

July 8-11, 2007

Wyndham Rio Mar Beach Resort & Spa

Rio Grande, Puerto Rico



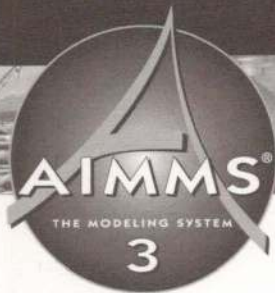
**PUERTO
RICO '07**

INFORMS International



A preview on AIMMS developments

www.aimms.com



Although everybody is enjoying AIMMS 3.7, at Paragon developers are also busy creating AIMMS 3.8, to be released at the end of 2007. Based on the newest insights from research & academia, requests from our customers, the latest technological developments and our personal ideas and experience, the following major features have been selected:

BENDERS DECOMPOSITION FOR STOCHASTIC PROGRAMMING

The nested Benders decomposition as an user-customizable procedure inside the library for operations on Generated Mathematical Programs (GMP) - similar to the AIMMS Outer Approximation (AOA) solver - for solving (linear) multi-stage stochastic programming problems.

NONLINEAR PRE-SOLVE

Powerful pre-solve procedures for NLP and MINLP, like the pre-solve procedures employed by LP/MIP solvers, including inversion of non-linear expressions, solving the variables in the pre-triangular part of the matrix, tightening the bounds of variables based on the linear and non-linear constraints, and reduction of instruction trees to speed up function evaluations.

MULTI-START SOLVE FOR NLP

Calling an NLP solver from multiple starting points and reports back the best feasible solution as its final solution (all feasible solutions can be retrieved as well). Again, written as a user-customizable procedure within the GMP library, allowing modelers to adapt the algorithm to their own needs.

NETWORK OBJECT, GIS, AND PIVOT TABLE EXTENSIONS

A multiple of extensions will be made to specific GUI object such as curved & segmented arcs in the network object, extended GIS connectivity (Yahoo® Maps, ESRI® Shape Files), and advanced sorting and controllability in the Pivot table.

A FREELY DISTRIBUTABLE AIMMS VIEWER

The AIMMS Viewer will allow anyone to view & browse the results of an AIMMS-based optimization application through the graphical user interface of the application. Best of all, it is free. Opt to make your application viewable (if needed in a protected fashion) and start sharing. Combined with the new single project file concept, the AIMMS Viewer provides a convenient way to distribute a complete interactive report, dashboard so you will.

For details on AIMMS 3.8 or to obtain a **free trial license**, please visit our website



AIMMS is a registered trademark of Paragon Decision Technology B.V.

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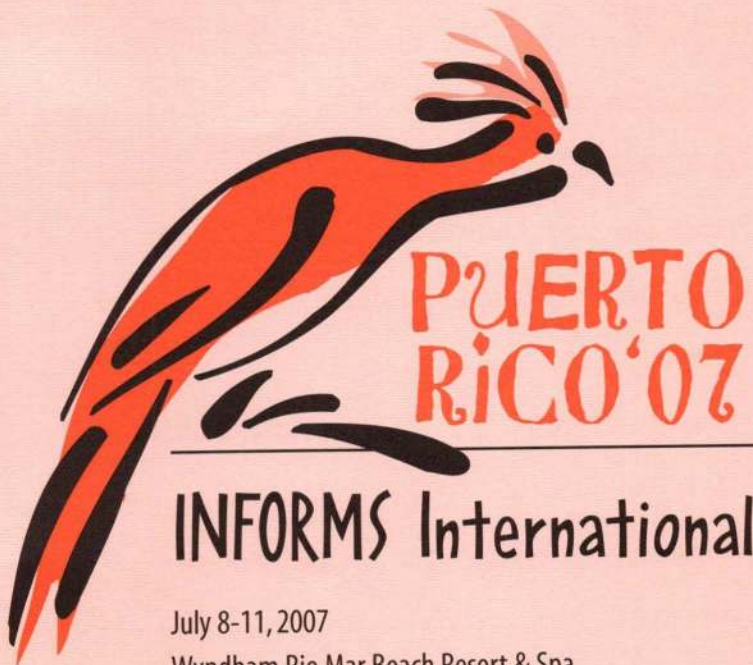
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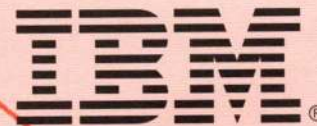
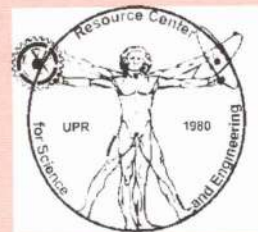
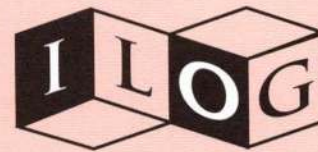
Copies of papers abstracted in the meeting program are available only from the authors. Requests for papers should be sent to the authors at the addresses shown in the program. Published annually prior to the meeting by the Institute for Operations Research and the Management Sciences. Individual issues of the program are available for \$20US per copy. Orders must be prepaid and sent to INFORMS, PO Box 631704, Baltimore, MD 21263-1704.

THANKS TO OUR SPONSORS



July 8-11, 2007

Wyndham Rio Mar Beach Resort & Spa
Rio Grande, Puerto Rico



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**WELCOME RECEPTION
SPONSORS**

WELCOME FROM THE GENERAL CHAIR



Dear Colleagues and Friends,

It is my pleasure to welcome you to INFORMS International Conference in beautiful Puerto Rico. We have been working hard to provide you with a rewarding and enjoyable experience. This meeting provides an opportunity for you to keep abreast of the latest developments in the field and, at the same time, experience the vibrant beauty and culture of this fascinating tropical island.

The conference scientific program covers the broad O.R. landscape. In addition to two plenaries and 16 tutorials, there are 29 invited clusters, 18 sponsored clusters, and over 700 papers. There also are special sessions honoring the legacies of two giants in our field who died during the past year—Peter Hammer (1936-2006) and Alex Rubinov (1940-2006). New features of the meeting include special sessions on O.R. in the Americas, O.R. at the edge, industry's unsolved problems, and new O.R. techniques for emerging industries. Exhibitions by software vendors also will be offered.

I would like to take this opportunity to thank the Program Committee members: Ahad Ali, Viviana Cesani, Rajesh Ganesan, Bjarni Kristjansson, Darek Nalle, Cristina Pomales, J. Cole Smith, Stephen Strauss, Gerhard Wilhelm Weber, and especially Robin Lougee-Heimer, who chaired the Program Committee and performed numerous other functions. Without her tireless efforts, this meeting could not have taken place. I would also like to thank the Organizing Committee for all of their hard work in putting the conference together: Ahad Ali, Viviana Cesani, Reza Emamy, Mario Cordova, Mariano Marcano, Luis Pericchi, Dieter Reetz, and especially Alexandra Medina-Borja who led this effort. And, of course, thanks to each of you for your contributions and participation.

In addition to the extremely stimulating technical sessions, I hope that you will also take some time to enjoy this beautiful island. The Organizing Committee has put together a remarkable social program. Our welcome reception will take place in Old San Juan, where historical walking tours of Old San Juan will be available. After your walk, you will enjoy a reception (including a folkloric performance) at La Puntilla Arsenal, overlooking the harbor, which was built by the Spanish in the nineteenth century to guard San Juan's port. The reception is sponsored by the University of Puerto Rico at Mayagüez; PRCB (Puerto Rico Convention Bureau); the Puerto Rico Rum Association; LifeScan, a Johnson & Johnson Company; Merck & Co., Inc.; Pfizer, Inc. The Monday night reception will take place at the Vista Verde Garden at the Wyndham, and will include Latin music and dance instruction provided by the University of Puerto Rico. So come, meet old friends and make new friends while learning to salsa.

Finally, I wish to thank our meeting sponsors ILOG and IBM for their support of this meeting and their long-term support of INFORMS. I also wish to express my gratitude to the Chancellor of the University of Puerto Rico, Mayagüez, Dr. Jorge I. Velez-Arocho, who expended a great deal of his personal time to help find sponsors, work with the committee on the program, and organize press releases and press conferences to advertise not only this conference but the profession of operations research. Thank you so much! Thanks also to INFORMS' Terry Cryan and her staff, Cheryl Clark, Paulette Bronis, Lynn Murray and Sandy Owens, for their invaluable assistance throughout the process of planning and putting together the conference. And, thanks also to the INFORMS Board of Directors who have supported this meeting from its inception. I applaud all of you.

I hope that you enjoy the sessions, as well the wonderful social program. I also hope that you will have time to explore the island: the tropical rainforest, the bioluminescent waters (enjoy a swim after dark), the vibrant nightlife of Old San Juan, snorkeling, fishing or just enjoying the views.

Again, welcome to Puerto Rico — an extraordinarily diverse and captivating island.

A handwritten signature in black ink, appearing to read "Karla Hoffman".

Karla Hoffman
Conference Chair

WELCOME FROM THE CHANCELLOR



Dear Friends,

Bienvenidos a Puerto Rico!

The University of Puerto Rico at Mayagüez (UPRM) is very pleased to be part of INFORMS 2007 International Conference Celebrating the Globalization of OR/MS. On behalf of the UPRM's local organizing committee, I want to extend to all of you our warm welcome to one of the most developed high-technology regions in the Caribbean. We are confident that Puerto Rico offers a unique venue to look at the growth and globalization of OR/MS. We at UPRM are joining INFORMS in its goal of fostering research and application of OR/MS methods to global problems to inform leaders in their quest to ultimately improve the quality of life of all the world's regions. We are in a unique position to do so in the region. Our engineering school is proud of its legacy, having groomed a number of renowned scientists and leaders, including over 200 NASA scientists and engineers, among many others.

UPRM's faculty and students are justifiably proud of having played a significant role in the development of most OR/MS applications in several Fortune 500 companies based in the island. So it was only natural for UPRM's Industrial Engineering Department to join INFORMS in organizing a very lively local program for INFORMS Puerto Rico 2007. I am sure you are going to enjoy unforgettable experiences in our paradise island during these next four days.

UPRM is very thankful to the Puerto Rico Convention Bureau, Instituto de Cultura Puertorriqueña, Puerto Rican Tourism Company, the City of San Juan and the several manufacturing companies mentioned elsewhere for enthusiastically underwriting the organization of local events. I invite you to share the unique cultural richness of Puerto Rico with its fascinating history, hospitable inhabitants and festive attitude. We hope that our planned social and cultural activities give you an appreciation of Puerto Rico's US/Hispanic heritage, its striving industrial sector and most importantly, that you will have a chance to enjoy Puerto Rico's greatest resource, its people.

As you wander around the conference please do not hesitate to ask our student volunteers any questions you may have about the conference, the facilities, places to go in our island or our history. They are eager to help you, and why not, teach you few salsa steps!

Jorge I. Velez-Arocho, Ph.D.
Chancellor, University of Puerto Rico at Mayagüez

PROGRAM AT A GLANCE

SUNDAY, JULY 8

The technical program begins at 10:00am with the first Technical Session block, and ends at 3:00pm to enable attendees to catch buses to the Old San Juan tours and the Welcome Reception.

7:00am-3:00pm	Registration	Rio Mar Foyer
9:30am-10:00am	Refreshment Break	Rio Mar Foyer
10:00am-11:30am	Technical Session (SB)	Conference Center
10:00am-3:00pm	Exhibits	Rio Mar Foyer
11:45am-12:15pm	Welcome Session	Rio Mar Salon 5
12:15pm-1:30pm	Lunch Break (lunch available for purchase in meeting area)*	
1:30pm-3:00pm	Technical Sessions (SC)	Conference Center
3:30pm	First buses depart for Old San Juan and Welcome Reception	
5:00pm	Second buses depart for Welcome Reception	
6:00pm-8:30pm	Welcome Reception: La Puntilla, Old San Juan (buses return to hotels about 9:30pm)	

MONDAY, JULY 9

The technical program ends at 3:00pm on Monday.

7:00am-3:00pm	Registration	Rio Mar Foyer
8:00am-5:00pm	Teachers Workshop	Rio Mar Salon 4
8:00am-9:30am	Technical Sessions (MA)	Conference Center
9:00am-3:00pm	Exhibits	Rio Mar Foyer
9:30am-10:00am	Refreshment Break	Rio Mar Foyer
10:00am-11:30am	Technical Sessions (MB)	Conference Center
11:40am-12:30pm	Plenary: Loren Cobb and Michael Gonzalez	Rio Mar Salon 5
12:30pm-1:30pm	Lunch Break (lunch available for purchase in meeting area)*	
1:30pm-3:00pm	Technical Sessions (MC)	Conference Center
7:30pm-9:30pm	General Reception	Vista Verde Garden, Wyndham

TUESDAY, JULY 10

7:00am-5:00pm	Registration	Rio Mar Foyer
8:00am-9:30am	Technical Sessions (TA)	Conference Center
9:00am-4:00pm	Exhibits	Rio Mar Foyer
9:30am-10:00am	Refreshment Break	Rio Mar Foyer
10:00am-11:30am	Technical Sessions (TB)	Conference Center
11:40am-12:30pm	Plenary: Jack Levis	Rio Mar Salon 5
12:30pm-1:30pm	Lunch Break (lunch available for purchase in meeting area)*	
1:30pm-3:00pm	Technical Sessions (TC)	Conference Center
3:00pm-3:30pm	Refreshment Break	Rio Mar Foyer
3:30pm-5:00pm	Technical Sessions (TD)	Conference Center
5:00pm-6:00pm	COIN-OR Users Group Meeting	Rio Mar Salon 4

WEDNESDAY, JULY 11

The meeting ends at 11:30am on Wednesday.

7:30am-11:00am	Registration	Rio Mar Foyer
8:00am-9:30am	Technical Sessions (WA)	Conference Center
9:00am-11:00am	Exhibits	Rio Mar Foyer
9:30am-10:00am	Refreshment Break	Rio Mar Foyer
10:00am-11:30am	Technical Sessions (WB)	Conference Center

*On Sunday, Monday and Tuesday, we'll offer the option of informal lunch in the meeting area, available for purchase.

NOTE:

All technical sessions are held at the Wyndham Rio Mar. For specific room locations, check the Master Track Schedule beginning on page 96 or the Technical Session abstracts beginning on page 19.

INFORMS Puerto Rico QUICK REFERENCE including the Master Track Schedule

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Don't miss this handy reference. It's a separate flyer that came with your program. The Master Track Schedule is also printed beginning on page 96.

BADGES REQUIRED FOR TECHNICAL SESSIONS

INFORMS International Puerto Rico 2007 badges must be worn to all sessions and events. Badges will be checked at the entrance to technical session areas. 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.



SPEAKER INFORMATION

SPEAKER GUIDELINES

Audio/Visual Equipment

Every room will be equipped with an LCD (data) 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.
- Do NOT attempt to run your presentation off the laptop battery, no matter how trustworthy.
- Produce and bring overhead transparencies as a backup.
- 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.

Speaker Ready Room

A Speaker Ready Room (Rio Mar Foyer) is available for you to practice connecting your laptop to the LCD projector. Technical assistance will also be available during the technical sessions for any problems. The Speaker Ready Room will be open during the following hours:

Sunday	9:00am-3:00pm	Monday	7:00am-3:00pm
Tuesday	7:00am-5:00pm	Wednesday	7:00am-11:00am

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 and leave an opportunity for questions. Bring copies of your paper to distribute or provide a handout with information relating to your oral presentation. INFORMS does not produce proceedings with complete papers. To obtain complete copies of any papers abstracted in the program, please contact the authors directly at the addresses supplied with each abstract.

For Assistance During Your Session: Session Monitor Desks

Session Monitor Desks are located in several locations in the Wyndham Rio Mar Conference Center (see the hotel map on page 15 for specific locations). Students from the University of Puerto Rico-Mayaguez will staff these desks. 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.

For Questions about the Program: Program Information Desks

If you have general questions about the meeting program and/or questions about your own presentation, go to the Program Information Desk in the Rio Mar Ballroom Foyer. We also ask Session Chairs to notify the person at the Program Information Desk about any last-minute changes or cancellations in their sessions (these changes will be posted outside the meeting rooms).

GUIDELINES FOR SESSION CHAIRS

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 forms (forms will be in the room).

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 Wyndham 787-888-6000 and ask for the 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 conference using this message board. Please check the message board periodically to see if you have received a message.

Registration

Conference Bags – Sponsored by ILOG



The registration fee includes admittance to all technical sessions, exhibits, refreshment breaks, the Welcome Reception on Sunday evening and the General Reception on Monday evening. Meals other than these two receptions are not included. If your guest would like to accompany you to the receptions, a guest registration must be purchased for \$100 at the INFORMS registration desk. The guest fee includes only the two receptions; guests are not eligible to attend the technical sessions.

EMAIL ACCESS & BUSINESS CENTER

Wyndham Rio Mar

There is free wireless Internet access in the lobby. The Lanier Business Center is open 8:00am-5:00pm Monday-Friday; Saturday 8:00am-12:00pm.

El Conquistador

Wireless Internet access is available in the hotel lobby; the cost is \$5 per hour payable by credit card. The Business Center is open 7 days: 8:00am-5:00pm Monday-Saturday; Sunday - check schedule posted.

In-room Internet access is available at both hotels for \$14.95 per day. There will be no email center available at the conference venue.

HOTEL SHUTTLE AND TRANSPORTATION

HOTEL SHUTTLE: BETWEEN EL CONQUISTADOR & WYNDHAM

DAY-TIME SCHEDULE

INFORMS will operate a regular shuttle service between the El Conquistador and the Wyndham. Buses will run approximately every 30 minutes (a detailed schedule will be posted at both hotels):

	From	To
Sunday, July 8	7:00am	- 5:00pm
Monday, July 9	7:00am	- 5:00pm
Tuesday, July 10	7:00am	- 6:30pm
Wednesday, July 11	7:00am	- 1:00pm

EVENING EVENTS

Special shuttle service will also be provided between the two hotels for the Welcome Reception on Sunday evening and the General Reception on Monday evening.

Welcome Reception, Sunday

2:30pm	Buses will depart El Conquistador for those with tickets to the walking tours of Old San Juan.
4:00pm	Buses will depart El Conquistador for those with tickets to the Reception.
Return to hotels	On return from the Reception to the hotels, selected buses will stop at both hotels. Check the sign in the bus window.

General Reception, Monday

To Wyndham Departs El Conquistador at 6:00pm, 6:30pm and 7:00pm.

CHANGING ROOMS

If you are not staying at the Wyndham but would like to use the Wyndham pool or beach, you can make use of a changing room we have reserved for that purpose. A sign-up sheet and key are available at the INFORMS Registration Desk (Rio Mar Foyer). Use of the room is on a first-come, first-serve basis; you can reserve a 30-minute time in advance. Please remember to return the key when you have finished using the room. Also note that we cannot be responsible for personal items left in the changing room; please do not leave any of your belongings in the room.

PARKING

Wyndham: for hotel guests and INFORMS attendees staying at other hotels, \$15 per day self-parking (with in-and-out privileges).

El Conquistador: for hotel guests, \$15 per day self-parking (with in-and-out privileges).

DEPARTURE TRANSPORTATION: WYNDHAM/EL CONQUISTADOR TO AIRPORT

Taxi service to the Luis Muñoz International Airport from either of the hotels is approximately \$60-80 one-way. We recommend that you select from the following options for bus transportation: (1) the INFORMS-GTA transport service; or (2) one of the hotel transport services. For ALL options, you must RESERVE in advance.

INFORMS-GTA Airport Service

This service is being handled by Global Travel Alliance, the company managing tours for the INFORMS conference.

Price: \$25.50 one-way per person, plus 7% tax. Children ages 2-12, \$12.75. Children under 2, free. To reserve: go to the GTA Tour Desk in the Rio Mar Foyer (near INFORMS Registration). *Note: You must make reservations in advance.*

Wyndham Rio Mar Resort Shuttle

This is the Wyndham's exclusive shuttle service. The hotel recommends that guests depart the hotel 3 hours prior to their flight time. The shuttle from the Wyndham to the airport departs starting at 5:00am and runs every two hours until 7:00pm. Please check the schedule for any changes.

Price: \$27.50 one-way per person, plus 7% tax. Children ages 2-12, \$17.50. Children under 2, free. These are discounted fees; you must mention INFORMS to obtain these fees. To reserve: go to the Wyndham Concierge Desk. *Note: you must make reservations in advance.*

El Conquistador Shuttle

This is the El Conquistador's exclusive shuttle service. For departure, the hotel recommends departing 3 hours prior to flight time. The shuttle departs every hour on the hour; however, please check with the concierge for changes in the shuttle schedule.

Price: \$33 one-way per person, plus 7% tax. Children ages 2-12, \$23; children under 2, free. To reserve: go to the El Conquistador Concierge Desk. *Note: you must make reservations in advance.*



NETWORKING AND SOCIAL EVENTS

WELCOME RECEPTION

Sunday, July 8

3:30pm-9:30pm – Walking Tours, Reception & Return to Hotels

5:00pm-9:30pm – Reception & Return to Hotels

Important: the bus trip to Old San Juan is approximately one hour. Keep in mind that the weather will be hot (90-100 degrees F) and humid for the walking tour.

Sections of the tour require walking up a steep hill.

Institutional Sponsors:

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Guided tours of Old San Juan, a folkloric ballet, hosted rum-tasting, a reception at the historic La Puntilla – this is a real Puerto Rican welcome! The University of Puerto Rico, in partnership with key tourism organizations and local companies, has put together a fabulous multi-event party to showcase genuine Puerto Rican hospitality. The Puerto Rico Rum Producers Association will provide samplers of rum drinks; fruit drinks and soda will also be served. The menu will feature a full dinner of tempting Puerto Rican dishes, including chicken and beef turnovers, corn sticks, yucca fritters, rice and beans, baked turkey and pork, a variety of salads, several styles of meatless pasta, soybean meatballs and dessert.

Walking Tours of Old San Juan; Welcome Reception

3:30pm – Buses depart from the Wyndham.

You must have **reserved in advance** to attend one of these walking tours and take the 3:30pm bus. The two tour options are: (1) walking tour of Old San Juan, with guides from the Tourism Bureau, or (2) self-guided walking tour of Old San Juan. A ticket for the tour you selected is included in your registration badge envelope. You must have a ticket to attend either of these tours and board the bus. After the walking tour, you will be directed to La Puntilla for the Welcome Reception. Please keep in mind that the weather will be hot and humid for the walking tours, and sections of the tour require walking up a steep hill. Dress appropriately and bring bottled water.

