Session APS/ Queueing: Tail Asymptotics in Multi-Dimensional Stochastic Models II
TB09	Supply Chains, Disruption and Disruptive Events
TB10	Learning in Pricing and Capacity Management
TB11	Cancer Performance Improvement
TB12	Collaboration Support for Requirements Engineering II
TB13	Phased-conflict Analysis Transformation and Resolution II
TB14	Data Mining - Applications
TB15	Game Theory Applications
TB16	FUTURE: Agent Based Simulation for Managing the Navy's Personnel Enterprise
TB18	Wind Energy and Planning
TB19	Telecommunications Applications
TB20	Electrical Markets and Pricing
TB21	Decision Analysis

Tuesday, 1:30pm - 3:00pm

TC01	GIS and Network Optimization
TC03	Mathematical Programming Models of Equilibrium
TC04	NSERC Information Session
TC05	Operations Management
TC06	Operations and Production Scheduling
TC07	Tutorial: Optimization, Operations Research and the Engineering Sciences
TC08	Joint Session APS/Queueing: Control of Queueing Systems
TC09	Inventory Management
TC10	Assortment Planning
TC11	Diseases and Operations Research
TC12	GDN Keynote Session II
TC14	Simulation
TC15	Statistical Applications
TC16	Emerging Methods for Technology Innovation
TC18	Sustainable Development
TC19	Industrial Applications
TC20	Pricing and Revenue Management
TC21	Multicriteria Decision Making I

Tuesday, 3:30pm - 5:00pm

TD01	Trucking and Container Models
TD02	Game Theoretical Learning
TD03	Conic Optimization - Algorithms and Applications
TD04	NSERC Discovery Grant Program Workshop
TD05	Pricing, Marketing and Operation
TD06	Warehouse Operations
TD07	Tutorial: Numerical Inversion of Transforms Occurring in Queueing and Other Stochastic Processes
TD08	Joint Session APS/Queueing: Stochastic Processes and Queueing
TD09	Shipping and Supply Chains
TD10	Vehicle Routing
TD11	Scheduling and Planning in Healthcare
TD12	Panel Discussion: Finding Common Ground Through Negotiation Dialogue
TD13	Preferences in Negotiations
TD14	Input Model Uncertainty in Stochastic Simulations
TD16	Tutorial: Simulation-based Optimization for Military Applications
TD18	Project Management: Past and Present
TD19	Service Industry Applications
TD21	Multicriteria Decision Making II

Wednesday, 8:00am - 9:30am

- WA02 Applications of Metaheuristics in Vehicle Routing
- WA03 Heuristics for Large-Scale Combinatorial Optimization
- WA04 Design Optimization
- WA05 Marketing I
- WA07 Tutorial: Introduction to Optimization in Radiotherapy
- WA08 Queueing in Communication
- WA09 Intelligent Traffic Management
- WA11 Health Care Operations
- WA12 Negotiation Support and Applications
- WA13 Group Decisions and Coalitions
- WA14 Agent Based Simulation in Diffusion Processes
- WA16 Military Applications
- WA19 OR Education I
- WA20 Energy Markets
- WA21 DEA Theory

Wednesday, 12:30pm - 2:00pm

- WC02 The Latest in Local Search
- WC03 Optimization of Energy Intensive Systems
- WC04 Dynamic Programming: Theory and Applications
- WC07 Tutorial: A Feasibility Model for Healthcare Resource Planning:
Applications and Potential Future Research Opportunities
- WC08 Queueing and Related Models
- WC09 E-Commerce
- WC10 Routing and Rails
- WC11 Healthcare Operations Research Applications in the
Region of Waterloo
- WC12 Strategic Analysis in Systems Management
- WC14 VISUAL8 Workshop
- WC20 Economic Modeling
- WC21 DEA Applications

Wednesday, 10:00am - 11:30am

- WB02 Recent Developments in Metaheuristics
- WB03 Process Optimization and Control
- WB04 Design of Classification Methods for Diagnostics
- WB05 Marketing II
- WB07 Tutorial: The Formal Design of Modeling Languages for
Mathematical Programming
- WB08 Joint Session Queues/Healthcare: Queues and Congestion
in Health Care
- WB09 Structural Analysis of Systems
- WB10 Urban and Regional Transportation Planning
- WB11 Optimization in Radiation Therapy Treatment Planning II
- WB12 Group Decision Models and the Strategic Problems
of Organizations
- WB13 Community-based Group Decision Systems:
Methods and Issues
- WB14 Simulation and Optimization
- WB19 OR Education II
- WB20 Modelling Windpower; Economics and Uncertainty
- WB21 DEA Non Profit Applications

Master Track Schedule

SUNDAY & MONDAY

KEY: CC- Conference Centre, H- Hotel

		SUNDAY				MONDAY					
Room	Track	SB 10:00am - 11:30am	SC 12:30pm - 2:00pm	Plenary 2:10pm - 3:00pm	SD 3:30pm - 5:00pm	MA 8:00am - 9:30am	Plenary 10:00am - 10:50am	MB 11:00am - 12:30pm	MC 1:30pm - 3:00pm	MD 3:30pm - 5:00pm	Track
Frontenac - CC-Level 1	1	Transportation Science & Logistics	TSL		TSL	TSL		TSL	TSL	TSL	1
Queens Quay I - CC-Level 1	2	Combinatorial Optimization	Combinatorial Optimization		Combinatorial Optimization	Combinatorial Optimization		Combinatorial Optimization	Combinatorial Optimization	Combinatorial Optimization	2
Queens Quay II - CC-Level 1	3	Nonlinear Programming	Graph & Network Optimization		Network Design	Optimization		Optimization	Optimization in Finance	Optimization in Finance	3
Bay Room - CC-Level 1	4	Optimization / Nonlinear Program.	Optimization / Stochastic Program.		Optimization / Stochastic Program.	CORS Student Competition		CORS Student Competition	Simulation Competition	Simulation Competition	4
Yonge - CC-Level 1	5	Aviation Applications	Aviation Applications		Aviation Applications	No Session		Aviation Applications	Reliability	Reliability	5
Wellington - CC-Level 1	6	Process & Capacity Planning	Timetabling & Scheduling		Scheduling	Scheduling		Location	Location	Location	6
Metro Grand West- CC-Level 2	7	Tutorial	Tutorial		Tutorial	Tutorial		Tutorial	Tutorial	Tutorial	7
Pier 2 - H-Conv. Level	8	Emergent Care Operations	Health Care Applications		Queueing & Networks	Applied Probability / Queues		Applied Probability	Applied Probability	Applied Probability	8
Pier 3 - H-Conv. Level	9	Decentralized Supply Chains	Supply Chain Performance		Supply Chain Performance	Supply Chain Relationships		Supply Chain Mgt.	Supply Chain Optimization	Supply Chain Optimization	9
Salon A - H-Conv. Level	10	Mfg. & Service Operations Mgt.	MSOM		MSOM	MSOM	IFORS Distinguished Lecture Richard Karp Metro Grand Centre - CC-Level 2	MSOM	MSOM	MSOM	10
Salon C - H-Conv. Level	11	Health Care	Health Applications	Omega Rho Distinguished Lecture Gilbert Laporte Metro Grand Centre - CC-Level 2	Health Applications	Health Applications		Health Applications	Health Applications	Health Applications	Health Applications
Pier 4 - H-Conv. Level	12	Group Decision & Negotiation	GDN		GDN	GDN		GDN	GDN	GDN	12
Pier 5 - H-Conv. Level	13	Group Decision & Negotiation	GDN		GDN	GDN		GDN	No Session	GDN	13
Pier 7 - H-Conv. Level	14	Optimization	Information Systems		Information Systems	Information Systems		Information Systems	Information Systems	No Session	14
Pier 8 - H-Conv. Level	15	Graph & Network Optimization	Information Systems		Group Decision Making	Computing: Constraint Program.		Computing: Constraint Program.	Computing: Constraint Program.	Computing: Constraint Program.	15
Pier 9 - H-Conv. Level	16	No Session	No Session		No Session	Military Applications		Military Applications	Military Applications	Military Applications	16
Regatta - H-Main Lobby Level	17	No Session	No Session		Software Tutorial Maximal	Software Tutorial SAS		Software Tutorial JMP	Software Tutorial ILOG	Software Tutorial FICO	17
Dockside 1 - H-Lower Level	18	Forestry	Forestry		Forestry	Forestry		Forestry	Mine Operations	Energy & Natural Resources	18
Dockside 2 - H-Lower Level	19	Technology Mgt. & Applications	Innovation		OR in Sports & the Public Sector	CPMS - Practice of ORMS		CPMS	CPMS	CPMS	19
Dockside 3 - H-Lower Level	20	Financial Engineering	Risk Mgt.		Risk Mgt.	Revenue Mgt & Pricing		Revenue Mgt. & Pricing	Revenue Mgt. & Pricing	Revenue Mgt. & Pricing	20
Dockside 9 - H-Lower Level	21	Decision Support Systems	Decision Support Applications		Decision Support Applications	Decision Analysis		Decision Analysis	Decision Analysis	Decision Analysis	21