Welcome Reception Only

5:00pm – Buses depart from the Wyndham.

You must have **reserved in advance** to attend the reception and board the 5:00pm bus. A ticket for the reception is included in your registration badge envelope. You must have a ticket to board the bus.

Schedule

3:30pm

Buses depart the Wyndham for the two Old San Juan walking tours. If you are staying at the El Conquistador, buses will transport you from the El Conquistador to the Wyndham (see shuttle schedule below). You must have a ticket for one of the two walking tours in order to board the bus.

4:30-6:00pm

Walking tours of Old San Juan.

5:00pm

Buses depart the Wyndham for the Welcome Reception. If you are staying at the El Conquistador, buses will be available to transport you from the El Conquistador to the Wyndham (see shuttle schedule below). You must have a ticket for the reception in order to board the bus.

6:00-8:30pm

Welcome Reception at La Puntilla.

8:30pm

Buses depart from La Puntilla for the return trip. All buses will go to the Wyndham. Selected buses will stop at the Wyndham and continue on to the El Conquistador. Check the sign in the bus window.

8:50pm

The last bus departs.

IMPORTANT: If you decide to stay later in San Juan and do not take the return INFORMS bus, please be aware that taxi service back to either hotel will cost over \$100.

Guest Tickets

If you have not purchased a ticket for your guest(s) and would like to do so, there may still be tickets available. Go to the INFORMS Registration Desk to check availability. The guest registration fee of \$100 includes the Welcome Reception and the Monday evening General Reception. Children ages 6-12 are \$50 (children under 6 are free). Tickets for the Welcome Reception alone are \$50 adult, \$25 children ages 6-12.

Hotel Shuttle for Welcome Reception

The shuttle between the El Conquistador and Wyndham will operate as follows:

2:30pm

Buses will depart El Conquistador for those with tickets to the walking tours of Old San Juan.

4:00pm

Buses will depart El Conquistador for those with tickets to the Reception.

Return

On return from the Reception to the hotels, selected buses will stop at both hotels. Check the sign in the bus window.

Social Events continued

GENERAL RECEPTION – SALSA NIGHT

Monday, July 9
7:30pm-9:30pm
Early salsa lessons begin at 7:00pm
Wyndham Rio Mar, Vista Verde Garden

Learn to salsa! Another fabulous party with a real Puerto Rican flavor, the General Reception offers you a once-in-a-lifetime opportunity to learn to salsa from true experts, students from the University of Puerto Rico. Salsa “tutorials” will be offered at 7:00pm (a half-hour before the reception begins at 7:30pm) and continue during the evening.

After you work up an appetite, you’re invited to enjoy some genuine island cuisine and sample from a variety of foods at this buffet dinner. The party will be held under the stars, at the Wyndham’s Vista Verde Garden. If you are staying at the El Conquistador, buses will be available to transport you between the two hotels before and after the party.

Guest Tickets

If you have not purchased a ticket for your guest(s) and would like to do so, there may still be tickets available. Go to the INFORMS Registration Desk to check availability. The guest registration fee of \$100 includes the Welcome Reception and the Sunday General Reception. Children ages 6-12 are \$50. Children under 6 are free. Tickets for the General Reception alone are \$50 adult, \$25 children ages 6-12.

Hotel Shuttle for General Reception

The shuttle between the El Conquistador and the Wyndham will operate as follows:

To Wyndham: departs El Conquistador at 6:00pm, 6:30pm and 7:00pm.

Return: departs Wyndham at 8:30pm, 9:00pm, 9:30pm and 10:00pm.

Wyndham Casino

The Wyndham Casino is closed for renovation. In order to minimize guests’ inconvenience, the hotel has made arrangements with a local casino so that Wyndham guests are provided with complimentary scheduled transportation to and from the Casino, beginning at 6:00pm and ending at midnight. The Wyndham will also provide a \$20 casino match play per person. For more information, stop by the Concierge Desk or Front Desk.

INFORMS GUEST TOURS

Buses for guest tours depart from the **Wyndham, El Yunque Foyer, Level 3**, at the beginning time listed for each tour. Buses will return to the Wyndham at the ending time listed.

El Yunque Rainforest

Sunday, July 8
9:00am-12:30pm
\$32 (lunch not included)

El Yunque Rainforest is the perfect place to spend some quiet time, take unique photos and enjoy the vistas from a mountaintop location. The Caribe Indians spent some 200 years living in this 28,000 acre tropical paradise, and when you explore the mountain named after their “Good Indian Spirit, Yuquiyu,” you can imagine the serene life they must have lead. The 3,624-foot mountain is home to 240 different species of trees. With over 120 inches of rain each year, a lush ground cover of vines, tubers, ginger and orchids abounds. The sounds of waterfalls blend with those of tropical creatures such as birds and frogs in this sanctuary. Observatories, walking trails and great places to sit and contemplate make this tour a special one.

Catamaran – Sail/Snorkel Buffet

Sunday, July 8
8:30am-1:00pm
\$69 (includes lunch buffet)

Sail/Snorkel Buffet is a 4-hour program that begins with a pickup and transfer to Fajardo’s Puerto de Rey Marina. We will board for a relaxing sail on our majestic catamaran to one of the nearby coral reefs. Throughout the sail you will partake of unlimited Rum Punch, Piña Coladas, soft drinks and assorted snacks including fresh tropical fruit and deli style lunch that consists of Pan de Agua (Spanish style bread), Smoked ham, turkey and salami with swiss and cheddar cheese, lettuce, tomatoes and pickles, pineapple, bananas, seasonal fruits, bar snacks and cookies. When we anchor you may choose to snorkel near a live reef with hundreds of colorful species of fish. Relax on the pristine beaches and crystal clear waters of the Caribbean Sea.

Laguna Grande Bioluminescent Eco-Tour (Las Croabas)

Tuesday, July 10
6:00pm-9:00pm
\$55 (includes boxed snack)

One of Puerto Rico’s most incredible sights must be witnessed in the dark! The precise conditions of mangrove and limited sea access combine to host millions of dinoflagellates, microscopic organisms that release energy in the form of light. These underwater fireworks can be seen in the wake of kayaks paddling silently into the night. The reason for their existence and near extinction will be revealed to you by your guides...an unforgettable adventure!

ADDITIONAL TOURS ON YOUR OWN

GTA TOUR DESK

Global Tourism Alliance (GTA) has prepared a list of tours that may appeal to INFORMS attendees. You can purchase these tours directly at the GTA Tour Desk. Tours offered include: Arecibo Observatory and Camuy Caves, deep sea fishing, St. Thomas excursion by air, Las Cabezas Bay kayaking/snorkeling, a sunset sail, Rio Grande Nature Reserve, shopping in Old San Juan and the Bacardi Distillery, horseback riding and more.

If you have not already made reservations for your return trip from the hotel to the airport, you can do so at the GTA Tour Desk. Reservations must be made 24 hours in advance.

The GTA Tour Desk in the Rio Mar Foyer is open during the following hours:

Sunday	9:00am-3:00pm
Monday	9:00am-3:00pm
Tuesday	9:00am-5:00pm

GUEST REGISTRATION

The program for registered guests includes the Welcome Reception on Sunday evening and the General Reception on Monday evening. The guest fee is US\$ 100. A guest registration may be purchased at the INFORMS registration desk. Registered guests will receive a colored name badge that must be worn for admittance to the receptions. *Guests are not eligible to attend the technical sessions.*

PLENARY PRESENTATIONS

MONDAY, JULY 9

11:40am-12:30pm
Rio Mar Salon 5

The Use of Strategic Gaming and Simulation Modeling to Assist in Policy Decisions in Central and South America

Loren Cobb and Michael A. Gonzalez, Center for Hemispheric Defense Studies

The NationLab Seminar is a successful strategic gaming laboratory that serves Latin American countries in leadership training for government officials and experienced executives who aspire to the highest levels of government. NationLab seminars are intense week-long role-playing that play 1-15 years into the future of the host country, requiring participants to engage in short, medium and long range strategic planning, and implement structural reforms in government, all the while addressing opposition demands, organized crime, endemic corruption and short-term crises ranging from pandemic influenza to natural disasters to foreign financial emergencies. The seminar is driven by the decisions and actions of all the players, rather than by a script or event list. NationLab adjudication is assisted by a sophisticated dynamic simulation model of the socio-economic conditions prevalent in the host country. The consequences of the each day's decisions and actions, good or bad, determine the conditions faced by the players in all succeeding days of the seminar. To date, NationLab has been executed in Bolivia, Colombia, the Dominican Republic, Ecuador, El Salvador, Paraguay, Peru and Uruguay. The Honduran government has requested a seminar to take place in the near future.



Michael A. Gonzalez was appointed to the Center for Hemispheric Defense Studies (CHDS) in October of 2006. Prior to joining the center, he served ten years combined as a defense contractor with

Computer Sciences Corporation, and Northrop Grumman/Information Technology at US Southern Command (USSOUTHCOM) Panama, and Miami, Florida, respectively. Gonzalez was a key player in the development of the command's Theater Strategy for Cooperative Peacetime Engagement. Also, he was the Co-Director and Director, respectively, for Exercise and Simulation Support Group in command post exercises in Peacekeeping Operations in Central, South America and the Caribbean; and Humanitarian Assistance and Disaster Relief exercises in the Dominican Republic, Honduras and El Salvador. A retired US Army officer,

his military background is primarily associated with the U.S. Army Foreign Area officer specialty. Since 1998, Gonzalez has participated in the development and implementation of the NationLab and RegionLab strategic seminars. His academic credentials include a master's in International Relations and a PhD in Political Science.



Loren Cobb received a PhD in mathematical sociology from Cornell University. For fifteen years he was a professor of bio-statistics and applied mathematics at the Medical University of South Carolina

and the University of New Mexico Medical Center, working as a research consultant in the areas of medicine and public health. As a consultant specializing in the modeling and simulation of third-world societies, he has worked for the U.S. Joint Staff, the British and Swedish Ministries of Defense, and U.S. Southern Command. He is the author of numerous simulation models for Peacekeeping and Humanitarian Operations, including two that were written specifically for U.S. Southern Command, and another for a joint project of Sweden and the USA to build a state-of-the-art command center for civil/military peacekeeping and peace enforcement operations. In recent years he has designed and facilitated the NationLab series of seminars and exercises and the RegionLab exercise in international negotiations. Cobb is the author of three books, including *Mathematical Frontiers of the Social and Policy Sciences*, and holds a patent for his commercial software algorithms. In 2004 he was awarded the gold medal of the Bolivian School of High National Studies, for his work in developing the NationLab approach to Bolivian national strategies against corruption, poverty and organized crime.

TUESDAY, JULY 10

11:40am-12:30pm
Rio Mar Ballroom

Package Flow Technologies at UPS

Jack Levis, Director of Package Process Management, UPS

UPS delivers more than 13 million packages daily through its vast delivery network. Package Flow Technologies is part of a process redesign that optimizes the last mile of that network. This award-winning suite of tools is designed to improve customer service and provide greater internal efficiency through optimization, simplification of work and training. This will allow UPS to improve customer service, offer new products and reduce the mileage driven by all of its delivery trucks by more than 100 million miles each year. The talk will explain this breakthrough technology in its current state as well as future plans. It will focus on the challenges encountered in its development and deployment and highlight how operations research was integrated into the process from the beginning.



Jack Levis, Project Portfolio Manager at UPS, is responsible for providing operational technology solutions. The projects that his group manages have reengineered current systems in an effort

to streamline processes and maximize productivity. Under his direction, UPS has completed integration of multiple operations systems, requiring extensive system engineering and usability provisions. These systems ultimately synchronize the flow of data throughout UPS, allowing the seamless movement of goods, funds and information. Levis has been the business owner, process designer and project manager for UPS's award winning Package Flow Technology suite of systems. That suite of tools and process redesign has been a breakthrough change for UPS.

Levis' current role is a natural progression from his prior positions. Since joining UPS in 1976, as a package sorter, he has worked as a manager in multiple operations, an engineering section manager and region transportation planner. In his position as region planning manager, Levis was responsible for the redesign of the Pacific Region transportation plan, resulting in UPS savings of over \$30 million per year. He earned his BA in psychology from California State University Northridge, and also holds a Master's Certificate in Project Management from George Washington University.

OR in the Americas - Special Cluster

Sunday
SB16, 10:00am-11:30am
SC16, 1:30pm-3:00pm
Monday
MA16, 8:00am-9:30am
MB16, 10:00am-11:30am
MC16, 1:30pm-3:30pm
San Cristobal Room

A special feature of the technical program is the "OR in the Americas" cluster. This cluster features talks on innovations in OR theory, applications and practice from countries in the Americas outside the United States. Speakers from Brazil, Chile, Mexico, Puerto Rico and more will present.

Honoring the Legacy of Peter Hammer

Sunday – SB04, 10:00am-11:30am
Rio Mar 4
Tuesday – TD11, 3:30pm-5:00pm
Caribbean 1
Wednesday – WA11, 8:00am-9:30am
Caribbean 1



This special memorial cluster honors the legacy of Peter Hammer (1936-2006). In addition to technical sessions, the cluster includes a fond tribute session to his memory (SB04, Sunday 10:00am-11:30am).

Peter Ladislav Hammer was born in Timisoara, Romania. He earned his PhD at the University of Bucharest and served as a professor at Technion in Haifa, University of Montreal, University of Waterloo and finally at Rutgers University in 1983. Dr. Hammer was the founding Director of RUTCOR (Rutgers University Center for Operations Research), Editor-in-Chief and founder of numerous professional journals, including *Discrete Mathematics*, *Discrete Optimization*, *Annals of Operations Research* and more. His publications include 19 books and over 240 papers. Dr. Hammer's landmark book, *Boolean Methods in Operations Research and Related Areas*, founded the

new area of pseudo-Boolean optimization. He was instrumental in developing a new theory of Boolean functions.

Dr. Hammer was one of the most influential researchers in the fields of OR and discrete applied mathematics, and a relentless organizer of professional conferences and workshops. He received numerous distinctions, including honorary degrees from the Swiss Federal Institute of Technology in Lausanne, University of Rome "La Sapienza," University of Liege, the "George Tzitzeica" prize of the Romanian Academy of Science, and the Euler Medal of the Institute of Combinatorics and its Applications. He was a Fellow of the AAAS and a Founding Fellow of the Institute of Combinatorics and its Applications.

Honoring Alex Rubinov

Monday - MC19, 1:30pm-3:00pm
Sea Gull



A special memorial session will be held in honor of Alex Rubinov (1940-2006), the renowned expert in non-smooth and global optimization. He published over 200 refereed papers and 27 books

and journal special issues, and held the honor of being appointed the first EUROPT Fellow by the European Continuous Optimization Working Group in 2006. Dr. Rubinov was born in Leningrad (now St Petersburg), Russia. He did his undergraduate studies at Leningrad State University, his PhD in Novosibirsk (Siberia) and his academic doctorate at Moscow University.

Dr. Rubinov held positions in Leningrad, Novosibirsk, Kalinin (Russia), Baku (Azerbaijan) and Beersheba (Israel). He joined the University of Ballarat in 1996 where he was appointed Professor of Mathematics, and founding director of the research centre CIAO (Centre for Informatics and Applied Optimization). He was admired not only for his fundamental work in optimization, but also for his great personal character, his readiness to share knowledge, and his avid devotion to promoting research activities in the optimization community. All attendees are invited to join this celebration of his life and our history as a community.

Puerto Rico Area Math Teachers Program

Monday
8:00am-5:00pm
Rio Mar Salon 4

This program, geared to middle/high school/community college math and science teachers, will consist of introductory OR and computer application presentations followed by hands-on participation. Participants are also welcome to attend technical sessions, and will receive copies of all program materials.

COIN-OR Users Meeting

Tuesday
5:00pm-6:00pm
Rio Mar Salon 4

Anyone interested in free open-source software tools, open standards, and on-line repositories of data and models for operations research is encouraged to attend the user meeting of the Computational Infrastructure for Operations Research (COIN-OR). Come meet members of the community, learn more about the initiative, ask questions, get assistance, find out how to publish your own software on COIN-OR, and more.



SUNDAY, JULY 8

■ SB06

10:00am-11:30am
Rio Mar Salon 6

Mathematical Programming in Sports

Cole Smith, University of Florida

This tutorial gives an overview of operations research in sports, with issues ranging from team-ranking algorithms, data analysis and tactical optimization problems. In particular, this tutorial places an emphasis on optimization challenges arising in arranging regular season and tournament schedules. These problems are of particular interest because they are often heavily constrained, multi-objective optimization problems. OR techniques promise an organized method for providing a feasible schedule free of the biases that may drive manually derived schedules.

■ SB22

10:00am-11:30am
Pelican

Advances in Simulation Optimization

Marco Better, OptTek Systems, Inc.

This tutorial will demonstrate how these two traditional areas of OR are combined into a powerful decision-making system. Simulation can model uncertainty while optimization seeks best policies. The sense in which these represent decision-making will be explained in the tutorial, which will include several examples from finance, business process management and supply chain management.

■ SC06

1:30pm-3:00pm
Rio Mar Salon 6

Getting and Dealing with Media Attention for Your Research

Moderator: Candace A. Yano

University of California-Berkeley

Panelists: Sheldon Jacobson, University of Illinois;

Eva Lee, Georgia Institute of Technology;

Gary Bennett, INFORMS

Panelists will offer suggestions on how to get media attention for your research, and how to deal with it when the attention finally arrives, based on their recent personal experiences.

MONDAY, JULY 9

■ MA06

8:00am-9:30am
Rio Mar Salon 6

When More is Better

David Simchi-Levi, MIT

A supply chain setting is inherently characterized by interactions between multiple products and agents seeking to maximize their own utility. In this presentation we use an axiomatic approach to explore the impact of product variety on customer demand, product price, system revenue and inventory levels. These results are applied to two supply chains. The first is a decentralized multi-retailer system where each retailer sells a single product and retailers compete on price. The second supply chain is a single retailer selling multiple competitive products. We use the insight from our analysis to answer the question of whether more consumer choices are better for the customers or the seller.

■ MB06

10:00am-11:30am
Rio Mar Salon 6

An Introduction to Semidefinite Programming and Its Applications

Samuel Burer, University of Iowa

Over the past 15 years, the field of semidefinite programming--which fits somewhere between linear programming and general convex programming--has grown tremendously. This growth can be attributed to a wealth of applications in areas such as combinatorial optimization, machine learning and probability theory. In this tutorial, we introduce semidefinite programming, trace its history, touch on algorithms and software for its solution, and detail a number of applications.

■ MC06

1:30pm-3:00pm
Rio Mar Salon 6

Does More Money Buy You More Happiness?

Rakesh K. Sarin, UCLA

We examine empirical evidence on the relationship between income and happiness. The first empirical finding is that, within a society, richer people are happier than poorer ones. The second finding is that, for a given country, average well-being has not improved over time in spite of large gains in per capita income. We propose a model of adaptation and social comparison for valuing time streams of consumption. The model explains the puzzle: why do we believe that more money will buy us more happiness (when in fact it does not)?

■ MC08

1:30pm-3:00pm
Rio Mar Salon 8

Combinatorial Auctions

S. Raghavan, University of Maryland

Combinatorial auctions allow bidders to bid on combinations of goods being sold in an auction. When there are complement or substitution effects amongst goods being sold, combinatorial auctions permit bidders to better express their preferences, allowing for the efficient allocation of goods. However, this comes at a significant price in terms of the computational complexity of the auction. In this tutorial we provide an overview of current research in mathematical programming related issues in combinatorial auctions. We also discuss a number of applications of combinatorial auctions in both the public and private sector. Finally, we examine the topic of search auctions that today are the largest source of revenue for search sites like Yahoo and Google.

TUESDAY, JULY 10

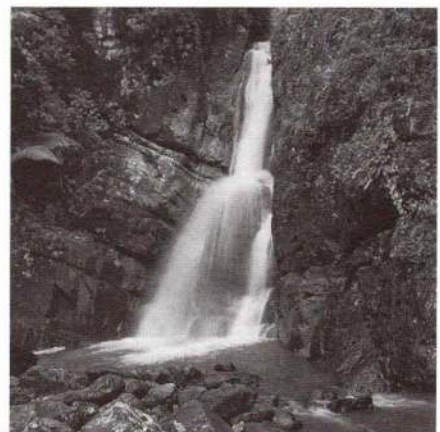
■ TA06

8:00am-9:30am
Rio Mar Salon 6

Linking Decision Analysis and Behavioral Decision Research

Robert Clemen, Duke University

Results from behavioral decision research can be used to improve prescriptive decision analysis (DA) methods. I will review several examples in the modeling of uncertainty and preferences and point toward possibilities for future work. Developing new DA methods will also require techniques for evaluating how well they work; the talk will also suggest procedures for studying the effectiveness of DA methods. My goal is to provide a starting point for reading and thinking about these issues.



■ TA08

8:00am-9:30am

Rio Mar Salon 8

Introduction to Social Network Analysis for the Operations Research and Management Science Community

Mary Helander and Kate Ehrlich, IBM Research

This tutorial introduces basic concepts of social network analysis (SNA) for the OR/MS community. SNA will be explored as an established methodology for revealing patterns of human communication and decision-making. Examples will illustrate SNA use to detect communication and other issues impacting team performance. Current advances in data capture, analysis and interpretation, as well as the connection to the current "social computing" movement will also be discussed.

■ TB06

10:00am-11:30am

Rio Mar Salon 6

Toward a Science of White-Collar Workforce Management

Wallace J. Hopp, Northwestern University

White-collar service and professional jobs dominate the U.S. economy, but the majority of operations management models and analyses focus on blue collar manufacturing systems. In this session, we discuss a framework for organizing existing research streams in various fields relevant to knowledge-based white-collar work, highlight significant emerging results and point toward future research opportunities.

■ TC06

1:30pm-3:00pm

Rio Mar Salon 6

Symmetry in Integer Programming

Francois Margot, Carnegie Mellon University

This is an overview of techniques used to handle symmetries in integer linear programming problems. Three different approaches will be discussed: reformulations (based on column generation and permutation groups), symmetry-breaking inequalities (associated with relatively simple symmetry groups), and isomorphism pruning (delete isomorphic sub-problems in the enumeration tree).