Master Track Schedule

TUESDAY & WEDNESDAY

KEY: CC- Conference Centre, H- Hotel

		TUESDAY					WEDNESDAY			
		TA	Plenary	TB	TC	TD	WA	WB	WC	Track
Room	Track	8:00am – 9:30am	10:00am – 10:50am	11:00am – 12:30pm	1:30pm – 3:00pm	3:30pm – 5:00pm	8:00am – 9:30am	10:00am – 11:30am	12:30pm – 2:00pm	
Frontenac - CC-Level 1	1	Transportation Science & Logistics	CORS Harold Larnder Memorial Lecture Steve Gallivan Metro Grand Centre - CC-Level 2	TSL	TSL	TSL	No Session	No Session	No Session	1
Queens Quay I - CC-Level 1	2	Optimization: Combinatorial		Optimization: Combinatorial	No Session	Optimization: Metaheuristic	Optimization: Metaheuristic	Optimization: Metaheuristic	Optimization: Metaheuristic	2
Queens Quay II - CC-Level 1	3	Large Scale Optimization		Large Scale Optimization	Large Scale Optimization	Large Scale Optimization	Large Scale Optimization	Large Scale Optimization	Large Scale Optimization	3
Bay Room - CC-Level 1	4	CORS Practice Competition		CORS Practice Competition	NSERC	NSERC	Design Optimization	Design Optimization	Dynamic Programming	4
Yonge - CC-Level 1	5	Statistical Process Control		Forecasting Applications	Operations Mgt.	Pricing, Marketing & Operations	Marketing	Marketing	No Session	5
Wellington - CC-Level 1	6	Facility Location: Theory & Applications		Facility Territory Design	Operations & Production Scheduling	Warehouse Operations	No Session	No Session	No Session	6
Metro Grand West- CC-Level 2	7	Tutorial		Tutorial	Tutorial	Tutorial	Tutorial	Tutorial	Tutorial	7
Pier 2 - H-Conv. Level	8	Applied Probability		Applied Probability & Queuing	Applied Probability & Queuing	Applied Probability & Queuing	Queues	Queues & Healthcare	Queues	8
Pier 3 - H-Conv. Level	9	Logistics & Supply Chains		Supply Chains	Inventory Mgt.	Shipping & Supply Chains	Intelligent Traffic Mgt.	Structural Analysis of Systems	E-Commerce	9
Salon A - H-Conv. Level	10	Manufacturing & Service Operations Mgt.		MSOM	MSOM	Vehicle Routing	No Session	Urban & Regional Transportation Planning	Routing & Rails	10
Salon C - H-Conv. Level	11	Health Applications		Health Applications	Health Applications	Health Applications	Health Applications	Health Applications	Health Applications	11
Pier 4 - H-Conv. Level	12	Group Decision & Negotiation		GDN	GDN	GDN	GDN	GDN	GDN	12
Pier 5 - H-Conv. Level	13	Group Decision & Negotiation		GDN	No Session	GDN	GDN	GDN	No Session	13
Pier 7 - H-Conv. Level	14	Data Mining		Data Mining	Simulation	Simulation	Agent-Based Simulation	Simulation & Optimization	Workshop VISUAL8	14
Pier 8 - H-Conv. Level	15	Computing: Constraint Program.		Game Theory Applications	Statistical Applications	No Session	No Session	No Session	No Session	15
Pier 9 - H-Conv. Level	16	Military Applications		Military Applications	Military Applications	Military Applications	Military Applications	No Session	No Session	16
Regatta - H-Main Lobby Level	17	No Session		No Session	No Session	No Session	No Session	No Session	No Session	17
Dockside 1 - H-Lower Level	18	No Session		Wind Energy & Planning	Sustainable Development	Project Management	No Session	No Session	No Session	18
Dockside 2 - H-Lower Level	19	CPMS - Practice of ORMS		Telecommunications Applications	Industrial Applications	Service Industry Applications	OR Education	OR Education	No Session	19
Dockside 3 -H-Lower Level	20	Finance		Electrical Markets & Pricing	Pricing & Revenue Mgt.	No Session	Energy & Markets	Energy & Markets	Economic Modeling	20
Dockside 9 - H-Lower Level	21	Making Decisions		Decision Analysis	Multicriteria Decision Making	Multicriteria Decision Making	DEA Theory	DEA Nonprofit Applications	DEA Applications	21

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