■ TD06

3:30pm-5:00pm

Rio Mar Salon 6

Modeling and Optimizing Nonlinear Systems in Integrated Computing Environments

Janos D. Pinter, Pinter Consulting Services Inc

Nonlinear optimization models are developed and solved across the sciences and engineering. In this tutorial, we place an emphasis on building and solving models in Maple and Mathematica. Both systems include advanced modeling features and nonlinear optimization functionality, enhanced by add-on optimization packages. A brief introduction to global optimization is followed by interesting examples and a review of real-world applications.

WEDNESDAY, JULY 11

■ WA06

8:00am-9:30am

Rio Mar Salon 6

Perl in an Hour

Vernon Austel, IBM

Perl is popular scripting language that makes it easy to change the format of a text file or extract information from it. One can accomplish a great deal using less than a page of code. This tutorial will introduce Perl with simple but useful examples. Only a basic knowledge of regular expressions will be assumed.

■ WA08

8:00am-9:30am

Rio Mar Salon 8

Healthcare Facility Evacuation – Plans, Requirements and Effectiveness

Kevin Taaffe, Clemson University

All health care facilities are required to have evacuation plans in place. While there are many tools for hurricane or transportation modeling, none of these tools address the complications in carrying out the tasks in a health care facility evacuation. In this tutorial, we will discuss three key elements of the health care facility evacuation problem: staffing, transportation and sheltering. We will offer a quantitative-based methodology for measuring a plan's effectiveness.

■ WB06

10:00am-11:30am

Rio Mar Salon 6

Systems Decision Process

Gregory S. Parnell, U.S. Military Academy

We present a systems decision process for determining solutions to problems with uncertainties, complex alternatives, conflicting objectives and significant resource implications. The process phases are problem definition, solution design, decision-making and solution implementation. The process uses systems thinking, modeling, multiobjective decision analysis, optimization, simulation, life cycle costing and project management techniques. An example is given using Excel macros and add-ins.

■ WB16

10:00am-11:30am

San Cristobal

FAQs about Dynamic Programming

Moshe Sniedovich, University of Melbourne

In this tutorial we shall address some of the basic questions regarding the methodological, theoretical and computational aspects of dynamic programming.

REFRESHMENT BREAKS

All breaks will be held in the Rio Mar Ballroom Foyer.

Sunday, July 8

9:30am-10:00am

Tuesday, July 10

9:30am – 10:00am

3:00pm – 3:30pm

Monday, July 9

9:30am – 10:00am

Wednesday, July 11

9:30am – 10:00am

GUIDE TO EXHIBITS

Visit the exhibits located at the
Wyndham, Rio Mar Ballroom Foyer.
Exhibit hours:

Sunday	10:00am-3:00pm
Monday	9:00am-3:00pm
Tuesday	9:00am-4:00pm
Wednesday	9:00am-11:00am

SOFTWARE SEMINARS

Rio Mar Salon 4

AMPL Optimization LLC - Enhanced Solver Support in the AMPL Modeling Language
Sunday – SC04, 1:30pm-3:30pm

SAS Institute Inc.
Delivering OR Bundled with SAS Analytics via a Spreadsheet
Tuesday – TA04, 8:00am-9:30am

GAMS Development Corp.
Application Prototyping with GAMS
Tuesday – TB04, 10:00am-11:30am

ILOG, Inc.
OPL and ODM for Model Development
Tuesday – TD04, 3:30pm-5:00pm

AMPL Optimization LLC
900 Sierra Pl. SE
Albuquerque, NM 87108-3379
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www.ampl.com

AMPL Optimization LLC develops and supports the AMPL modeling language, the most powerful tool for working with the large, complex linear and non-linear optimization problems that arise in a broad variety of applications. AMPL Optimization distributes AMPL and several large-scale solvers, including Ziena Optimization's KNITRO, ARKI Development's CONOPT, Optirisk Systems' FortMP/QP/SP and SAMPL/SPInE, and the AMPL Studio graphical user interface and Windows COM objects developed by OptiRisk.

COIN-OR
www.coin-or.org

Visit the Computational Infrastructure for Operations Research (COIN-OR) table to learn about free, open-source tools for OR professionals and students. COIN-OR is celebrating its seventh year as a non-profit initiative to build an open infrastructure of algorithms, models, data and other digital resources for the OR community. Over two-dozen projects including solvers, interfaces, frameworks, modeling languages and more are available on-demand, free of charge at www.coin-or.org. COIN-OR is hosted on-line by INFORMS.

GAMS Development Corp.
1217 Potomac St. NW
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The General Algebraic Modeling System (GAMS) is a high-level modeling system for mathematical programming problems. It consists of a language compiler and a stable of integrated high-performance solvers. GAMS is tailored to create complex, large-scale modeling applications, and allows the user to build large maintainable models that can be adapted quickly to new situations.

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LINKS-simulations.com markets 10 LINKS simulations variants to the higher education community. OR/MS faculty will be especially interested in the LINKS Supply Chain Management Simulation which is used in leading supply chain management programs such as Arizona State, MIT-Zaragoza International Logistics Program, Ohio State, Penn State and Wisconsin.

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Combined Book Display

Visit the combined book display for important titles from EDP Sciences and Taylor & Francis.



HOTEL FLOOR PLANS

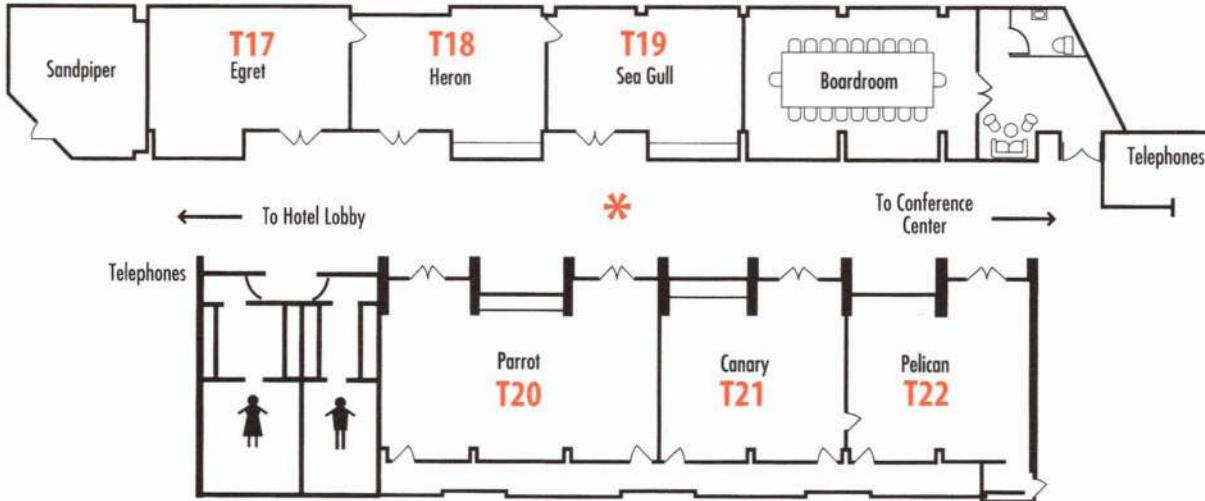
Wyndham Rio Mar

Track Numbers are shown for Technical Session rooms

LEVEL 2 MEZZANINE

Tracks
17-22

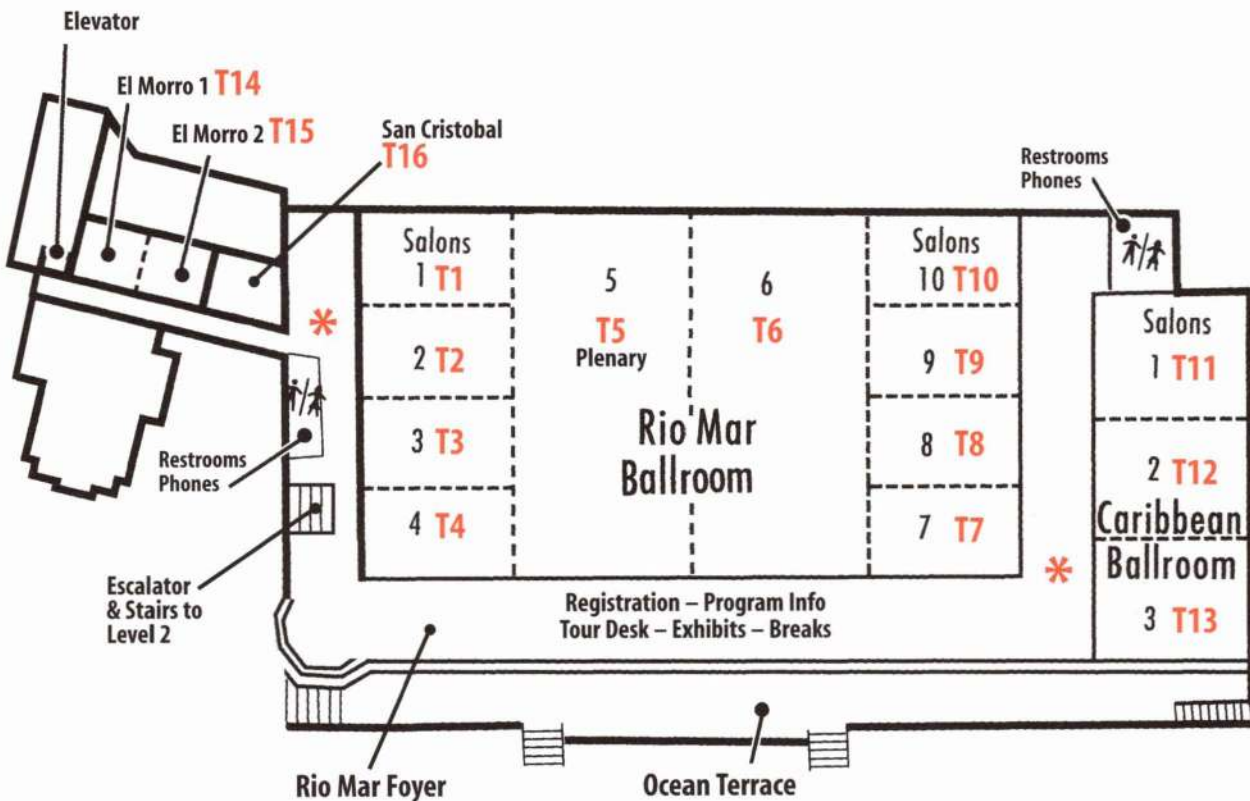
* Session Monitor Desk



LEVEL 1/CONFERENCE CENTER

15

Tracks
1-16



INVITED CLUSTER CHAIRS

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FUTURE INFORMS MEETINGS

INFORMS MEETINGS

2007

July 26-29

INFORMS Teaching of Management Science Workshop

Georgia Institute of Technology
Atlanta, Georgia

Chair: Stephen G. Powell

meetings.informs.org/TMSWorkshop/TMS07/

November 4-7

INFORMS Annual Meeting 2007 Seattle

Washington State Convention and Trade Center &
Sheraton Seattle

Seattle, Washington

Chair: Zelda B. Zabinsky, University of Washington

www.informs.org/Conf/Seattle07

2008

April 13-15

INFORMS Practice Conference: Applying Science to the Art of Business

Baltimore Marriott Waterfront
Baltimore, Maryland

Chair: Karl G. Kempf, Intel Corporation

www.informs.org/Conf/Practice08

October 12-15

INFORMS Annual Meeting 2008 Washington

Marriott Wardman Park Hotel &

Omni Shoreham Hotel

Washington, DC

Chair: Hani S. Mahmassani, University of Maryland

masmah@mail.umd.edu

2009

April 26-28, 2009

INFORMS Practice Conference: Applying Science to the Art of Business

Sheraton Phoenix Downtown
Phoenix, Arizona

October 11-14

INFORMS Annual Meeting 2009 San Diego

San Diego Convention Center and Hilton San Diego

Chair: Soheila Jorjani, California State University-
San Marcos

sjorjani@csusm.edu

2010

November 7-10

INFORMS Annual Meeting 2010 Austin

Austin Convention Center and Hilton Austin

Chair: Jonathan Bard, University of Texas at Austin

jbard@mail.utexas.edu

IFORS 2008

July 14-18

Sandton Convention Centre
Sandton, South Africa

www.ifors2008.org

CORS/INFORMS International Toronto 2009

June 14-17

Westin Harbour Castle

Toronto, Ontario, Canada

Chair: Liping Fang, Ryerson University

lfang@ryerson.ca

ALIO-INFORMS International Buenos Aires, Argentina 2010

Watch for the announcement of a Joint ALIO-
INFORMS International meeting in
May/June of 2010.

INFORMS SUBDIVISION MEETINGS

2007

August 24-25

INFORMS Midwest Regional Conference

Northwestern University
Evanston, Illinois

Chair: Sanjay Mehrotra, Northwestern University

www.informs.org/site/RC_Midwest_2007/

November 3-4

CIST-INFORMS Conference on Information Systems and Technology

Seattle, Washington

Chairs: Paulo Goes, University of Connecticut

Arvind Malhotra, University of North Carolina

www.citi.uconn.edu/cist07/

December 9-12

Winter Simulation Conference 2007

JW Marriott

Washington, DC

Chair: Jeffrey Tew

www.wintersim.org

2008

March 27-29

INFORMS Telecommunications Conference

University of Maryland

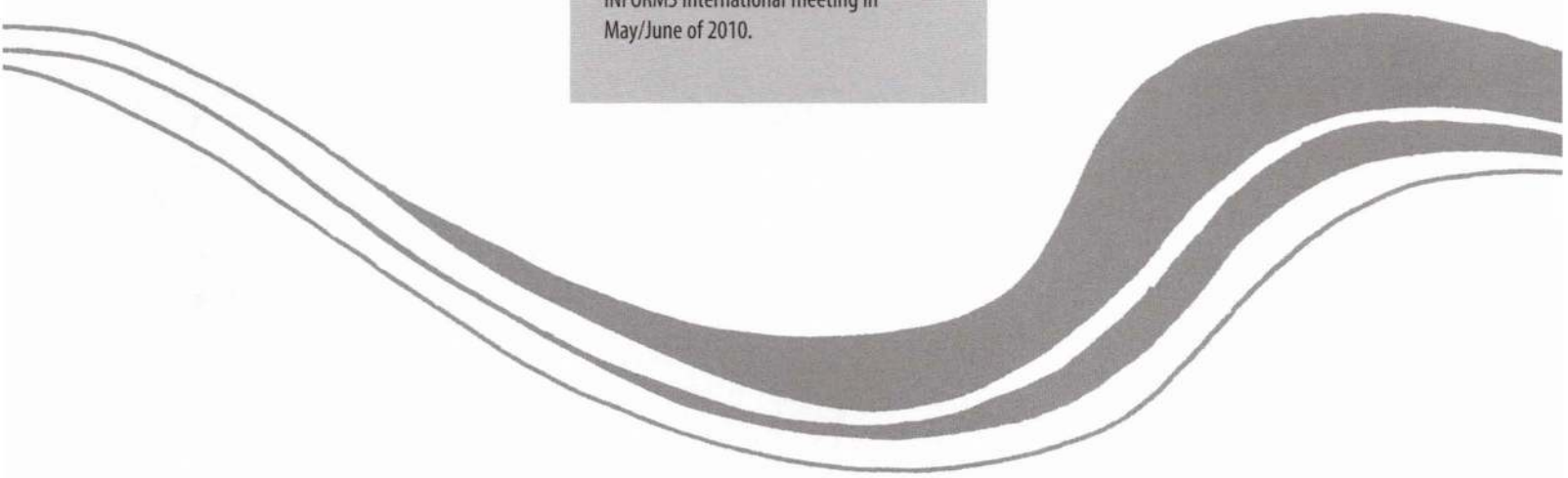
College Park, Maryland

Chairs: S. Raghavan and Bruce Golden, University of

Maryland; Edward Wasil, American University

<http://telecom.section.informs.org/conference08>

Go to www.informs.org/Conf for a searchable
INFORMS Conference Calendar.



How to Navigate the Technical Sessions

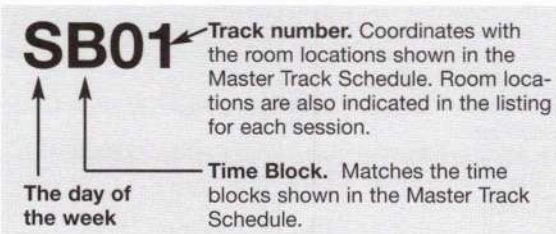
There are four primary resources to help you understand and navigate the Technical Sessions:

- 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 87-95).
- The map and floor plans on page 15 show you where technical session tracks are located.
- The "Master Track Schedule" is on page 96. 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 88-92 — 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

- A — 8:00am - 9:30am
- B — 10:00am - 11:30am
- C — 1:30pm - 3:00pm
- D — 3:30pm - 5:00pm

Room Locations/Tracks

All tracks and technical sessions are held in the Wyndham Rio Mar. Room numbers are shown on the Master Track Schedule and in the technical session listing.

Quick Reference

Don't miss the "Quick Reference," a separate flier you received in your registration packet. It includes the Master Track Schedule and floor plans, providing a quick, portable summary of the meeting

Sunday, 10:00 - 11:30am

■ SB01

Rio Mar Salon 1

Current Issues in Project Scheduling

Cluster: Project Management and Scheduling
Invited Session

Chair: Erik Demeulemeester, Professor, FETEW, Katholieke Universiteit Leuven, Naamsestraat 69, Leuven, B-3000, Belgium, Erik.Demeulemeester@econ.kuleuven.be

1 - Time Buffering Approaches for Robust Project Scheduling When Faced With Resource Breakdowns

Olivier Lambrechts, FETEW, Katholieke Universiteit Leuven, Naamsestraat 69, Leuven, B-3000, Belgium, Olivier.Lambrechts@econ.kuleuven.be, Erik Demeulemeester, Willy Herroelen

In order to cope with the uncertainty inherent in practical project management various strategies can be used. We present a number of proactive approaches that try to accommodate disruptions in advance to minimize the deviation between the baseline schedule and the repaired schedule when solving the RCPSP subject to unexpected resource breakdowns. This is done by inserting explicit idle time into the schedule using approaches based on simulation and on surrogate robustness measures.

2 - A Reactive Scheduling Procedure for the Multi-Mode Resource Constrained Project Scheduling Problem

Filip Deblaere, FETEW, Katholieke Universiteit Leuven, Naamsestraat 69, Leuven, B-3000, Belgium, Filip.Deblaere@econ.kuleuven.be, Willy Herroelen, Erik Demeulemeester

The multi-mode resource-constrained project scheduling problem involves the determination of a baseline schedule of the project activities, which can be executed in multiple modes, satisfying the precedence relations and resource constraints while minimizing the project duration. During the execution of the project, the baseline schedule may become unfeasible due to numerous types of disruptions. We propose a reactive scheduling procedure for the MRCPSPP for restoring a disrupted schedule.

3 - Heuristic Procedures for the Selection and Planning of Dynamically Arriving Project Offers

Jade Herbots, FETEW, Katholieke Universiteit Leuven, Naamsestraat 69, Leuven, B-3000, Belgium, Jade.Herbots@econ.kuleuven.be, Roel Leus, Willy Herroelen, Erik Demeulemeester

We develop heuristic procedures for selecting and planning dynamically arriving project offers under limited regular and non-regular resources. The goal consists of maximizing the expected profits within a finite problem horizon. The way the projects are planned affects their payout time and as a consequence, the reinvestment revenues, as well as the available capacity for future arriving projects. We perform simulation experiments to compare our algorithms to methods commonly used in practice.

4 - R&D-Project Scheduling When Activities May Fail

Roel Leus, Prof. Dr., FETEW; Katholieke Universiteit Leuven, Naamsestraat 69, Leuven, B-3000, Belgium, Roel.Leus@econ.kuleuven.be, Bert De Reyck, Pascale Crama

We tackle the problem of scheduling the activities of an R&D project. The goal is to maximize the expected net present value of the project, taking into account the activity costs, the cash flows generated by a successful project, the activity durations and the probability of failure of each of the activities. We formulate the problem, show that it is NP-hard, develop a branch-and-bound algorithm that allows to obtain optimal solutions, and we provide extensive computational results.

■ SB02

Rio Mar Salon 2

Issues in Supply Chain Management

Sponsor: Manufacturing & Service Operations Management
Sponsored Session

Chair: Mahesh Nagarajan, Sauder School of Business Faculty,
mahesh.nagarajan@sauder.ubc.ca

Co-Chair: Greys Susic, Assistant Professor, University of Southern
California, Los Angeles, CA, susic@marshall.usc.edu

1 - Coalition Stability in Assembly Models

Greys Susic, Assistant Professor, University of Southern California, Los
Angeles, CA, susic@marshall.usc.edu

In this talk, we examine a decentralized assembly system where n component manufacturers sell to a single downstream assembler who faces deterministic price sensitive demand. We look at three types of competition — Supplier Stackelberg, Vertical Nash, and Assembler Stackelberg — and in each type allow the suppliers to freely form coalitions among themselves. Using dynamic concepts of stability, we predict the structure of the stable supplier coalitions.

2 - Should a Retailer Sell its Store-Brand Factory?

Candi Yano, Professor, University of California at Berkeley, 4141
Etcheverry Hall, Berkeley, CA, 94720-1777, yano@ieor.berkeley.edu,
Elizabeth Durango-Cohen

Many grocery chains own factories that produce their store-brand products, but they often wonder whether they should sell their factories. We investigate this issue in situations where store-brand and national-brand products compete at the retail level. The national brand manufacturer chooses the wholesale price for its product. The retailer chooses retail prices to maximize profit from both products. We characterize conditions in which the retailer should or should not sell the factory.

3 - Entrepreneurs, Newsvendors and Risk Profiles: An Empirical Perspective

Charles Corbett, Professor, UCLA Anderson School of Management,
110 Westwood Plaza, Box 951481, Los Angeles, 90095-1481,
United States, charles.corbett@anderson.ucla.edu, Jan Fransoo

We empirically assess whether entrepreneurs follow the newsvendor model in making inventory decisions, and the role of their risk preferences, based on a survey of some 50 entrepreneurs. Our findings suggest that entrepreneurs do follow the newsvendor logic, and that their risk profiles are consistent with prospect theory. We also find that risk aversion for profits is associated with higher safety stocks, in contradiction to existing theory.

■ SB03

Rio Mar Salon 3

Supply Chain Optimization and Risk Management

Contributed Session

Chair: Fouad El Ouardighi, Professor, ESSEC Business School,
Av B. Hirsch, Cergy, 95021, France, elouardighi@essec.fr

1 - Multi-Objective Customer Order Acceptance and Due Date Setting

Tadeusz Sawik, Professor, AGH University of Science & Technology,
Department of OR & IT, Al. Mickiewicza 30, Krakow, 30059, Poland,
ghsawik@cyf-kr.edu.pl

A new integer programming approach is proposed to bi-objective customer order acceptance and due date setting in make-to-order manufacturing. The problem objective is to select maximal subset of customer orders that can be completed by requested dates and to delay due dates for the remaining orders to minimize their total or maximum tardiness, as a secondary criterion. Numerical examples are provided and some computational results are reported.

2 - A Decentralized Information Security Model for Collecting and Managing RFID Data

Mordechai Gal-Or, Duquesne University, School of Business,
Rockwell Hall, Pittsburgh, PA, 15282, United States, galor@duq.edu,
Jerrold May, Kathleen Hartzel, William Spangler

This study explores an information security model for product data collected via RFID, which balances the security issues inherent in the technology with the need for both companies and consumers to access relevant portions of the collected data. We describe an approach in which a product's distribution history is assembled into a database model capable of imposing access controls based on various information usage roles.

3 - Design Supply Chain Distribution Network Under Uncertainty and Performance Improvement

Eleazar Herrera, Student, UPRM, Mayagüez, PR, 00680,
United States, gileleazar@hotmail.com, Ahad Ali

This research focuses on designing distribution network of the supply chain under uncertainty. The goal is to develop an optimization model to the integrated electronic supply chain and determine the optimal supply chain network based on the objectives and the constraints restricted by uncertainty. The model will provide a performance evaluation for the network and evaluate the impact of e-business and assessing the sensitivity to uncertainty associated with factors that change over time.

4 - Wholesale Price and Revenue Sharing Contracts in a Dynamic Game of Supply Chain Management

Fouad El Ouardighi, Professor, ESSEC Business School,
Av B. Hirsch, Cergy, 95021, France, elouardighi@essec.fr

This paper emphasizes some important differences between wholesale price contract and revenue-sharing contract in supply chain management. For this purpose, the paper develops a dynamic game model involving operations and marketing activities that are performed by a manufacturer and a retailer in a simple two-member supply chain. Among the issues addressed are the path of inventories over time, and the trade-off between attracting new customers and improving the loyalty of current customers.

■ SB04

Rio Mar Salon 4

Peter Hammer's Memorial Session

Cluster: Honoring the Legacy of Peter Hammer
Invited Session

Chair: Bruno Simeone, Professor, La Sapienza University,
Piazzale Aldo Moro 5, Rome, Italy, bruno.simeone@uniroma1.it

1 - Peter Hammer: The Scholar and the Person

Bruno Simeone, Professor, La Sapienza University, Piazzale Aldo
Moro 5, Rome, Italy, bruno.simeone@uniroma1.it

The present talk intends to be a fond tribute to the memory of Peter Hammer by one of his earlier students, co-author of 30 papers, and a long-time friend for over 35 years. I have chosen to collect and tell several anecdotes and short stories to evoke his charismatic figure of Scholar and leader, his incredible energy, his warm humanity, as well as minor, but unforgettable, traits of his personality. Those who have had the chance to make his acquaintance will recognize familiar circumstances.

2 - Polyhedral Representation of Solutions of a Homogeneous Linear Recurrence Relation

Bahman Kalantari, Professor, Rutgers University, 110 Frelinghuysen
Road, Piscataway, NJ, 08854, United States of America,
kalantar@cs.rutgers.edu

We give polyhedral representation of solutions of a homogeneous linear recurrence relation and study its applications. This is based on connections to a fundamental family of iteration functions for polynomials and inspire novel applications of linear or integer programming, over the real or complex numbers. As a particular application, we define a zero-one Fibonacci polytope and apply our results to derive new identities and insights, even in the case of Fibonacci and Lucas recurrences.

3 - Life at RUTCOR: An Insider's View on Peter Hammer's Center for Operations Research

Mario Cordova, Associate Professor, University of Puerto Rico,
Mayagüez, P.O. Box 9009, Mayagüez, PR, 00681-9009, Puerto Rico,
drcordova@yahoo.com

From the point of view of the only Puerto Rican to graduate from RUTCOR to date, this talk describes the Center's role in the Operations Research community. It also gives an account of the academic and social environment that permeated everyday life at the Center. Special emphasis is given on how it all fitted Dr. Hammer's vision for RUTCOR and his leadership role in shaping it into what it is today.

■ SB05

Rio Mar Salon 5

Logistics Network Design and InventorySponsor: Location Analysis
Sponsored SessionChair: Erhan Kutanoglu, Professor, University of Texas at Austin,
United States, erhank@mail.utexas.edu**1 - A Multi-Product Network Design Model With Lead Time and Safety Stock Considerations**

Reha Uzsoy, Professor, Purdue University, School of Industrial Engineering, West Lafayette, IN, 47907-1287, United States, uzsoy@ecn.purdue.edu, Leyla Ozsen, Karthik Sourirajan

We study a multi-product network design problem in which we explicitly model the non-linear relationships between demand assigned to a DC, replenishment lead times and safety stocks. While lead time congestion can be thought of as a global network property that depends on the total demand flows, safety stock risk-pooling can be thought of as a local network property that depends on individual products' demand flows. Our model captures the trade-off between these properties.

2 - Two-Echelon Location Heuristic With Risk-Pooling (TLHRP) for LRIP

Leyla Ozsen, Assistant Professor, Purdue University, 315 N. Grant Street, Lafayette, IN, 47907, lozsen@ecn.purdue.edu, Abdul Alenezi

We introduce a Location-Routing-Inventory Model (LRIP) in which each chosen distribution center (DC) maintains safety stock for designated set of customers, each facing stochastic demand. Multiple customers can be served by one vehicle. The objective of the LRIP is to minimize location, routing, and inventory costs. We develop a two-phase heuristic: location and clustering first and routing second to solve the LRIP. The first phase is formulated as a two-echelon location problem with risk-pooling.

3 - Customer-Centric Service Levels and Inventory Sharing in Service Parts Logistics Network Design and Inventory Problems

Erhan Kutanoglu, Professor, University of Texas at Austin, United States, erhank@mail.utexas.edu, Ilyas M. Iyoob, Mehmet F. Candas

We study two important extensions of the integrated network design and inventory problem motivated by the low-demand systems such as after market service parts logistics: The first extension seeks to satisfy customer-centric time-based service levels, instead of aggregated regional service levels that span multiple customers. The second considers inventory sharing explicitly as part of a location, allocation and inventory problem. We analyze special cases of both problems, draw analytical observations, and present computational results for both problems.

■ SB06

Rio Mar Salon 6

Tutorial: Mathematical Programming in SportsCluster: Tutorials
Invited SessionChair: Cole Smith, Associate Professor, University of Florida,
P.O. Box 116595, Gainesville, FL, 32611-6595, United States,
j.cole.smith@gmail.com**1 - Tutorial: Mathematical Programming in Sports**Cole Smith, Associate Professor, University of Florida,
P.O. Box 116595, Gainesville, FL, 32611-6595, United States,
j.cole.smith@gmail.com

This tutorial gives an overview of Operations Research in sports, with issues ranging from team-ranking algorithms, data analysis, and tactical optimization problems. In particular, this tutorial places an emphasis on optimization challenges arising in arranging regular season and tournament schedules. These problems are of particular interest because they are often heavily constrained, multi-objective optimization problems. OR techniques promise an organized method for providing a feasible schedule free of the biases that may drive manually-derived schedules.

■ SB07

Rio Mar Salon 7

Joint Session ICS/Minority Issues/OptimizationSponsor: Interface of Computing Science & OR, Minority Issues,
Optimization
Sponsored Session

Chair: Illya Hicks, Associate Professor, Rice University, Dept. of Computational & Applied Math, 6100 Main St. - MS 134, Rice University, Houston, TX, 77005, ivhicks@rice.edu

1 - Composition of Stable Set Polyhedra

Benjamin McClosky, Rice University, bjm4@rice.edu, Illya Hicks

Barahona and Mahjoub defined the minimal system of the stable set polytope for a graph G when G has a cut-set of cardinality 2. We extend this result, derive a class of facets, and provide a short proof for a theorem of Chvatal.

2 - A Cooperative Search Heuristic to Infer Evolutionary Trees

Tiffani Williams, Texas A&M University, Department of Computer Science, College Station, TX, 77845, United States, tlw@cs.tamu.edu

Phylogenetic (or evolutionary) trees model the evolution of biological species or genes from a common ancestor. We present a novel heuristic that leverages the power of cooperation to reconstruct large-scale evolutionary trees quickly and accurately. In particular, our approach is based on a hybrid evolutionary algorithm composed of a population-based global search with individual local searches. Extensive experimental results validate the effectiveness of the proposed approach.

3 - Mathematically Correct Political DistrictingHayri Onal, ACE, University of Illinois at Urbana-Champaign,
h-onal@uiuc.edu

Political districting aims to divide a target area into mutually disjoint geographical units (districts) with almost equal populations while satisfying certain spatial and social criteria including compactness, contiguity, and community integrity. This paper presents integer programming formulations of districting and computational experience with medium and large scale data sets.

■ SB08

Rio Mar Salon 8

Evolutionary Algorithms

Contributed Session

Chair: Ole Brodersen, Institut fuer Wirtschaftsinformatik, Dep. II,
Platz der Goettinger Sieben 3, Goettingen, 37073, Germany,
obroder@uni-goettingen.de**1 - Detection of Spatial Hot-Spots Using a Multiobjective Evolutionary Algorithm**Carlos Ramon Garcia-Alonso, ETEA, University of Cordoba, C/
Escritor Castilla Aguayo, 4, Cordoba, 14004, Spain, cgarcia@etea.com,
Leonor Maria Perez-Naranjo

This paper focuses on the detection of hot-spots in geographical projections (Kernel) of local autocorrelation and relative risk (bayesian approach) scores. An evolutionary algorithm is designed to solve this model. Users can optimize autocorrelation scores, their standard deviation and the sum of minimum geographical distances (dynamic programming problem) considering only non-dominated solutions. The algorithm and its selection, crossover and mutation operators are tested in a real problem.

2 - A Study on Advanced Image Classification TechniqueDong Sik Jang, Korea University, 522, Engineering Building, Anam-dong, Seongbuk-gu, Seoul, 136-713, South Korea, jang@korea.ac.kr,
Sang Sung Park, Young Geun Shin

This paper proposes an image classification algorithm using a model combined with two algorithms, Genetic and Back-Propagation under the mass database. An image feature vector based on contents used color and texture. The accuracy of the image classification is improved by the proposed model that retrieves an optimal feature vector set.

3 - Personalized Web Search Using Text Categorization and Intelligent Agents

Jaime Mora Vargas, Maestría en Ciencias con especialidad en Ingeniería Industrial (MII), Escuela de Graduados en Ingeniería y Ciencias (EGIC), Tecnológico de Monterrey, Campus Estado de México, Mexico, jmora@itesm.mx

One of the main activities for any internet user is to search for information. To do this, there are many search engines available in order to retrieve web pages having related information to keywords or phrases given by the user. Even though, search engines are very fast, the enormous amount of information available converts the web-searching into a manual process in which the user manually selects the most useful and relevant documents. This process is usually very time-consuming. In this work, we propose a method to help users to make a personalized on-line

classification of the search results, based on Support Vector Machines as a front end to popular search engines to classify the results. We use a fixed set of categories for initial classification allowing the system to learn new categories provided by user's feedback.

4 - Optimizing a Stochastic Warehouse Using Particle Swarm Optimization

Ole Brodersen, Institut fuer Wirtschaftsinformatik, Dep. II, Platz der Goettinger Sieben 3, Goettingen, 37073, Germany, obroder@uni-goettingen.de, Matthias Schumann

Particle Swarm Optimization is a population based search strategy based on the idea of the simulation of bird flocks. In this paper we will introduce an application of the PSO to a management problem. The simulated stochastic 2-product-warehouse with the parameters order amount and safety stock is a capital oriented model with the goal to maximize the capital value. PSO finds optimal values for order amount and safety stock compared to a partial enumeration of the problem parameters.

SB09

Rio Mar Salon 9

Business Applications

Contributed Session

Chair: Jishan Zhu, Professor, Long Island University, 1 University Plaza, Brooklyn, NY, 11803, United States, jishan.zhu@liu.edu

1 - Challenges to Cost Analysis Early in Concept Development

Kirk Hoy, President, Summit Engineering Group, 102 Paul Mellon Court, Suite 1, Waldorf, MD, 20602, United States, khoy@summit-group.com

The defense acquisition community invested heavily to enable simulation of systems early in concept development. Estimating the cost of concepts requires new approaches. Likewise, the OR community lacks tools and processes to define concepts in terms of technology feasibility within a specified time horizon. This presentation provides examples of these challenges.

2 - Modeling Opportunities in Email Management Issues

Ramesh Sharda, Department of MSIS, Spears School of Business, Oklahoma State University, Stillwater, OK, ramesh.sharda@okstate.edu, Ashish Gupta

Email has become an indispensable tool of a modern worker, but it has also led to problems such as email addition, email overload, and of course, spam. Issues such as how often to check email, when to switch, how much time to spend on checking email, etc., can benefit from analytical approach to making these decisions. Yet these problems have received little attention in the use of various ORMS techniques in this practically untapped domain of "email management". In this presentation, we first describe various problems related to email processing and then identify potential ORMS modeling opportunities for each problem. We summarize our studies that have applied ORMS techniques to some of these problems. Example applications have applied simulation, queuing theory, inventory theory, and semi-markov decision processes, among others.

3 - Profitability Analysis of Free Upgrade Policy

Jishan Zhu, Professor, Long Island University, 1 University Plaza, Brooklyn, NY, 11803, United States, jishan.zhu@liu.edu

We consider a firm selling two similar products with different prices. When the lower-priced product is out of stock, the firm supplies the customer a higher-priced product with the lower-priced product price. The policy is called free upgrade. In this paper, we study the profitability of such policy. We formulate the problem as a two-product newsvendor problem, and prove that the firm achieves more profit with the free upgrade policy.

SB10

Rio Mar Salon 10

OR in the Forest Sector I

Cluster: OR in the Forest Sector
Invited Session

Chair: Peter Lohmander, Professor, SLU, Faculty of Forest Sciences, Umeå, SE-901 83, Sweden, peter.lohmander@sekon.slu.se

1 - Stochastic Dynamic Optimization of Forest Industry Company Management

Peter Lohmander, Professor, SLU, Faculty of Forest Sciences, Umeå, SE-901 83, Sweden, peter.lohmander@sekon.slu.se

Forest industry production, capacity and harvest levels are optimized. Adaptive full system optimization is necessary for consistent results. The stochastic dynamic programming problem of a complete forest industry company is solved. The raw material stock level and the main product prices are state variables. In each state and at each stage, a linear programming profit maximization problem of the forest

company is solved. Parameters from the Swedish forest industry are used as illustration.

2 - Optimal Spatial Patterns of Fuels Management & Timber Harvest: How Configuration & Setting Matter

Jeffrey L. Arthur, Professor, Oregon State University, Department of Statistics, 44 Kidder, Corvallis, OR, 97331-4606, United States, arthur@science.oregonstate.edu, Masashi Konoshima, Heidi J. Albers, Claire A. Montgomery

Recent studies have showed the effectiveness of strategic arrangements of fuel treatment on fire risk mitigation. But little is known about optimal timing and spatial configuration of treatment. We generate simple rules of thumb about when & where to perform fuel treatment & harvest and how various physical & economic settings affect these decisions. We develop a two-period spatial optimization model to manage fire risk across a landscape across a wide range of physical & economic conditions.

3 - The Supply Chain Design With Manufacturing Postponement Under Uncertain Demands

Cheng-Chang Lin, Professor, National Cheng Kung University, 1 University Road, Tainan, 701, Taiwan, cclin@mail.ncku.edu.tw, Tsai-Hsin Wang

The speculation strategy forecasts demands to gain the production economies of scale but increases the risk of obsolesces. The postponement strategy postpones product differentiation until the demands are realized. It gains the flexibility in meeting the uncertain demands. We developed a mathematical model that integrates both strategies to determine the optimal chain structure and operations. The results showed that the uncertainty and the service level have significant impacts on the cost.

SB11

Caribbean Salon 1

Advances in Integer Programming

Sponsor: Optimization/Integer Programming
Sponsored Session

Chair: Jean-Philippe Richard, Purdue University, jprichar@ecn.purdue.edu

1 - Incorporating Strong Cutting Planes Within Branch-and-Price

Wilbert Wilhelm, Professor, Texas A&M University, Department of Industrial Engineering, TAMUS 3131, College Station, TX, 77843-3131, United States, wilhelm@tamu.edu, Deepak Warrier

This paper presents a foundation for incorporating strong cutting planes within Branch-and-Price, showing that the Facet-Generation-Procedure and Lift-and-Project can be used in this context.

2 - Fair Division Problems - IP Formulations and Heuristics

Bala Krishnamoorthy, Washington State University, P.O. Box 643113 WSU, Pullman, WA, 99164-3113, United States, kbala@wsu.edu, William Webb

We study various generalizations of the number partitioning problem, where the goal is to divide a set of numbers into two subsets such that the difference in their sums is minimized. We consider IP formulations, and also develop generalizations of the Karmarkar-Karp differencing algorithm for various fair division problems.

3 - Hypergraphic Structures for Solving Hard Mixed Integer Programming Instances

Eva Lee, Associate Professor & Director, Georgia Institute of Technology, Industrial and Systems Engineering, Atlanta, GA, 30332-0205, United States, evakylee@isye.gatech.edu, Siddhartha Maheshwary

We continue our report on hypergraphic facial structures and its application in solving hard mixed integer programming instances arising from marketshare, and cancer treatment applications. The talk will first present recent theoretical results, next it will focus on the separation routines and parallel implementation of an efficient branch-and-cut environment. Computational results of real instances will be presented.

4 - On the MIR Closure of Polyhedra

Andrea Lodi, Professor, DEIS, University of Bologna, Viale Risorgimento, 2, 40136 Bologna, Italy, alodi@deis.unibo.it, Sanjeeb Dash, Oktay Gunluk

We study the MIR closure of polyhedra. The MIR closure of a polyhedron is equal to its split closure and the separation problem is NP-hard. We describe a MIP model with linear constraints and a non-linear objective that we linearize using additional variables. Our analysis yields a short proof of the result of Cook, Kannan and Schrijver (1990) that the split closure of a polyhedron is again a polyhedron. We also present some computational results with our approximate separation model.

■ SB12

Caribbean Salon 2

Risk Averse Optimization

Sponsor: Optimization/Stochastic Programming

Sponsored Session

Chair: Andrzej Ruszczyński, Rutgers University, 94 Rockefeller Road, Piscataway, NJ, 08854, United States, rusz@business.rutgers.edu

1 - Optimization With Multivariate Stochastic Dominance Constraints

Darinka Dentcheva, ddentche@stevens.edu, Andrzej Ruszczyński

We consider stochastic optimization problems with stochastic ordering constraint, which requires that a random vector depending on our decisions stochastically dominates a benchmark random vector. We identify a suitable multivariate stochastic order and describe its generator. We develop necessary and sufficient conditions of optimality and duality relations. These results refine and extend our previous results involving univariate stochastic orders.

2 - Optimization With First Order Stochastic Dominance Constraints

Nilay Noyan, Assistant Professor, SABANCI University, Faculty of Engineering and Natural Sciences, Orhanli, Tuzla, 34956, Istanbul, Turkey, nnoyan@sabanciuniv.edu, Andrzej Ruszczyński

We consider a discrete first order dominance constrained optimization model. We derive some valid inequalities and restrictions by employing the probabilistic structure. We also generate cuts from the disjunctive relaxations arising from the combinatorial structure by applying the lift-and-project procedure. We describe heuristic algorithms to construct feasible solutions, based on conditional second order stochastic dominance constraints, variable fixing, and conditional value at risk.

3 - A Dual Solution Method for Optimization Problems With Second Order Stochastic Dominance Constraints

Andrzej Ruszczyński, Rutgers University, 94 Rockefeller Road, Piscataway, NJ, 08854, United States, rusz@business.rutgers.edu, Gabor Rudolf

For a convex stochastic optimization problem with second order stochastic dominance constraints we develop a dual problem in the space of measures on product spaces. By using the theory of existence of measures with given marginals, we find an equivalent formulation in the spaces of marginal measures. In the finite dimensional case, this transformation dramatically decreases the dimension of the dual problem and leads to an efficient computational method.

■ SB13

Caribbean Salon 3

Transportation and Logistics

Contributed Session

Chair: John Liu, Professor, Hong Kong Polytechnic University, Department of Logistics, PolyU, Hung Hom, Kowloon, Hong Kong - ROC, lgtjliu@polyu.edu.hk

1 - Study on China Sustainable Transportation System

Xiao-Lei Feng, School of Management, Xián Jiaotong University, #1575, School of Management, Xián, 710049, China, fengxl@qq.com, Lin-Yan Sun, Shu-Xia Wang

Sustainable transportation is a key issue in sustainable development. The paper discusses the China's sustainable transportation system, which includes basic transportation infrastructure, vehicle system effectiveness, safety, and environmental pollution. A conclusion is given that Chinese government should denote more investment on expressway construction, public transportation system, safety and cities should learn from each other to promote the environmental protection.

2 - Coordinated Scheduling of BRT and Feeder Routes Using Genetic Algorithm

Sun Chuanjiao, Chang'an University, Middle of South 2nd Ring Road, Xián, 710064, China, sunchuanjiao@163.com, Wang Yuanqing

The study is a specific contribution toward operational integration of public transport modes. BRT and its feeder routers can play a better role in public transportation if they are coordinated. In this study, a non-linear model is formulated. The objective function is to minimize the transfer time between two services and operation cost. Genetic algorithm is used to solve this model.

3 - Production Efficiency Analysis Under Dynamic and Heterogeneous Frontiers

John Liu, Professor, Hong Kong Polytechnic University, Department of Logistics, PolyU, Hung Hom, Kowloon, Hong Kong - ROC, lgtjliu@polyu.edu.hk, Jia Yan

Stochastic frontier analysis (SFA) is the principle method for econometrical assessment of production efficiency under stochastic frontiers. In SFA, a stochastic frontier of a firm is assumed time-invariant (static) and in a unified functional form across all the firms under analysis. We develop in this paper an MC/MC based SFA of

dynamic and heterogeneous frontiers, and then verify it with an empirical application to efficiency analysis of global container ports.

■ SB14

El Morro 1

Applied Data Envelopment Analysis

Cluster: Data Envelopment Analysis

Invited Session

Chair: John Ruggiero, University of Dayton, 517 Miriam Hall, Dayton, OH, 45469, United States, ruggiero@udayton.edu

1 - Estimating Multiple-Input Multiple-Output Production Functions

John Ruggiero, University of Dayton, 517 Miriam Hall, Dayton, OH, 45469, United States, ruggiero@udayton.edu

We develop a methodology to estimate production functions characterized by multiple inputs and multiple outputs. Aggregate output is estimated assuming a piecewise-linear production possibility set and by measuring distance to the boundary using nonparametric techniques. The parameters of the production function are then estimated in a second-stage using ordinary least squares.

2 - Stochastic DEA Efficiency by Non-Radial Measures

Hiroshi Morita, Osaka University, 2-1 Yamadaoka, Suita, Japan, morita@ist.osaka-u.ac.jp

Data envelopment analysis is a useful tool to evaluate a relative efficiency by using the observed data. In general, observed data have inherent uncertainty, so it is necessary to assess the robustness of evaluation against the uncertainty. There are two types of efficiency measures, that is, radial measure and non-radial measure. We consider the stochastic characteristics of these measures and show how the slack value affects to the efficiency.

3 - How to Choose a Soccer "Dream Team"- A Data Envelopment Analysis Approach

Edgar Possani, Dr., ITAM- Instituto Tecnológico Autónomo de México, Río Hondo No.1, Col. Progreso Tizapán, Mexico City, D.F., C.P. 01080, Mexico, epossani@itam.mx

Data envelopment analysis has been used to evaluate sports efficiency in different settings including baseball, golf and football soccer. We review several models that deal with the individual and team performance. We present two models for selecting a "dream team" both from the owners point of view and for the configuration of a national team for the World Cup. We apply it to different leagues including the US league.

■ SB15

El Morro 2

Innovation/Entrepreneurship

Contributed Session

Chair: Michael Badawy, Professor, Virginia Tech University, POB 2931, Merrifield, Va, 22116, United States, mbadawy@vt.edu

1 - A Knowledge-to-Innovation Transformation Model

A. D. Amar, Professor, Seton Hall University, School of Business, South Orange, NJ, 07079, United States, amaramar@shu.edu

On the premise that organizational innovation is intentional and designed, this work models the transformation of the firm's knowledge to innovation. The primary building blocks of this model are (1) knowledge repositories, consisting of tacit and explicit knowledge, (2) an innovation-culture that encourages creativity, and (3) the firm's social capital inclusive of the employees' social networks. Also covered in here are some implementation issues from around the world.

2 - A Paradigm Shift in Scholarly Research on Technological Innovation

Michael Badawy, Professor, Virginia Tech University, POB 2931, Merrifield, Va, 22116, United States, mbadawy@vt.edu

The objective of this paper is to report on research findings and trends characterizing the antecedents and conditions for effective technological innovation in technology-based companies. A comparative analysis between research findings of past studies, and contemporary research investigations will be presented. The various dimensions of a new paradigm will be proposed.

■ SB16

San Cristobal

Modeling Logistics and Transportation Problems

Cluster: OR in the Americas

Invited Session

Chair: Nicolau D. F. Gualda, Professor Titular, Escola Politécnica - Universidade de São Paulo, Departamento de Enga. de Transportes, Av. Prof. Almeida Prado, Trav 2, no. 83, São Paulo, SP, 05508-900, Brazil, ngualda@usp.br

1 - Solving the Vehicle Routing Problem With Time Windows Through Natural Behavior-Based Heuristics

Rodrigo Garrido, Associate Professor, Pontificia Universidad Catolica de Chile, Vicuna Mackenna 4860, Macul, Santiago, RM, 6904411, Chile, rgarrido@ing.puc.cl

This paper presents a comparison between two metaheuristics for the Vehicle Routing Problem with Time Windows: Ant Colony Optimization and Tabu Search with Adaptive Memory. ACO method was more efficient at minimizing the number of vehicles, while TSAM was better at minimizing traveled distance. Results suggest that a hybrid method could be successful in the solution of these type of network optimization problems.

2 - A Hybrid Meta-heuristic for the Vehicle Routing Problem With Multiple Depots and Heterogeneous Fleet

Nicolau D. F. Gualda, Professor Titular, Escola Politécnica - Universidade de São Paulo, Departamento de Enga. de Transportes, Av. Prof. Almeida Prado, Trav 2, no. 83, São Paulo, SP, 05508-900, Brazil, ngualda@usp.br, Ulisses O. Bonasser

An ant colony - tabu search hybrid meta-heuristic (Routing AnTS) is proposed to solving the vehicle routing problem with multiple depots and fixed heterogeneous fleet (MDHETVRP). The review of the literature has shown no previously implemented method for this kind of problem. Details on the development and on the structure of the method are presented, along with results of its successful application to a real world problem faced by the Brazilian Air Force on a humanitarian assistance operation.

3 - Ant Colony Optimization and Switch Order Generation for Railroad Yard

José Eugênio Leal, Professor, PUC-Rio, R. Marques de São Vicente 225 Gávea, R. Gal Cristóvão Barcelos 89/801, Rio de Janeiro, RJ, 22253900, Brazil, jel@ind.puc-rio.br, Jodelson Barroso

This research tackles the definition of the switch engine schedule in a railroad yard in such a way that none of the operational constraints are violated and the costs are minimized. The base for the solution algorithm formulated is an Ant Colony Optimization algorithm called competANTS which handles two ant colonies with different priority rules. As a structured set of data of switch orders was very difficult to be obtained in practice, a data set simulator had to be developed.

4 - Voronoi Diagram Approach to Solve Transportation/Logistics Problems

Antonio G. N. Novaes, Professor of Transportation and Logistics, Federal University of Santa Catarina, LabTrans - Civil Engineering Department, Florianopolis, SC, 88040-900, Brazil, novaes@deps.ufsc.br

Most location-allocation problems are solved assuming the region previously partitioned into a large number of elemental areas and aggregating them with the aid of a mathematical programming model. Continuous approximation, on the other hand, is based on the spatial distribution of demand, rather than on precise information on every unit. We show how Voronoi diagrams can be used in association with continuous approximation models to solve transportation and logistics location-allocation problems

■ SB17

Egret

Data Mining and Business Decision Making

Sponsor: Joint Sponsored: Quality, Statistics, and Reliability/ Data Mining

Sponsored Session

Chair: Ji Zhu, University of Michigan, 445B West Hall, MI, jizhu@umich.edu

Co-Chair: Li Wang, Ross School of Business, University of Michigan, 701 Tappan Street, Ann Arbor, MI, 48109, United States, wang@umich.edu

1 - A Spline-Function Smoothed Support Vector Machine for Data Classification

Weiguang Fan, Associate Professor, Pamplin College of Business, Virginia Tech, 3007 Pamplin Hall, Blacksburg, VA, 24061, United States, wfan@vt.edu, Yubo Yuan, Xiaoyan Yu

Support vector machine is a very popular method for binary data classification in data mining. However, the objective function of un-constrained model of SVM is a non-smooth function and a lot of good optimal algorithms can't be used to find the solution. In this paper, a three-order spline function is used to smooth the objective function. Our experimental results several benchmark data sets prove that the new model has better classification capability than other competitive baselines.

2 - A Finite Mixture Model on B2B Electronic Payments System Adoption

Zhongju Zhang, Assistant Professor, Operations and Information Management Department, University of Connecticut, School of Business, University of Connecticut, Stamford, CT, 06901, United States, John.Zhang@business.uconn.edu

In this paper, we develop a finite mixture model that examines the effects of various variables towards electronic payments system (EPS) adoption. The finite mixture model allows us to test whether different segments of business categories express different propensity on electronic payments adoption, and if so, what variables drive the adoption of electronic payments. Our dataset is based on commercial equipment finance billing data from one of the top Fortune 500 companies.

3 - Mining Reviews - A Novel Approach

Praveen Pathak, Assistant Professor, University of Florida, 362 STZ, Warrington College of Business Administr, Gainesville, FL, 32611, United States, praveen@ufl.edu, Gaurav Kapoor

Customer feedback is one of the most important methods to understand importance of various product features and customer preferences. In this paper we discuss a novel text mining methodology using semantic relationships in text to extract and aggregate customer preferences from web-based data. We utilize domain expertise which helps in increasing the relevance of extracted data. We present results on real life data.

■ SB18

Heron

Education and Distance Learning I

Contributed Session

Chair: Hamed Fazlollahabbar, B.C. Student, Mazandaran University of Science and Technology, Iran, Mazandaran, Babol, Azadi Street, Babol, Iran, ha_jojo@yahoo.com

1 - Quality of Management Education in Nepal

Sunity Shrestha, Faculty of Management, Tribhuvan University, sunity@wlink.com.np

Quality in education sector is reflected by important factors like the quality input (students), the quality teachers (human resource), quality teaching pedagogy and the curriculum. The indicators used to represent quality in this study are various internal and external efficiency measures. There are four universities in Nepal conducting management education at various levels in Nepal. This study concentrates on Tribhuvan University only.

2 - The Pedagogy of Games in Business

Tal Ben-Zvi, Stevens Institute of Technology, Castle Point on Hudson, Hoboken, NJ, 07030, United States, tbenzvi@stevens.edu, Thomas C. Carton

This research discusses game pedagogy in teaching business and management. Traditional teaching methods, while appropriate for conveying foundational knowledge, do not provide students the platform to link abstract concepts and real-world problems. We suggest that simulation games are an effective way to prepare students to grasp the ambiguities associated with real-world organizations. Our findings indicate that business games represent a promising approach to teaching and learning.

3 - A Fuzzy AHP Approach to the Determination of the Math Courses Syllabuses in the IE Education

Ilkay Gultas, Research Assistant, Istanbul Kultur University, Iku Atakoy Istanbul, Istanbul, Turkey, i.gultas@iku.edu.tr

This study, aims to make the faculties' opinions be added to the departments mission, as ABET 2000 approach says, by way of taking this problem up as a multicriteria decision making problem. Fuzzy AHP is used as a multicriteria decision making approach. As a result, I have used the weights found by Fuzzy AHP to shape a new curriculum/syllabus for math courses. Consequently, Fuzzy AHP can be used as an analytical solution approach to solve curriculum development problems.

4 - Simultaneous Statistical Analysis on e-Learning Educational Systems in Iran

Hamed Fazlollahtabar, B.C. Student, Mazandaran University of Science and Technology, Iran, Mazandaran, Babol, Azadi Street, Babol, Iran, ha_jojo@yahoo.com, Ali Tajdin, Babak Shirazi

In recent years e-learning has become a process which is changing the educational system from traditional to collaborative web-based. For overcoming remoteness and time problem, distance learning system is proposed. Hence, various architecture of e-learning systems are implemented. This paper compared traditional system with virtual system economically in Iran and by the means of statistical analysis, we illustrated that the best option for educational system is the combination of both systems.

SB19

Sea Gull

Dynamic Programming and Its Applications

Cluster: Bellman Continuum
Invited Session

Chair: Seiichi Iwamoto, Professor, Kyushu University, Fukuoka, Japan, iwamoto@en.kyushu-u.ac.jp

1 - Optimal Solution is Fibonacci in Quadratic Programming

Akifumi Kira, Kyushu University, Fukuoka, Japan, ec207004@s.kyushu-u.ac.jp, Seiichi Iwamoto

We consider two quadratic programming problems with a Fibonacci optimal solution; the minimum point constitutes a two-step Fibonacci sequence in reverse order and the minimum value is a quadratic function, whose coefficient is a ratio of two adjacent Fibonacci numbers. Our methods are matrix analysis and dynamic programming.

2 - Americanization of Look-Back Option

Takayuki Ueno, Nagasaki Prefectural University, 123 Kawashimo-cho, Sasebo, 858-8580, Japan, ueno@nagasakipu.ac.jp, Kazuyoshi Tsurusaki

In this talk, we consider Americanization of look-back option. We consider an optimal stopping problem of look-back option, which is called "Americanization". On the basis of dynamic pricing from dynamic programming approach, we maximize the value of American look-back option on the binomial model. Our method is invariant imbedding, which expands the original state space by one dimension. Then we derive backward recursive relations. Finally, numerical illustrations are shown.

3 - Multi-Stage Decision Process Under a Constraint Over All Stages

Toshiharu Fujita, Kyushu Institute of Technology, Faculty of Engineering, 1-1 Sensui-cho, Tobata-ku, Kitakyushu, 804-8550, Japan, fujita@comp.kyutech.ac.jp

We are often faced with a problem which has two criteria. Both criteria are important but they usually conflict. To meet this type of demand, we introduce a constraint over all stages to multi-stage decision process. Typical example is to maximize overall reward under the constraint that overall risk is less than or equal to a given level. Thus our problem is to optimize the associative criterion under the associative constraint and we derive recursive equation by using dynamic programming.

4 - The Golden Optimal Trajectories in Continuous Dynamic Optimization

Seiichi Iwamoto, Professor, Kyushu University, Fukuoka, Japan, iwamoto@en.kyushu-u.ac.jp, Masami Yasuda

We discuss two control processes and two allocation processes from Golden optimality. A trajectory is called Golden if it always generates Golden section in unit time. We show that an optimal trajectory is Golden both in a control process and in two allocation processes.

SB20

Parrot

Methodologies to Tame Complexity

Cluster: Complex and Dynamic Systems
Invited Session

Chair: Luis Rabelo, Professor, University of Central Florida, 4000 Central Florida Blvd., Orlando, FL, United States, lrabelo@mail.ucf.edu

1 - System Dynamics and Agent-Based Simulations for Workforce Climate

Mario Marin, Chief Executive Officer, American Technologika, 37 N Orange Avenue, Orlando, FL, 32801, United States, mariomarin@americantechnologika.com

System Dynamics capture some factors which influence NASA Kennedy Space Center workforce, while Agent-based models capture particular features not possible with just system dynamics models. Our approach helps understand how all of these different factors work together to produce an overall workforce climate consistent with safety and mission success.

2 - A Methodology for Detecting and Minimizing the Oscillations in the Supply Chain

Alfonso Sarmiento, University of Central Florida, 4000 Central Florida Blvd., Orlando, FL, 32816, United States, sarmient@mail.ucf.edu, Reinaldo Moraga, Luis Rabelo

We present a methodology that combines system dynamics, neural networks and genetic algorithms for detecting and minimizing oscillatory behaviors in the supply chain. Neural networks are used to capture the dynamics from the system dynamic models in order to predict changes before they take place. Optimization techniques based on genetic algorithms are applied to find the best setting of the supply chain parameters that minimize the oscillations.

3 - Systemic Model of the Natural Gas Impact on Sustainable Development of Peru

Rosario Guzman, Professor, Universidad de Lima, Av. Javier Prado Este s/n, Monterrico, Lima, Lima 33, Peru, rguzman@correo.ulima.edu.pe, Angelica Kamiyama

Natural gas is considered as an opportunity to boost economical and social development in Peru. A wrong policy may result in its misuse and exhaustion without having contributed to the national development. This work presents a systemic view of the complex natural gas value net resulting from the analysis of the dimensions of sustainable development. Once implemented, it can be used to assess the impact that diverse policies on the natural gas may have on the development of the country.

4 - Hybrid Simulation Modeling for Navy Ships

Jose Sepulveda, Associate Professor, University of Central Florida, 4000 Central Florida Blvd., Orlando, FL, 32816, United States, sepulved@mail.ucf.edu, Haluk Akin

This presentation will discuss the development of a hybrid simulation environment for Navy ships. The purpose is to measure the effectiveness of active and passive sensors. The hybrid simulation environment was required in order to tame the complexity of the environment.

SB21

Canary

Deterministic Models in Information Systems

Sponsor: Information Systems Society
Sponsored Session

Chair: Milind Dawande, University of Texas at Dallas, milind@utdallas.edu

1 - When Hackers Talk: A Model of Security System Maintenance With Strategic Hackers and Information Dissemination

Radha Mookerjee, University of Texas at Dallas, radham@utdallas.edu, Alain Bensoussan, Wei Yue, Vijay Mookerjee

We study optimal policies to maintain a security system under strategic hacker behavior characterized by an attack rate that is dependent on system accuracy. The impact of these conditions is studied on the effort needed to maintain the security system.

2 - Value-Driven Creation of Functionality in Software Projects: Optimal Sequencing and Reuse

Dengpan Liu, University of Alabama, dengpan.liu@uah.edu, Vijay Mookerjee, Milind Dawande

We investigate the problem of optimally sequencing the release of functionality in a software project. As modules are created, certain parts of the system become functional and provide value even though the entire system has not been completed. We compare reuse decisions under supply-side and demand-side objectives.

3 - The Notion of Commonality in Pair Programming

Chelliah Sriskandarajah, University of Texas at Dallas,
chelliah@utdallas.edu, Milind Dawande, Vijay Mookerjee,
Subodha Kumar

Motivated by applications in pair programming, we introduce the notion of commonality of an assignment of developers to software modules. We discuss several structural and algorithmic results for the problem of finding an assignment of maximum commonality.

SB22

Pelican

Tutorial: Advances in Simulation Optimization

Cluster: Tutorials

Invited Session

Chair: Marco Better, 1919 Seventh Street, OptTek Systems, Inc,
Boulder, CO, 80302, better@opttek.com

1 - Tutorial: Advances in Simulation Optimization

Marco Better, 1919 Seventh Street, OptTek Systems, Inc, Boulder, CO,
80302, better@opttek.com

This tutorial will demonstrate how these two traditional areas of OR are combined into a powerful decision-making system. Simulation can model uncertainty while optimization seeks best policies. The sense in which these represent decision-making will be explained in the tutorial, which will include several examples from finance, business process management, and supply chain management.

Sunday, 1:30 - 3:00pm**SC01**

Rio Mar Salon 1

Project Selection

Cluster: Project Management and Scheduling

Invited Session

Chair: Christian Stummer, Associate Professor, University of Vienna,
Bruenner Str. 72, Vienna, A-1210, Austria, christian.stummer@univie.ac.at

1 - Interactive Decision Support for Competence-Driven Project Selection in a Research Center

Christian Stummer, Associate Professor, University of Vienna,
Bruenner Str. 72, Vienna, A-1210, Austria,
christian.stummer@univie.ac.at, Walter J. Gutjahr, Elmar Kiesling

This talk provides preliminary results of ongoing work on an interactive system that supports decision-makers at the E-Commerce Competence Center in Vienna, Austria, in selecting project opportunities with particular emphasis on the corresponding competence development of the center's "human capital". To this end, we had to deal with the assigning of researchers to projects, developed proper multiobjective versions of metaheuristic solution procedures and designed an intuitive user-interface.

SC02

Rio Mar Salon 2

Retail Operations

Sponsor: Manufacturing & Service Operations Management

Sponsored Session

Chair: Hans (Seb) Heese, Indiana University, 1309 E 10th St, Bloomington,
IN, 47401, United States, hheese@indiana.edu

Co-Chair: Xinxin Hu, Assistant Professor, Indiana University, 1309 E 10th
St. BU570C, Bloomington, IN, 47405, United States, hux@indiana.edu

1 - Role of Bundling Strategies in a Two Firm, Two Product Competitive Environment

Srinagesh Gavirneni, Johnson School, Cornell University, Ithaca, NY,
14850, United States, sg337@cornell.edu, Shu Zhou

We analyze a two-firm scenario where each company sells two complementary products with their competition focused primarily on price. If one firm decides to bundle its products, we wish to determine (i) whether it (or its competitor) is better off? (ii) what happens to the market size? (iii) whether the competitor will follow? Further we analyze how these results change in the presence of uncertainties.

2 - Impact of Slotting Fees on the Channel, Consumers, and Social Welfare

Ling Wang, University of Miami, lwang2@miami.edu

We consider a two-stage supply chain with two competing suppliers and one retailer. The retailer incurs a fixed transaction cost of sourcing with each supplier and charges a slotting fee. We show that use of slotting fees do not always lead to less variety or higher price. When variety is decreased, it is usually compensated by lower prices. We find that consumer surplus often increases with the use of slotting fees. While the manufacturer is always worse off, the retailer usually benefits.

3 - Replenishment Decision with Extended Warranty

Xinxin Hu, Assistant Professor, Indiana University, 1309 E 10th St.
BU570C, Bloomington, IN, 47405, United States, hux@indiana.edu

This is a retailer's multiperiod replenishment problem with extended warranty. Retailer has two demands - new customers and old customers who exercise the warranty. The warranty demand has the first priority to be satisfied, and retailer must guarantee a full satisfaction. Hence, it reduces retailer's capability to meet new demand and even incurs an additional cost. We consider three uncertainties C new demand, warranty exercise ratio, and fraction of customers who buy warranty.

4 - Supply Chain Dynamics Under Extended Warranty Sales

Hans (Seb) Heese, Indiana University, 1309 E 10th St, Bloomington,
IN, 47401, United States, hheese@indiana.edu

Consider two competing manufacturers selling their products through the same retailer. If this retailer derives profits from extended warranty sales, the manufacturers face a dilemma: While they have incentive to increase their warranties to make their products attractive to consumers, the retailer might prefer selling lower-warranty products to enhance sales of extended warranties. We develop a stylized model to determine and analyze optimal manufacturer and retailer strategies in this setting.

SC03

Rio Mar Salon 3

The Impact of Strategic Purchasing Behavior on Pricing and Ordering Decisions

Cluster: Supply Chain Optimization

Invited Session

Chair: Chris Tang, Professor, UCLA Anderson School of Management, 110
Westwood Plaza, Los Angeles, CA, 90095, United States,
ctang@anderson.ucla.edu

Co-Chair: Rui Yin, UCLA Anderson School of Management, 110
Westwood Plaza, Suite B512, Los Angeles, CA, 90095, United States,
ryin@anderson.ucla.edu

1 - Dynamic Pricing of Seasonal Products in the Presence of Strategic Consumers

Yossi Aviv, Associate Prof. of Operations Management, Washington
University, Campus Box 1133, 1 Brookings Drive, St. Louis, MO,
63130, United States, aviv@wustl.edu

Dynamic pricing and revenue management practices are gaining increasing popularity in the retail industry, and have engendered a growing body of academic research in recent years. In this work, we develop a stylized model to study the optimal pricing of a finite inventory, in the presence of forward-looking customers that time their purchases in anticipation of future discounts.

2 - Purchasing, Pricing, and Quick Response in the Presence of Strategic Consumers

Robert Swinney, Doctoral Candidate, University of Pennsylvania,
3730 Walnut St, Suite 500, Philadelphia, PA, 19104, United States,
rswinney@wharton.upenn.edu, Gerard Cachon

We consider a model with a retailer selling to consumers, some of whom are strategic. A strategic consumer forms rational expectations regarding prices and availability during a selling season and chooses the optimal time to make a purchase. We study how the presence of strategic consumers influences the retailers quantity and pricing decisions, as well as the decision to invest in quick response inventory capabilities.

3 - Implications of Customer Purchasing Behavior and In-Store Display Formats on Retail Merchandising

Rui Yin, UCLA Anderson School of Management,
110 Westwood Plaza, Suite B512, Los Angeles, CA, 90095,
United States, ryin@anderson.ucla.edu, Chris Tang

Consider a retailer announces both the regular price and the post-season clearance price at the beginning of the selling season. Customers arrive in accord with a Poisson process. We consider the impact of customer purchasing behavior (myopic or strategic) and retailer's in-store display formats (depending on how many units to display on the sales floor) on the retailer's pricing and ordering decisions.

4 - Group Buying Mechanisms for Business-to-Business Exchanges

Rachel Chen, Assistant Professor, UC Davis, rachen@ucdavis.edu

In group buying, quantity discounts are offered based on the buyers' aggregated purchasing quantity. We consider group buying mechanisms in business-to-business exchanges with one seller and multiple buyers. Each buyer has private information regarding his valuation of the product, which varies with the number of units he acquires. We study the buyers' bidding behavior, and compare the buyers' surplus, the seller's revenue, and the social welfare under two group-buying mechanisms.

■ SC04

Rio Mar Salon 4

Software Seminar: AMPL

Cluster: Software Seminars

Invited Session

Chair: Robert Fourer, Professor, Northwestern University, Dept. of Industrial Eng & Mgmt Sciences, Evanston, IL, 60208-3119, United States, 4er@iems.northwestern.edu

1 - Enhanced Solver Support in the AMPL Modeling Language

Robert Fourer, Professor, Northwestern University, Dept. of Industrial Eng & Mgmt Sciences, Evanston, IL, 60208-3119, United States, 4er@iems.northwestern.edu, David M. Gay

AMPL has set the standard for optimization modeling languages that handle complex models naturally and large models efficiently. As a result it is available from many more sources and for many more solvers than competing products. Bob Fourer, an AMPL developer, will give a quick but lucid tour of AMPL's current solver support, with emphasis on recent enhancements to AMPL's facilities for optimization problems of varied kinds. Topics will include CPLEX 10's direct handling of certain logical implications, KNITRO 5's recognition of complementarity conditions as constraints, LGO's facilities for global optimization, and support for COIN-OR projects and other open-source solvers.

■ SC05

Rio Mar Salon 5

Public- and Private-Sector Facility Location

Sponsor: Location Analysis

Sponsored Session

Chair: Jianhua Xu, Carnegie Mellon Univ., Dept. of Engr. and Public Policy, 5000 Forbes Ave., Pittsburgh, PA, 15213, United States, xujianhua.cmu@gmail.com

1 - Robust Optimization of Sensors Placement in Dynamic Water Systems

Jianhua Xu, Carnegie Mellon Univ., Dept. of Engr. and Public Policy, 5000 Forbes Ave., Pittsburgh, PA, 15213, United States, xujianhua.cmu@gmail.com, Michael Johnson, Mitch Small, Paul Fischbeck

Designing a robust sensors network to detect contaminants intentionally injected into a water distribution system is a challenge given the uncertain nature of the contamination events and the dynamic nature of water distribution systems. This paper develops a multi-objective minimax regret model to place sensors to minimize the maximum regret of the volume of contaminated water consumed and the maximum regret of the uncovered nodes.

■ SC06

Rio Mar Salon 6

Tutorial: Getting and Dealing With Media Attention for Your Research

Cluster: Tutorials

Invited Session

Chair: Candi Yano, Professor, University of California at Berkeley, 4141 Etcheverry Hall, Berkeley, CA, 94720-1777, yano@ieor.berkeley.edu

1 - Tutorial: Getting and Dealing With Media Attention for Your Research

Moderator: Candi Yano, Professor, University of California at Berkeley, 4141 Etcheverry Hall, Berkeley, CA, 94720-1777, yano@ieor.berkeley.edu, Panelist: Sheldon Jacobson, Eva Lee, Gary Bennett

Panelists will offer suggestions on how to get media attention for your research, and how to deal with it when the attention finally arrives, based on their recent personal experiences.

■ SC07

Rio Mar Salon 7

Optimization and Computational Biology

Sponsor: Interface of Computing Science & OR

Sponsored Session

Chair: Bala Krishnamoorthy, Washington State University, P.O. Box 643113 WSU, Pullman, WA, 99164-3113, United States, kbala@wsu.edu

1 - Diversity Graph and Haplotyping

Al Holder, Trinity University Mathematics, One Trinity Place, San Antonio, TX, 78240, United States, aholder@trinity.edu

We show that the Pure Parsimony Problem has several closed form solutions. In particular, we show that if we can order the haplotypes, then solutions can be found in polynomial time. If an appropriate ordering is not possible, this idea leads to heuristic approaches.

2 - Inferring Phylogenies From Ambiguous Genetic Variation Data by Integer Linear Programming

Russell Schwartz, Carnegie Mellon University, russells@andrew.cmu.edu, Srinath Sridhar, Fumei Lam, Guy Blelloch, R. Ravi

Integer linear programming has proven effective for inferring maximum parsimony evolutionary trees from genetic sequences called "haplotypes." We build on haplotype ILP methods to infer trees from a more readily available data source called "genotypes," which consist of ambiguous combinations of pairs of haplotypes. The method allows us for the first time to find optimal solutions to this problem and has proven valuable in characterizing the variation structure of the human genome.

3 - An IP Model for Protein Sequencing Using Mass Spectrometry

Bala Krishnamoorthy, Washington State University, P.O. Box 643113 WSU, Pullman, WA, 99164-3113, United States, kbala@wsu.edu

We present an integer programming model to identify the amino acid sequence given the masses of a protein and several of its (overlapping) fragments. After finding the composition (counts of each of twenty amino acids) and the ion-type of fragments (b or y), the sequence order is obtained using an efficient enumeration algorithm. Compared to standard dynamic programming models, we add many more constraints, resulting in a much smaller number of candidate solutions.

■ SC08

Rio Mar Salon 8

Artificial Intelligence and Neural Networks

Contributed Session

Chair: Hokey Min, James R. Good Chair in Global Supply Chain Strategy, Bowling Green State University, Department of Management, BAA3008C, College of Business Administration, Bowling Green, OH, 43403, United States, hmin@bgsu.edu

1 - A Neural Network Approach to Predict Activity Coefficients

Nazario D. Ramirez Beltran, Professor, University of Puerto Rico, P.O. Box 9043, Mayagüez, PR, 00680, Puerto Rico, nazario@ece.uprm.edu, Harry Rodríguez Vallés, L. Antonio Estévez

Artificial neural networks (ANN) techniques and a group-contribution approach were used to predict activity coefficients in binary solutions. The Levenberg-Marquardt algorithm was applied to train the ANN to generate a sample of the most likely Margules-equation parameters. The Margules equation was used as a base method to satisfy the thermodynamic consistency. The algorithm was validated with nineteen systems and results show a relative improvement over existing methods.

2 - Identification of a Crack in a Rotating Shaft Using a New Wireless Accelerometer and Neural Networks

F. Andrés Bejarano, Graduate Student ME, University of Puerto Rico, 1650 Sector Cuba, Mayagüez, PR, 00680, Puerto Rico, feranbe@yahoo.com, Yi Jia

A novel real time monitoring diagnostic method of determining the position and depth of a crack on a rotating shaft is studied. A new wireless accelerometer capable to be mounted directly on the shaft was developed to obtain signals at different points of the structure. Vibration parameters are obtained theoretically by Finite Element Method and experimentally by signal processing for different crack scenarios. Neural Networks is employed as a function approximator to solve the inverse problem.

3 - Artificial Intelligence in Supply Chain Management

Hokey Min, James R. Good Chair in Global Supply Chain Strategy, Bowling Green State University, Department of Management, BAA3008C, College of Business Administration, Bowling Green, OH, 43403, United States, hmin@bgsu.edu, Thomasz Smolinski

Despite its widespread acceptance as a decision-aid tool, artificial intelligence (AI) has seen limited application in supply chain management (SCM). To fully exploit the potential benefits of AI for SCM, this paper explores various sub-fields of AI that are most suitable for solving practical problems relevant to SCM. In so doing, this paper reviews the past record of success in AI applications to SCM and identifies the most fruitful areas of SCM in which to apply AI.

■ SC09

Rio Mar Salon 9

Practice- Industrial Applications

Contributed Session

Chair: Juntao Gong, Xián Jiaotong University, 28# Xianning Westroad, Xián, 710049, China, xjtugongji@gmail.com

1 - Business Process Reengineering for the Mexican Central Securities Depository

Miguel de Lascurain, Professor and Researcher, ITAM, Rio Hondo No. 1, Industrial Engineering, Mexico City, DF, 01000, Mexico, mdelasc@itam.mx, Omar Romero-Hernandez, Sergio Romero Hernandez, David F. Muñoz

This work illustrates a comprehensive re-engineering of a complex business environment in one of the major Central Securities Depositories (CSD) in the Americas. Re-engineering work emphasizes in: (i) incorporation of the best practices in the industry, (ii) increase in operation reliability, (iii) real-time settlement, (iv) improved security, and (v) transparency in the process and information handling. Moreover, this new design is based on straight-through continuous processing (STP).

2 - Research for Adaptive Deadband Control in Semiconductor Manufacturing

Kim Seoneok, Korea University, Industrial System Information the Department of Technology, Korea University, 1, 5-ka, Anam-dong, Su, Seoul, South Korea, psiburster@korea.ac.kr

The reduction of the overlay deviation is one of the key factors in improving the quality of the semiconductor products. Generally, three types of process condition change exist; uncontrollable white noise, slowly changing drift, and abrupt condition shift. To effectively control the aforementioned process changes, control scheme using adaptive deadband is proposed. The suggested approach and existing control methods are evaluated through simulation.

3 - A Graphical Tool for the Analysis of Response Surface Experiments: A Three-Dimensional Approach

Valerie J Rodríguez Cortés, UPR- Mayagüez, San Alberto Gardens Apt 32, Utuado, PR, 00641, Puerto Rico, vjulieth@engineer.com

Statistical software with DOE tools are limited in their capability of allowing the user a full control on independent factors representation. They lack graphical interfaces that support DOE's capabilities. This project presents the development of a GUI application that allows the user for visualize Full Factorial, Box-Behnken and CCD 3-D contour plots. The application was developed in Matlab 13, verified against other statistical software and applied to a case study of an electronic industry.

4 - Materials Purchase Plan for Enterprise Groups-A Case Study

Juntao Gong, Xián Jiaotong University, 28# Xianning Westroad, Xián, 710049, China, xjtugongji@gmail.com, Lin-Yan Sun

Materials purchase plays an important role for enterprise groups. In this study, a centralized framework is described to treat the purchase planning problem in enterprise groups. Rolling policy is used to deal with the uncertainty in forecasting demands. Material balance of various enterprises in the group also is considered. Non-linear programming models are formulated to solve these issues. An example indicates that the method is efficient in practice.

■ SC10

Rio Mar Salon 10

OR in the Forest Sector II

Cluster: OR in the Forest Sector
Invited Session

Chair: Peter Lohmander, Professor, SLU, Faculty of Forest Sciences, Umeå, SE-901 83, Sweden, peter.lohmander@sekon.slu.se

1 - A Hierarchical Transportation Planning and Scheduling Approach in the Forest-Wood Supply Chain

Manfred Gronalt, Professor, BOKU University of Natural Resources and Applied Life Sciences, Feistmantelstrasse 4, Vienna, Au, 1160, Austria, manfred.gronalt@boku.ac.at, Patrick Hirsch

The efficient planning of transports between wood storage locations and industrial sites is a crucial task, since transportation costs add up to about 30% of the total round timber cost. In order to reduce this cost component a comprehensive optimization scheme is presented. This concept includes tactical issues like the weekly delivery plan for industrial sites as well as the daily scheduling of log-trucks. We give extensive numerical studies for different problem sizes.

2 - A Comparison of Road Inventory Analysis Methods

Beth Dodson, Dr., Assistant Professor, University of Montana, College of Forestry and Conservation, Missoula, MT, 59812, United States, beth.dodson@cfc.umt.edu, Woodam Chung

Increased environmental concerns have lead many forest owners to conduct inventories of their forest road networks. Managers use these datasets to better understand the condition of the road network and to set maintenance and upgrade priorities. Analysis of these inventories can range from multi-criterion optimization to a simple ranking of problem areas. In this paper a range of forest road analysis methods will be evaluated based on their ease of use, solution quality, and efficiency.

3 - Using Composite Variable Modeling to Achieve Realism and Tractability in Production Planning

Ada Barlatt, University of Michigan, 1205 Beal Avenue, Ann Arbor, MI, 48109, United States, abarlatt@umich.edu, Oleg Gusikhin, Yakov Fradkin, Craig Morford, Amy Cohn

As an alternative to traditional mathematical programming approaches, we consider using models based on composite variables, variables that capture multiple decisions simultaneously, in production planning. We present a model and algorithm for a sequence-dependant machine environment without restricting the number of setups, batch sizes, labor availability, and sequencing of parts. Computational results are presented using data from Ford Motor Company stamping facilities.

■ SC11

Caribbean Salon 1

Cutting and Packing

Cluster: Combinatorial Optimization
Invited Session

Chair: Graham Kendall, University of Nottingham, Nottingham, United Kingdom, gxk@cs.nott.ac.uk

1 - Packing Sets of Circles with Shape-Memory

Takashi Imamichi, PhD Student, Kyoto University, Yoshida Hommachi, Sakyo-ku, Kyoto, KY, 606-8501, Japan, ima@amp.i.kyoto-u.ac.jp, Hiroshi Nagamochi

We introduce a new problem that asks to place given sets of circles into a 2D container without overlapping so that each set of circles forms a specified shape. This can be applied to the 2D irregular strip packing problem with free rotations, and can be extended to the 3D case. We design several placing procedures based on the quasi-Newton method, and propose an efficient algorithm for the problem by combining these procedures appropriately. We also show some computational results.

2 - Applications of the No Fit Polygon

Graham Kendall, University of Nottingham, Nottingham, United Kingdom, gxk@cs.nott.ac.uk, Edmund Burke, Glenn Whitwell, Rob Hellier

The no fit polygon has been utilised in nesting for a number of years. In this talk we will introduce this geometric structure, explaining some recent algorithmic advances enabling it to be generated in a robust manner. We will also explore some uses, beyond nesting, for the no fit polygon.

3 - Two-Dimensional Bin Packing Problems in Steel Industry

Sanghyuck Park, RIST, San32 Hyoja-dong Nam-gu, Pohang, Korea, parksh@rist.re.kr

This paper identifies various types of bin packing problems in the steel industry and examines the constraints and objectives that should be considered when grouping is carried out for each issue. Based on the findings, characteristics that complicate existing bin packing problems are analyzed. In particular, the variants of the two-dimensional bin-packing problem in the steel industry are studied. We model these problems as two-dimensional vector packing problems and propose heuristics.

■ SC12

Caribbean Salon 2

Multi-Stage Stochastic Programming

Sponsor: Optimization/Stochastic Programming
Sponsored Session

Chair: Suvrajeet Sen, Professor, Ohio State University, IWSE Department, Baker System Bldg, Columbus, OH, 43201, United States, sen@sie.arizona.edu

1 - The Value of Multi-Stage Stochastic Programming in Capacity Planning Under Uncertainty

Shabbir Ahmed, Georgia Institute of Technology, sahmed@isye.gatech.edu, Kai Huang

We provide bounds on the value of using a multi-stage stochastic programming approach over previously used two-stage models for a class of stochastic capacity planning problems. An asymptotically optimal heuristic for the multi-stage problem is developed.

2 - A Stochastic Decomposition Algorithm for Multistage Stochastic Linear Program

Zhihong Zhou, University of Arizona, 2519 Indianola Ave. Apt.A, Columbus, OH, 43202, United States, zhzhou@email.arizona.edu, Suvrajeet Sen

A multistage stochastic linear program (MSLP) is a model of sequential decision making where the objective and constraints are both linear. In this work, we develop a stochastic decomposition algorithm for MSLP, which is intended to solve the large scale MSLP problems.

3 - Branch-and-Bound Algorithms for Multistage Stochastic Integer Programs

Thomas Heinze, University of Duisburg-Essen, Lotharstr. 65, Duisburg, Germany, heinze@math.uni-duisburg.de, Rüdiger Schultz

Two branch-and-bound algorithms will be described, that use decomposition methods to solve multistage stochastic integer programs. To evaluate and compare these algorithms, a real-life problem from power optimization in electricity networks with dispersed generation is considered.

■ SC13

Caribbean Salon 3

Online and Fixed Routing

Sponsor: Joint Sponsored/Invited: Transportation and Logistics
Sponsored Session

Chair: Martin Savelsbergh, Professor, Georgia Institute of Technology, martin.savelsbergh@isye.gatech.edu

1 - Constructing Fixed Routes for Vehicle Routing Problems With Stochastic Demands

Martin Savelsbergh, Professor, Georgia Institute of Technology, martin.savelsbergh@isye.gatech.edu, Alan Erera, Emrah Uyar

We study the construction and operation of fixed routes for delivery problems with uncertain customer demands. A customer may or may not place an order on a particular delivery day; the probability that a customer places an order is known. Sample-based feasibility evaluation techniques are developed to accommodate delivery time windows. A novel feature is the flexibility, at the operational level, for a customer to be visited by one of two vehicles.

2 - Online Vehicle Routing Problems

Michael Wagner, California State University East Bay, 25800 Carlos Bee Blvd, Hayward, CA, 94542, United States, michael.wagner@csueastbay.edu, Patrick Jaillet

We present new competitive ratio bounds for generalized versions of the online Traveling Salesman Problem. In particular, we introduce precedence constraints, capacity constraints and multiple vehicles. We study both general and polynomial-time algorithms. Finally, we consider resource augmentation, where we give the online algorithm additional resources, such as faster vehicles, larger capacities and advanced information. We quantify the value of increasing resources.

3 - Path Relinking for the Vehicle Routing Problem

Sin C. Ho, Postdoctoral Fellow, Department of Systems Engineering & Engineering Management, The Chinese University of Hong Kong, Shatin, NT, Hong Kong - ROC, scho@se.cuhk.edu.hk, Michel Gendreau

We describe a tabu search heuristic with path relinking for the vehicle routing problem. Path relinking is a method to integrate intensification and diversification in Tabu search. It explores paths that connect previously found elite solutions. Computational results show that tabu search with path relinking is superior to pure tabu search on the vehicle routing problem.

■ SC14

El Morro 1

DEA Applications in Service Operations

Cluster: Data Envelopment Analysis
Invited Session

Chair: Kostas Triantis, Professor, Virginia Tech, Industrial & Systems Engineering, Northern VA Graduate Center, 7054 Haycock Road, Room 428, Falls Church, VA, 22043, United States, triantis@vt.edu

1 - The Service Delivery Axioms

Alexandra Medina-Borja, University of Puerto Rico at Mayagüez, Industrial Engineering Building, II-205, Mayagüez, 00680, Puerto Rico, amedina@uprm.edu

Production axioms have governed productivity measurement techniques such as DEA and others. Even service operations have been evaluated using principles of production inherent to those. Yet, it is well documented in the literature that service operations are distinct and unique, yet similar to production of physical goods. We present a first attempt to elaborate on what the service delivery axioms could be as a first step towards a theory of service delivery.

2 - Real-Time Efficiency/Performance Evaluation: Iterative Aerospace Scheduler Algorithm Optimization for Multi-Payload Next Generation Commercial Satellite

Kostas Triantis, Professor, Virginia Tech, Industrial & Systems Engineering, Northern VA Graduate Center, 7054 Haycock Road, Room 428, Falls Church, VA, 22043, United States, triantis@vt.edu, Phil Eichensehr

Engineering is concerned with the design of products, services, processes, or in general with the design of systems. These design activities are managed and improved by the organization's decision-makers. Therefore, the performance evaluation of the production function where engineering plays a fundamental role is an integral part of managerial decision-making. In the last twenty five years, there has been limited research that uses performance and efficiency evaluation approaches in engineering and specifically in the design of systems. The objective of this research is two fold. The first objective is to provide an overview of how aerospace simulation is used for system, in this case commercial satellite imagers, design and development. The second objective is introduce the concept of "n" scheduling algorithms per interval of time and the use of real-time efficiency model to select the most efficient use of resources per scheduling interval. Real-time efficiency models can select the best scheduling option given the weather, natural or man-made disasters, target geographic diversity, and/or platform constraints like pointing, quality, and communications. The data requirements of this performance evaluation concept are discussed as well as brief illustration with results are provided.

3 - Efficiency Measurement of Road Maintenance

M. Ozbek, Via Department of CEE, Virginia Tech, Blacksburg, VA, 24061, meozbek@vt.edu, J.M. de la Garza, Kostas Triantis

The road maintenance performance measurement systems developed and implemented by researchers and state departments of transportation (DOTs) mainly focus on the effectiveness measures, e.g., the level-of-service. Such measurement systems do not elaborate on the efficiency. Not knowing how "efficient" state DOTs are in being "effective" can lead to excessive and unrealistic maintenance budget expectations. The specific objective of this paper is, through the use of data for the Commonwealth of Virginia, to illustrate the modeling and data challenges of identifying (i) the relative efficiency of different units in performing road maintenance services, (ii) the reasons of the efficiency differences between units, (iii) the effects of the uncontrollable factors on the road maintenance efficiency of units, (iv) the benchmarks (peers) and best practices that pertain to the inefficient units. Results that pertain to the specific highway sections within the Commonwealth will be presented. The possible use of these results in affecting decision making in state DOTs with respect to asset management interventions will be discussed and suggestions for alternative modeling approaches will be provided.

■ SC15

El Morro 2

Strategic Planning and Management

Contributed Session

Chair: Rafael Matos, Manager - Fleet Support Analysis, Whitney, Bradley & Brown, Inc., 1604 Spring Hill Road, Suite 200, Vienna, VA, 22182, United States, rmatos@wbbinc.com

1 - Game of Module Supply for Education

Masatake Saito, Dr., Chuo University, 742-1, #21267, Higashinakano, Hachioji, Tokyo, 1920393, Japan, msaito@tamacc.chuo-u.ac.jp

The aim of this paper is to design the model of module supply and to develop the game of PC module supply for education. Players could study how to purchase the PC module along their tactics with competitors in the virtual PC market that instructors set up. The outcome of the game is decided as an instructor's assessment. The developed game is one of on-line business games using Microsoft ASP technology.

2 - Positioning Strategies of Robotics Firms in the Value-Added Chain

Sung Shim, Associate Professor, Seton Hall University, 400 South Orange Avenue, Stillman School of Business, South Orange, NJ, 07079, United States, shimsung@shu.edu, Arun Kumar

This study examines the positioning strategies of robotics firms in the value-added chain. The results show that robotics firms vary in their positioning in the value-added chain and more importantly, in the degree of integration of value-added chain activities. Also, some differences in positioning in the value-added chain are observed among robotics firms by their nationality. The results would help robotics firms evaluate their competitive positions in the field.

3 - Resource Allocation for Mitigating Pandemic Influenza

Feng Pan, TSM, Los Alamos National Laboratory, Los Alamos National Laboratory, F603, Los Alamos, NM, 87545, United States, fpan@lanl.gov

Allocating scarce resources and implementing an effective mitigation strategy is important for minimizing the damage caused by a pandemic influenza. A simulation optimization method and a stochastic programming model were developed. In the simulation optimization method, response surface methodology serves as a bridge between the simulated pandemic influenza and the resource allocation problem. The preliminary results show the effectiveness of mitigation strategies under several measures.

4 - Analyzing Singapore's Auto Supply Chain Dynamics

Balan Sundarakani, Dr, Research Fellow, The Logistics Institute Asia Pacific, Block E3A, Level 3, 7 Engineering Drive 1, NUS, Singapore, 117574, Singapore, tlabs@nus.edu.sg, Robert De Souza, Mark Goh

This paper presents a system dynamics model for strategic analysis of Singapore's auto supply chain. By critically examining the variables, it's possible to analyze the Singapore's auto market over a period of time and try to capture the factors affecting them. A detailed sensitivity test is carried out to examine the robustness of the model. The research recommends some strategies for the Singapore automotive industry and auto logistics industry in a long term growth perspective.

5 - "About Round Pegs and Square Holes" - A Tutorial

Rafael Matos, Manager - Fleet Support Analysis, Whitney, Bradley & Brown, Inc., 1604 Spring Hill Road, Suite 200, Vienna, VA, 22182, United States, rmatos@wbbinc.com

A large amount of resources are used by humans trying to fit a solution to a problem convinced that it is "the one". If the problem is larger than the solution, parts of it are not solved. If the problem is smaller than the solution, there is wasted solution. We look at the influence of social and behavioral elements on legacy linear analyses and the attempts to these practices, possible social and behavioral drivers, and potential implications, based on recent experience at the Pentagon.

■ SC16

San Cristobal

Evolutionary Computation in Engineering Applications

Cluster: OR in the Americas

Invited Session

Chair: Jose R. Cedeno, Associate Professor, University of Puerto Rico at Mayagüez, Department of Electrical Engineering, Stefani Building, S-224, Mayagüez, PR, 00680, Puerto Rico, Jose.Cedeno@ece.uprm.edu

1 - Security-Constrained Power Generation Dispatch Using Differential Evolution

Jose R. Cedeno, Associate Professor, University of Puerto Rico at Mayagüez, Department of Electrical Engineering, Stefani Building, S-224, Mayagüez, PR, 00680, Puerto Rico, Jose.Cedeno@ece.uprm.edu, Luisa I. Feliciano-Cruz

This paper proposes the implementation of an Evolutionary Computation approach for solving the Security-Constrained Power Generation Dispatch Problem. Differential Evolution (DE) is presented as a reliable method for both minimizing generation costs and restraining bus voltages and line flows within technical limitations to avoid potential system failures. The proposed approach has been tested satisfactorily on the IEEE 30-bus system. Modifications were conducted on the system to force it to operate outside its security limits so that the security constraints could be implemented. The results obtained with the proposed solution methodology were compared to those obtained via some traditional optimization techniques including Linear and Quadratic Programming.

2 - Differential Evolution-Based Weighted Least Squares State Estimation With Equality and Inequality Constraints

Jose R. Cedeno, Associate Professor, University of Puerto Rico at Mayagüez, Department of Electrical Engineering, Stefani Building, S-224, Mayagüez, PR, 00680, Puerto Rico, Jose.Cedeno@ece.uprm.edu, Alfredo A. Cuello-Reyna

Through the years, interconnected power systems have become much more complex and the task of securely operating the systems has become more difficult. To help avoiding major system failures and regional power blackouts, electric utilities have installed more extensive supervisory control and data acquisition (SCADA) systems throughout the network, which support computer-based systems at the energy control center. The database created serves in supporting a wide range of applications, some to ensure the economic operation and others to assess the security of the system if transmission line outages or other equipment failures should occur. Before executing any security assessment program or taking any control action in the system, a reliable estimate of the existing state of the system must be determined. The state estimation program provides an estimate of the system state and a quantitative measure of how good that estimate is, before it is used for real time power flow calculations or for on-line security purposes. Besides some of the inputs typically required for conventional power flow calculations, additional measurements should be provided in order to counteract the effect of inaccurate (or missing) data due to instrument failures. A good state estimation will smooth out small random errors in measurements, detect and identify large measurement errors, and compensate for missing data. Thus, gross errors detected in the course of state estimation are automatically filtered out, improving the reliability of the estimation. There are several topics in state estimation being studied to improve the accuracy and reliability of the state estimators in power systems. The integration of the new technology of phasor measurement units (PMUs), the incorporation of operational constraints to the traditional state estimation formulation, and the way that these features could be used to improve the estimation of the real state of the system in the new emerging electricity markets are some of the features which are been analyzed nowadays. In this article we propose to use the Differential Evolution algorithm for solving the Weighted Least Squares State Estimation problem with the inclusion of equality and inequality constraints to the original formulation. In order to validate and demonstrate the applicability of the proposed method, a case study of a sample state estimation problem is presented.

3 - Differential Evolution-Based Weighted Least Squares State Estimation With Phasor Measurement Units

Jose R. Cedeno, Associate Professor, University of Puerto Rico at Mayagüez, Department of Electrical Engineering, Stefani Building, S-224, Mayagüez, PR, 00680, Puerto Rico, Jose.Cedeno@ece.uprm.edu, Alfredo A. Cuello-Reyna

Through the years, interconnected power systems have become much more complex and the task of securely operating the systems has become more difficult. To help avoiding major system failures and regional power blackouts, electric utilities have installed more extensive supervisory control and data acquisition (SCADA) systems throughout the network, which support computer-based systems at the energy control center. The database created serves in supporting a wide range of applications, some to ensure the economic operation and others to assess the security of the system if transmission line outages or other equipment failures should occur. Before executing any security assessment program or taking any control action in the system, a reliable estimate of the existing state of the system must be determined. The state estimation program provides an estimate of the system state and a quantitative measure of how good that estimate is, before it is used for real time power flow calculations or for on-line security purposes. Besides some of the inputs

typically required for conventional power flow calculations, additional measurements should be provided in order to counteract the effect of inaccurate (or missing) data due to instrument failures. A good state estimation will smooth out small random errors in measurements, detect and identify large measurement errors, and compensate for missing data. Thus, gross errors detected in the course of state estimation are automatically filtered out, improving the reliability of the estimation. Since state estimation provides the platform for advanced security monitoring applications in control centers, this is perhaps the most important application of the Phasor Measurement Units (PMUs) in power systems. PMUs improve the monitoring and control functions of power systems through accurate, synchronized, and direct measurement of the system state. The greatest benefit comes from their unique capability to provide real time synchronized measurements. With PMUs the security indicators produced by these advance applications are representative of the true real time status of the power system. The challenge therefore is to incorporate the information provided by the PMUs in the conventional state estimator to improve the assessment of the current state of the system. This article presents a solution methodology to the state estimation problem with phasor measurement units by using the evolutionary computation technique known as Differential Evolution. In order to validate and demonstrate the applicability of the proposed method, a case study of a sample state estimation problem is presented.

4 - Power Flow Control in FACTS Using Particle Swarm Optimization

Jose R. Cedeno, Associate Professor, University of Puerto Rico at Mayagüez, Department of Electrical Engineering, Stefani Building, S-224, Mayagüez, PR, 00680, Puerto Rico, Jose.Cedeno@ece.uprm.edu, Juan L. Vargas-Figueroa

This paper describes a Particle Swarm Optimization (PSO) based algorithm developed for solving Optimal Power Flow (OPF) problems incorporating Flexible AC Transmission System (FACTS) devices. A FACTS device is a power electronics based system and other static equipment that provides control of one or more of the main AC transmission system parameters. FACTS devices can ease the power flow control, increase the loading capability of lines, increase system security through raising the transient stability limit, provide secure tie line connections to neighboring utilities and regions, provide greater flexibility in siting new generation, reduce reactive power flows and loop flows, and increase utilization of lowest cost generation. In this work, a PSO-based OPF solution procedure is proposed. The algorithm has been tested successfully on a modified IEEE 30 bus system. The results obtained with the proposed method were compared to those obtained by means of other optimization techniques like Differential Evolution (DE) and Genetic Algorithms (GA).

■ SC17

Egret

Innovation Science: A Data-Driven Perspective

Sponsor: Joint Sponsored: Quality, Statistics, and Reliability/
Data Mining

Sponsored Session

Chair: Andrew Kusiak, Professor, University of Iowa, 3131 Seamans Center, Iowa City, IA, 52242, United States, andrew-kusiak@uiowa.edu

1 - Innovation Science: A Tutorial

Andrew Kusiak, Professor, University of Iowa, 3131 Seamans Center, Iowa City, IA, 52242, United States, andrew-kusiak@uiowa.edu

The literature on innovation is extensive and rapidly growing, however, a unified theory of innovation is lacking. Analysis of triggers attributed to the past inventions and innovations may contribute to the creation of a formal innovation methodology advocated in this tutorial. Unifying and generalizing elementary concepts and practices is not new, e.g., operations research and data mining have been developed by such approaches.

2 - Efficient Extraction of Meaningful Features for High-Resolution NMR Spectra

Seoung Bum Kim, Industrial & Manufacturing Systems Engineering, The University of Texas at Arlington, 500 W. First St., Box 19017, 420K Woolf Hall, Arlington, TX, 76019-0017, sbkim@uta.edu

Successful implementation of feature selection in nuclear magnetic resonance (NMR) spectra not only improves the classification ability, but also simplifies the entire modeling process and thus, reduces computational and analytical efforts. We present some feature extraction / selection methods and discuss their properties for the analysis of high-resolution NMR spectra.

■ SC18

Heron

Education and Distance Learning II

Contributed Session

Chair: Martin Chlond, University of Central Lancashire, Corporation Street, Preston, PR1 2HE, United Kingdom, martin.chlond@btinternet.com

1 - Faculty Evaluations and the Grade Expectations of Students

Ulysses Brown, Assistant Professor, Savannah State University, 3219 College Street, College of Business Administration, Savannah, GA, 31404, United States, brownu@savstate.edu, Reginald Leseane

This paper explores the relationship between faculty evaluations and the grade expectations of students in six business courses. Using path analysis techniques we found that grade expectation was directly related to faculty evaluations. Implications, limitations, and future research suggestions were discussed.

2 - Integer Programming in Recreational Mathematics

Martin Chlond, University of Central Lancashire, Corporation Street, Preston, PR1 2HE, United Kingdom, martin.chlond@btinternet.com

This presentation will promote a number of puzzles take from the literature of recreational mathematics. Examples will be used to demonstrate common Integer Programming structures such as the Traveling Salesperson Problem, Set-packing and Set-covering problems and the use of binary variables to model logical conditions.

■ SC19

Sea Gull

Dynamic Programming

Cluster: Bellman Continuum

Invited Session

Chair: Ana Paias, University of Lisbon, Operations Research Center, Faculdade de Ciências, DEIO, C6 piso 4, Lisboa, 1749-016, Portugal, ampaia@fc.ul.pt

1 - A Hierarchy of Neighborhood Structures for the Hop-Constrained Minimum Spanning Tree Problem

Luis Gouveia, University of Lisbon, Operations Research Center, Lisbon, Portugal, legouveia@fc.ul.pt, Ana Paias, Dushyant Sharma

In this talk we present a hierarchy of neighborhood structures for the Hop-Constrained Minimum spanning tree problem. The neighborhoods are based on a new Dynamic Programming formulation for the problem. We present and test several local search methods that are based on the proposed neighborhoods.

2 - Generation of Dynamic Programming Applications

Jaroslav Sklenar, Senior Lecturer, University of Malta, Department of Statistics & OR, Msida, MSD 06, Malta, jaroslav.sklenar@um.edu.mt

Generalized mathematical model of Deterministic Dynamic Programming was applied to specify a common solver algorithm that performs the optimization procedure. Particular applications are represented by unified sets of few simple functions together with problem specific data. Use of the method in education is demonstrated by detailed description of two selected applications. Implementation languages are Matlab and Java.

■ SC20

Parrot

Using Agents to Tame Complexity

Cluster: Complex and Dynamic Systems

Invited Session

Chair: Albert Jones, National Institute of Standards & Technology, 100 Bureau Drive, MS 8260, Gaithersburg, MD, 20899-8260, United States, jonesa@cme.nist.gov

1 - Team Coordination Modeling Using Agent-Based Simulation

Jose A. Rojas, Instructor, University of Turabo, P.O. Box 3030, Estación Universidad, Gurabo, PR, 00778, United States, jrojas@suagm.edu, Ronald E. Giachetti

This research is based on the premise that teams can be designed for high performance. In order to accomplish this, there is a need for computational tools that can represent the complexity of human team behavior. We propose an agent-based simulation model to predict coordination and outcome performance of management teams based on team design characteristics. The simulation model will be used as a tool to determine which team design configuration will optimize team performance.

2 - Motivating Cooperative Behavior in Enterprises

Christian Wernz, University of Massachusetts Amherst, 160 Governors Drive, Amherst, MA, 01003, United States, cwernz@ecs.umass.edu, Abhijit Deshmukh

This paper studies the interaction of decision-makers in hierarchical organizations and derives a multi-agent, distributed decision-making model using dependency graphs and game theory. We extend a two-agent base model to a multi-agent framework and explore the effects of different organizational designs. Our model provides decision makers in complex decision situations with strategies, reduces information exchange costs, and determines organizational design that motivates cooperative behavior.

3 - Adaptive Control of Multistage Airport Departure Planning Process Using Approximate Dynamic Program

Rajesh Ganesan, Assistant Professor, George Mason University, 4400 Univ. Dr. MS 4A6, Fairfax, VA, 22030, United States, rganesan@gmu.edu, Lance Sherry

Many service enterprise systems such as the airport departure systems are typical multistage with non-linear complex interactions between stages. Adaptive controllers based on the analytical and/or artificial intelligence techniques can provide improved dynamic performance of the multistage process. We present a multiresolution assisted reinforcement learning controller, which is used in an agent-based control model for improving the performance quality of the airport departure planning process.

SC21

Canary

Special Topics in Information Systems

Sponsor: Information Systems Society

Sponsored Session

Chair: Vijay Mookerjee, University of Texas-Dallas, School of Management, Richardson, TX, United States, vijaym@utdallas.edu

1 - Impact of Investments in IT on Economic Development in Island Economies: The Case of the US Virgin Islands

William DeLone, Professor of Information Systems, Kogod School of Business, American University, wdelone@american.edu

Macro-level investments in Information Technologies and complimentary investments in IT education can bridge the Digital Divide for small developing countries. This presentation will discuss how higher education, government and the private sector are collaborating to create an IT industry on the island of St. Croix in the US Virgin Islands.

2 - Pricing Models for Online Advertising: CPM versus CPC

Nanda Kumar, University of Texas at Dallas, nkumar@utdallas.edu, Kursad Asdemir, Varghese Jacob

There is little consensus between advertisers and websites (publishers) on the appropriate pricing model (CPM or CPC) for Internet advertising. We seek to identify market conditions under which advertisers and publishers prefer one model over the other. We develop a game-theoretic model to highlight the relevant trade-offs.

3 - A Model to Analyze the Impact of P2P Technologies on the Market for Content Distribution

Nanda Kumar, University of Texas at Dallas, nkumar@utdallas.edu, Vijay Mookerjee, Monica Johar

The impact of a P2P network can benefit or hurt the market for content distribution services. By acting as a content filter the P2P network can support the market, whereas by acting as a content pirate the P2P network can weaken the market.

SC22

Pelican

OR in Public Health

Cluster: Operations Research in Medicine and Health Care
Invited Session

Chair: Eva Lee, Associate Professor & Director, Georgia Institute of Technology, Industrial and Systems Engineering, Atlanta, GA, 30332-0205, United States, evakylee@isye.gatech.edu

1 - Large-Scale Dispensing for Emergency Response to Bioterrorism and Infectious Disease Outbreak

Eva Lee, Associate Professor & Director, Georgia Institute of Technology, Industrial and Systems Engineering, Atlanta, GA, 30332-0205, United States, evakylee@isye.gatech.edu, Siddhartha Maheshwary

A simulation and decision support system, RealOpt, for planning large-scale emergency dispensing clinics to respond to biological threats and infectious disease outbreaks is described. RealOpt incorporates efficient optimization seamlessly interfaced with a simulation module. It allows public health administrators to investigate clinic design and staffing scenarios quickly for operational and strategic planning. Experience of using RealOpt for actual Anthrax drill planning will be analyzed.

2 - OR for HIV: Improving Prevention and Treatment Strategies in Resource-Limited Countries

Nathaniel Hupert, MD, MPH, Assistant Professor of Public Health and Medicine, Weill Cornell Medical College, 411 E. 69th St., KB-309, New York, NY, 10021, United States, nah2005@med.cornell.edu, Wei Xiong, PhD, Eric Hollingsworth, Kate Waldman, Adam Was, Meg O'Brien, PhD, William Rodriguez, MD

The pace of new HIV infections continues to outstrip treatment capabilities. We have partnered with the Clinton Foundation HIV/AIDS Initiative (CHAI) to bring classic operations research techniques (e.g., simulation and optimization) to bear on pressing issues in prevention and treatment in sub-Saharan African countries. We will highlight three projects: resource forecasting for prevention activities, simulation of clinical centers, and optimization of laboratory machine networks.

3 - Influenza Supply Chain With Multiple Agencies

Hamed Mamani, MIT, Massachusetts Ave, Cambridge, MA, 02139, United States, hamed@MIT.EDU, David Simchi-Levi

Billions of dollars are being allocated for influenza pandemic preparedness and vaccination is a primary weapon for fighting influenza outbreaks. We analyze a model with a single manufacturer and multiple agencies purchasing and distributing the vaccination. We show that production risks, taken by the manufacturer, lead to an insufficient supply of vaccine and design contractual agreements between the agencies and the manufacturer that can coordinate the supply chain.

Monday, 8:00 - 9:30am

■ MA01

Rio Mar Salon 1

Project and Risk Management I

Contributed Session

Chair: Juhnyoung Lee, Research Staff Member, IBM, 19 Skyline Drive, Hawthorne, BY, 10532, United States, jyl@us.ibm.com

1 - Compression of Project Activities

Abdelghani Elimam, Professor, San Francisco State Univ.,
Holloway Ave, San Francisco, CA, 94132, United States,
aelimam@sfsu.edu, Bajis Dodin

Normally, only critical project activities are crashed. In this paper, we identify and model PROJECT MANAGEMENT situations THAT CAN BENEFIT FROM crashing non-critical activities. We also treat crashing of activities with stochastic durations. Model Characterization and computational results on activities crashing are presented.

2 - Optimizing the Dismantling of Nuclear Power Plants - A Project Scheduling Model

Jan-Hendrik Bartels, Clausthal University of Technology,
Julius-Albert-Str. 2, Clausthal-Zellerfeld, D-38678, Germany,
jan_bartels@gmx.de, Thorsten Gather, Juergen Zimmermann

Due to economical, technical, or political reasons all over the world about 100 nuclear power plants have been disconnected until today and are still waiting for their dismantling. Per reactor this will cause cost of up to one Bil. dollars and last up to 20 years. In our contribution we present a project scheduling model minimizing the discounted disbursements of dismantling a nuclear power plant. A solution procedure for this problem will be presented within a subsequent contribution.

3 - Optimizing the Dismantling of Nuclear Power Plants - Solution Procedures

Thorsten Gather, Clausthal University of Technology,
Julius-Albert-Str. 2, Clausthal-Zellerfeld, D-38678, Germany,
thorsten.gather@web.de, Jan-Hendrik Bartels, Juergen Zimmermann

Within a preceding contribution we presented a project scheduling model with minimum and maximum time lags, renewable and cumulative resources as well as multiple execution modes for minimizing the discounted disbursements of dismantling a nuclear power plant. In this contribution we introduce solution procedures for the respective NP-hard optimization problem. These procedures make use of a relaxation based enumeration approach which may be incorporated into a branch-and-bound algorithm.

4 - Estimating Schedules, Costs and Values of Large-Scale IT Service Projects

Juhnyoung Lee, Research Staff Member, IBM, 19 Skyline Drive,
Hawthorne, BY, 10532, United States, jyl@us.ibm.com

Accurate estimation of project schedules, staffing and cost is critical in planning and delivery of large-scale ISV IT service projects. We propose a normative and constructive models and methods that facilitate generating implementation project plans, schedules, and strategies for various ISV systems (e.g., SAP, Oracle, Siebel, ...) and various classes of clients, supporting decisions for estimating cost and project schedules, and accurately estimating cost and value of IT projects.

■ MA02

Rio Mar Salon 2

Retail Operations Management

Sponsor: Manufacturing & Service Operations Management
Sponsored Session

Chair: Felipe Caro, Assistant Professor, UCLA Anderson School of Management, 110 Westwood Plaza, Suite B420, Los Angeles, CA, 90095, United States, fcaro@anderson.ucla.edu

1 - The Benefits of Substitution: Illustration With a General Model for Customer Preferences

Dorothee Honhon, Assistant Professor, University of Texas at Austin,
1 university station, CBA 3.440, Austin, TX, 78712, United States,
Dorothee.Honhon@mcombs.utexas.edu

We represent customer preferences for a product category by defining customer types, which are the lists of products they are willing to buy in decreasing order of preference. Demand for the product category is assumed to be continuous, with a fixed proportion of customers being of each possible type. We compute the optimal assortment under static and dynamic substitution and illustrate three benefits of substitution: risk-pooling, demand redistribution and demand hedging.

2 - Assortment Localization

Ramnath Vaidyanathan, PhD Student, The Wharton School, 500 Jon
M Huntsman Hall, 3730 Walnut Street, Philadelphia, PA, 19104,
United States, ramnathv@wharton.upenn.edu, Marshall Fisher

While consumer preferences vary widely across the stores of a retail chain, most retailers offer essentially the same assortment at all of their stores, because they lack a methodology for determining how to vary assortments by store. We describe an algorithm for analyzing sales history to determine store specific assortments that maximize a given profit function. We discuss application of this algorithm with a particular retailer.

3 - Why do Some Managers Use an 'Non-Optimal' Inventory Policy? An Empirical Investigation

Justin Ren, Boston University School of Management,
595 Commonwealth Ave, Boston, MA, United States, ren@bu.edu,
Sean Willems, Gokhan Usanmaz

This paper investigates why some inventory managers choose not to use the 'optimal' policy in managing their inventory. We collect data from a large nation-wide dealer network for a major industrial tractor manufacturer. Through our analysis we find that a multitude of factors jointly determine dealers' inventory policy choice, such as demand pattern, holding cost, competition, and management capability. Our results shed new light on inventory management and supply chain execution.

4 - Inventory Management of a Fast-Fashion Retail Network

Felipe Caro, Assistant Professor, UCLA Anderson School of
Management, 110 Westwood Plaza, Suite B420, Los Angeles, CA,
90095, United States, fcaro@anderson.ucla.edu, Jeremie Gallien

Fast-fashion retailers (e.g. Zara) have met some success responding to volatile demand trends through frequent introductions of new garments produced in small series. An important associated operational problem is the allocation over time of a limited amount of inventory across all stores in their network. We present models developed in collaboration with a large fast-fashion retailer, and then discuss the impact of this work based on empirical data collected during the Fall-Winter season 2006.

■ MA03

Rio Mar Salon 3

Pricing and Capacity Decision Models Under Uncertainty

Cluster: Supply Chain Optimization
Invited Session

Chair: Yunzeng Wang, University of Texas at Dallas, School of Management, Richardson, TX, United States, yunzeng.wang@utdallas.edu

1 - Long-Term Contracts Under the Threat of Supplier Default

Robert Swinney, Doctoral Candidate, University of Pennsylvania,
3730 Walnut St, Suite 500, Philadelphia, PA, 19104, United States,
rswinney@wharton.upenn.edu, Serguei Netessine

We address the issue of how to contract with suppliers facing the threat of failure when the probability of failure is directly influenced by contract terms (e.g., price and length of contract). We model this dynamic through a two period contracting game with two suppliers, a single buyer, and uncertain production costs. We determine when it is optimal to commit to a long-term relationship, and how this decision is affected by suppliers under the threat of failure.

2 - A Model of Partial Product Complementarity and Strategic Production Decisions With Uncertain Demands

Xiang Fang, Case Western Reserve University, 10900 Euclid Avenue,
Cleveland, OH, 44106, United States, Xiang.Fang@case.edu,
Yunzeng Wang

We consider an industrial setting where multiple manufacturers each produce a different product and sell it to the markets. These products are partially complementary products. Facing demand uncertainties, the manufacturers each choose a production quantity for its product to maximize its own expected profit. We formulate the problem as a non-cooperative game. We show that there always exists a unique Pareto-optimal Nash equilibrium, which can be derived analytically and explicitly.

3 - Pricing-Capacity Tradeoffs in Rehabilitative Healthcare Networks: Models and Open Problems

William Millhiser, Assistant Professor of Management, Baruch
College, Box B9-240, One Bernard Baruch Way, New York, NY,
10010, United States, William_Millhiser@baruch.cuny.edu

A United States network of rehabilitative care facilities bases the decision to accept patients for prescheduled surgeries on bed availability and expected reimbursement. With uncertain recovery times, there are weeks when all beds are occupied, prescheduled surgeries are delayed and new surgery requests are rejected. Using queueing network with blocking models, we explore relationships between a facility's capacity and the reimbursement thresholds used for patient acceptance/rejection.

■ MA05

Rio Mar Salon 5

Risk, Forecasting, and Decision Rules

Sponsor: Decision Analysis
Sponsored Session

Chair: Philippe Delquie, INSEAD, Boulevard de Constance, Fontainebleau, 77300, France, Philippe.DELQUIE@insead.edu

1 - Mean-Variance With Constant Risk Aversion: A Condition for Stochastic Dominance

Philippe Delquie, INSEAD, Boulevard de Constance, Fontainebleau, 77300, France, Philippe.DELQUIE@insead.edu, Alessandra Cillo

Mean-Variance models are widely used in financial portfolios analysis but can lead to stochastic dominance (SD) violations. Particularly disturbing is the violation of first degree SD, a pillar of rational choice theory. We propose a sufficient condition for the additive Mean-Variance model to satisfy FSD. The condition puts a restriction merely on the ranges of the probability distributions to choose from, not on their shape or other characteristics. The condition is easy to verify in practice.

2 - Incorporating Robustness in the Linear Pooling of Forecasts

Victor Richmond Jose, Duke University, Box 90120, Duke University, Durham, NC, 27708, United States, vrj@duke.edu, Robert L. Winkler

Linear pooling of forecasts is one of the most commonly used means of combining forecasts. Traditional performance-based models for linear pooling of forecasts often perform poorly in the presence of outliers. In this paper we investigate the effectiveness of incorporating robust estimators into these models. An analogous study is also made for non-performance-based approaches through the use of simple L-estimators such as the trimmed and winsorized means, as opposed to simple averages.

3 - Reconciling Support Theory and the Book-Making Principle

Enrico Diecidue, INSEAD, INSEAD, Bd. de Constance, 77305 Fontainebleau cedex, Fontainebleau, 77305, France, enrico.diecidue@insead.edu, Dolchai La-Ornuat

Support theory proposes that people's probability judgments differ when presented with different descriptions of the same event. This implies subadditivity in the derived subjective probability. This paper investigates and illustrates support theory' violations of a standard consistency requirement like the book-making principle. Goal of this paper is to propose a more general version of the book-making principle that allows for different descriptions of events.

4 - A Cross Cultural Study of Engineering Decision Making: Comparisons of U.S. and China Automotive Engineers

Gang Wang, Wayne State University, wanggang@wayne.edu, Kenneth Chelst

With the trend of global manufacturing, more and more tasks such as global product development, emerging market sourcing etc. require deep understanding of cross-cultural issues in the decision making process. In this paper, the differences of risk perception and risk attitude between American and Chinese engineers when they approach engineering decisions are investigated. The roles of risk perception and risk attitude in explaining the difference of risk-taking behaviors at society level are explored. Furthermore, possible cultural explanations such as uncertainty avoidance, collectivism and power distance etc. culture dimensions regarding the risk perception and risk attitude are discussed.

■ MA06

Rio Mar Salon 6

Tutorial: When More is Better

Cluster: Tutorials
Invited Session

Chair: David Simchi-Levi, Professor, MIT, 77 Massachusetts Ave., RM. 1-171, Cambridge, MA, 02139, United States, dslevi@mit.edu

1 - Tutorial: When More is Better

David Simchi-Levi, Professor, MIT, 77 Massachusetts Ave., RM. 1-171, Cambridge, MA, 02139, United States, dslevi@mit.edu

A supply chain setting is inherently characterized by interactions between multiple products and agents seeking to maximize their own utility. In this presentation we use an axiomatic approach to explore the impact of product variety on customer demand, product price, system revenue and inventory levels. These results are applied to two supply chains. The first is a decentralized multi-retailer system where each retailer sells a single product and retailers compete on price. The second supply chain is a single retailer selling multiple competitive products. We use the insight from our analysis to answer the question of whether more consumer choices is better for the customers or the seller.

■ MA07

Rio Mar Salon 7

Latest Methodologies in Mixed Integer Programming

Sponsor: Interface of Computing Science & OR
Sponsored Session

Chair: Huanyuan Sheng, Northwestern University, 2145 Sheridan Rd, Tech C231, Evanston, IL, 60201, United States, h-sheng@northwestern.edu

1 - Semi-Definite Programming Approaches to the Stochastic Portfolio Indexing Problem

Roy Kwon, University of Toronto, Mechanical and Industrial Engineering, Toronto, Canada, rkwon@mie.utoronto.ca

We consider the problem of solving the portfolio indexing problem under uncertainty. We formulate the problem as a two stage stochastic integer program. We propose a dual decomposition strategy based on semi-definite programming for solution and give computational results.

2 - Advanced Methods for Solving a Hard MIP-Based Multi-Category Classification Model

Eva Lee, Associate Professor & Director, Georgia Institute of Technology, Industrial and Systems Engineering, Atlanta, GA, 30332-0205, United States, evakylee@isye.gatech.edu

In this talk, we describe an integer-programming based classification model for disease prediction. Efficient computational strategies will be described and its application to real medical problems will be presented.

3 - Orbital Branching

James Ostrowski, Lehigh University, 200 W Packer, Bethlehem, PA, 18015, United States, jao204@lehigh.edu, Fabrizio Rossi, Stefano Smriglio, Jeff Linderoth

We introduce orbital branching, an effective branching method for integer programs containing a great deal of symmetry. The method computes equivalent variables wrt the symmetry remaining in the problem. These groups of equivalent variables (orbits) are used to create a partitioning of the feasible region which reduces the effects of symmetry while still allowing a flexible branching rule. We also show how to exploit the symmetries present to fix variables throughout the tree.

■ MA08

Rio Mar Salon 8

Computer Science - Optimization

Contributed Session

Chair: Yuntao Zhu, Assistant Professor, Arizona State University, Math Sciences and Applied Computing, Phoenix, AZ, 85069-7100, United States, yuntao.zhu@asu.edu

1 - Cut-Complexes: Geometric Approaches to Threshold Boolean and Pseudo- Boolean Functions

Carmen Caiseda, Inter American University of Puerto Rico, P.O. Box 10499 Caparra Station, San Juan, PR, 00922, Puerto Rico, ccaiseda@bc.inter.edu

The main goal is to introduce ramifications of a land-mark article by Hammer, Simone, Lieblings and De Werra, From Linear Separability to Unimodality: A Hierarchy of Pseudo-Boolean Functions. In this paper the authors introduce the concept of threshold pseudo-Boolean functions that are the smallest class in a hierarchy of pseudo-Boolean functions. We talk about characterization of threshold pseudo-Boolean functions for the 5-6 cubes and polytopal sections of the 5-cube.

2 - The Examination of Cluster Identification Algorithms for Vertical Partitions

Chun Hung Cheng, Associate Professor, The Chinese University of Hong Kong, Dept of Systems Engg & Engg Management, Chinese Univ. of Hong Kong, Shatin, NT, Hong Kong - ROC, chcheng@se.cuhk.edu.hk

In this work, we are concerned with cluster identification algorithms for vertical partitioning. In particular, we examine various formulations and the use of different cluster identification strategies. For vertical partitioning, existing algorithms may produce infeasible solutions to some problems. We propose to develop a new cluster identification strategy to avoid infeasibility. Illustrative examples are used to demonstrate the effectiveness of our new approach.

3 - SSDP and CCSDP Models for Mobile Ad-hoc Networks Design

Yuntao Zhu, Assistant Professor, Arizona State University, Math Sciences and Applied Computing, Phoenix, AZ, 85069-7100, United States, yuntao.zhu@asu.edu, K. A. Ariyawansa

We have recently proposed two new paradigms for stochastic optimization termed Stochastic Semidefinite Programming (SSDP) and Chance-Constrained Semidefinite Programming (CCSDP). In this presentation, we utilize these two new paradigms and

propose a class of stochastic location-aided routing strategies for mobile ad-hoc networks extending the existing deterministic location-aided routing algorithms.

■ MA10

Rio Mar Salon 10

OR in the Forest Sector III

Cluster: OR in the Forest Sector
Invited Session

Chair: Peter Lohmander, Professor, SLU, Faculty of Forest Sciences, Umeå, SE-901 83, Sweden, peter.lohmander@sekon.slu.se

- 1 - A Strategic Capacity Allocation Game in the High-Tech Industry**
Yang Sun, Research Associate, Industrial Engineering Department, Arizona State University, 1235 S. Dorsey Ln. #102, Tempe, AZ, 85281, United States, yang.sun@asu.edu, Dan Shunk, John Fowler

Consider a supply chain in which a sole supplier produces a part critical to downstream OEM buyers. The buyers turn the part into a homogeneous product and compete for market share. When the sum of the orders from the buyers exceeds the supplier's capacity, the supplier needs to allocate the restrictive capacity among the buyers. Hence, the buyers compete for not only customers but also scarce supplier capacity. Game theoretic models are used to analyze strategic behaviors in this situation.

- 2 - Global Carbon Markets and Implications for Forestry**

Darek Nalle, Assistant Professor, University of Idaho, Dept. of Forest Products, Moscow, ID, 83844-1132, United States, nalle@uidaho.edu, Miguel Henry

The new commodity of carbon is not a traditional commodity. This is due in part to currently evolving regulations within separate market places about the globe. The role of forestry in these markets will be overviewed, and the potential for forest land owners to profit from sequestration will be discussed.

■ MA11

Caribbean Salon 1

Exact and Heuristic Algorithms for Combinatorial Optimization

Cluster: Combinatorial Optimization
Invited Session

Chair: Mutsunori Yagiura, Nagoya University, Furocho, Chikusaku, Nagoya, 464-8603, Japan, yagiura@nagoya-u.jp

- 1 - Weaving Complicated Design Cloth Through Combinatorial Optimization**

Isamu Matsuura, Engineer, Owari Textile Research Center, Aichi Industrial Technology Institute, Mabiki Yamato-cho, Ichinomiya, AI, 491-0931, Japan, kaihatsu-sec@owaritex.jp, Masayoshi Andoh, Tomio Hirata

The more head frames a dobby loom is equipped with, the more complicated designs of cloth can be woven. By introducing long-eye heads into a loom, we can reduce the number of head frames. In this paper, we show that the number of necessary head frames equals the chromatic number of a graph associated with the design of cloth, and propose a heuristic algorithm that finds the number of necessary head frames.

- 2 - Effective Crossover Operator for the Traveling Salesman Problems: Edge Assembly Crossover**

Yuichi Nagata, Japan Advanced Institute of Science and Technology, 1-1 Asahidai, Nomi, 923-1292, Japan, nagatay@jaist.ac.jp

We propose a genetic algorithm for solving the traveling salesman problem. The objective of this research is improving a crossover operator named edge assembly crossover (EAX) where two tours can be globally merged into infeasible solutions, each consisting of small number of sub-tours. These infeasible solutions can be easily modified into valid tours. We demonstrate that the proposed GA found several new best solutions on National Traveling Salesman Problems.

- 3 - Robust Scheduling of Delivery Under Uncertainty on Demands at Delivery Points**

Keisuke Murakami, Osaka University, 2-1 Yamadaoka, Suita, Japan, keimura@ist.osaka-u.ac.jp, Hiroshi Morita

When we make a schedule of delivery, it could be that the quantity demanded at each delivery point alters along the way. That is, we cannot know the exact quantity demanded at each delivery point in advance. However we must determine the quantity of load on fleet, the size of fleet and the delivery route before departure. It is trade-off between the fuel cost of returning to the depot due to shortage of the load and the cost of employing the larger fleet. Then we find the robust schedule on cost.

■ MA12

Caribbean Salon 2

Risk Management in Mixed-Integer Stochastic Programming

Sponsor: Optimization/Stochastic Programming
Sponsored Session

Chair: Ralf Gollmer, Dr., University of Duisburg-Essen, Dept. of Mathematics, Forsthausweg 2, Duisburg, D-47048, Germany, gollmer@math.uni-duisburg.de

- 1 - Stochastic Programs With First-Order Dominance Constraints Induced by Mixed-Integer Linear Recourse**

Frederike Neise, University of Duisburg-Essen, Dept. of Mathematics, Forsthausweg 2, Duisburg, D-47048, Germany, neise@math.uni-duisburg.de, Ralf Gollmer, Rüdiger Schultz

We apply first order stochastic dominance to two-stage stochastic programs and therewith find a best solution that dominates a given benchmark. Results concerning structure and stability of these models are presented. For the arising large-scale linear mixed-integer deterministic equivalents a decomposition algorithm is established. We conclude with some preliminary computational results for a dispersed generation system managed with respect to random power and heat demand.

- 2 - Second-Order Stochastic Dominance Constraints Induced by Mixed-Integer Linear Recourse**

Uwe Gotzes, University Duisburg-Essen, Dept. of Mathematics, Duisburg, D-47048, Germany, gotzes@math.uni-duisburg.de, Ralf Gollmer, Rüdiger Schultz

We propose a new class of stochastic integer programs whose special features are dominance constraints of second order induced by mixed-integer linear recourse. We establish closedness of the constraint set mapping with the underlying probability measure as parameter. In the case of finite probability spaces, the models are shown to be equivalent to large mixed-integer linear programs. We propose a decomposition algorithm for the latter and discuss preliminary computational results.

- 3 - Efficient Points for Two Stage MIP Mean-Risk Models via Reference Point Scalarization**

Ralf Gollmer, Dr., University of Duisburg-Essen, Dept. of Mathematics, Forsthausweg 2, Duisburg, D-47048, Germany, gollmer@math.uni-duisburg.de

In linear stochastic programming parametrizing the weighted sum of the mean and a risk measure yields all efficient points of this special bi-objective problem, justifying the synonymous use of this approach for the term mean-risk. This doesn't hold for problems involving integrality requirements due to missing convexity. In the talk the application of the reference point approach well-known from multi-objective programming is presented allowing for decomposition in the linear MIP case.

■ MA13

Caribbean Salon 3

Routing and Scheduling Applications

Sponsor: Joint Sponsored/Invited: Transportation and Logistics
Sponsored Session

Chair: Jeff Kennington, Professor, Southern Methodist University, EMIS Department, SMU, Dallas, TX, 75275-0123, United States, jlk@engr.smu.edu

- 1 - Scheduling and Routing Sales Representatives at the Missouri Lottery**

Wooseung Jang, Univ. of Missouri - Columbia, E3437 Lafferre Hall, Columbia, United States, jangw@missouri.edu, Huay Lim

The Lottery Sales Representatives (LSRs) at the Missouri Lottery play a central role in sales growth by providing excellent customer service to ticket retailers. The newly implemented schedules and routes, resulted from our study, save the LSR operation costs in the amount of \$98,648 annually, significantly improve the balance of routes and visitation feasibility, and indirectly increase the sales of lottery tickets by improving customer service.

- 2 - An Arc-Path Model for the OSPF Weight Setting Problem**

Jeff Kennington, Professor, Southern Methodist University, EMIS Department, SMU, Dallas, TX, 75275-0123, United States, jlk@engr.smu.edu, Anusha Madhavan

The Internet is composed of thousands of autonomous systems. Most run the Open Shortest Path First (OSPF) protocol to determine routing tables using a shortest path algorithm with integer link weights. The OSPF weight selection problem is to obtain weights to minimize some network metric. We present a new algorithm and an empirical evaluation for this problem.

■ MA14

El Morro 1

Emergency Planning

Cluster: OR in the Public Sector
Invited Session

Chair: Igor Frolow, Associate Partner, IBM, 10101 Inshore Drive, Austin, TX, 78730, United States, igor.frolow@us.ibm.com

1 - Modeling the Business Impacts of a Pandemic

Igor Frolow, Associate Partner, IBM, 10101 Inshore Drive, Austin, TX, 78730, United States, igor.frolow@us.ibm.com

This presentation focuses on the IBM Pandemic Business Impact Model, a state-of-the-art emergency planning capability that can be used to evaluate the effects of an influenza pandemic and various government and corporate mitigation actions on workforce availability and business operations.

2 - Homeland Security: The Genesis, Evolution and Future of Emergency Preparedness and Response

Brian Cairns, Industry Liaison, Homeland Security and Intelligence, IBM, 12902 Federal Systems Park Drive, Fairfax, VA, 22033, United States, bcairns@us.ibm.com

DHS was created to lead the unified national effort to secure America. We will review the actions that guided the national and international efforts to address the myriad of threats to our nation and allies. Through the eyes of someone with unrestricted access to the thoughts and actions of DHS's most senior decision makers, we will discuss this unprecedented government wide initiative that would combine 22 agencies and alter our national security effort forever.

■ MA15

El Morro 2

Joint Session: Military Applications and Society for Risk Analysis

Sponsor: Military Applications, Society for Risk Analysis
Sponsored Session

Chair: Igor Linkov, Managing Scientist, Intertox Inc., 83 Winchester Street, Suite 1, Brookline, MA, 02446, United States, ilinkov@intertox.com

1 - Risk Assessment and Decision Analysis: Framework and Applications in Military Settings

Igor Linkov, Managing Scientist, Intertox Inc., 83 Winchester Street, Suite 1, Brookline, MA, 02446, United States, ilinkov@intertox.com

Risk assessment and decision analysis are getting increasingly used in military settings. This presentation reviews current military doctrine (network centric operations and mission command) and highlights utility of risk assessment and decision analysis to address military decision making needs.

2 - Risk and Decision-Making in Homeland Security

Robert Ross, Chief, Risk Sciences Branch, Dept of Homeland Security, Science & Technology Directorate, Washington, DC, 21114, United States, bob.ross@dhs.gov

This paper examines Homeland Security decision-making. Complexity, uncertainty and ambiguity and high social complexity require risk assessment tools that differ from traditional methods. This paper draws on new thinking in "risk governance" as well as on long accepted work on "social complexity" and "wicked problems." It presents relevant characteristics of the homeland security problem space, together with the resulting special demands for risk-informed homeland security decision-making.

3 - Chemical, Biological, and Radiological Defense: Risk-Based Decision Support

Rena Dittmer, Science Policy Analyst, DTRA/CBT, 499 Belmont Bay Drive, Woodbridge, VA, 22191, United States, renaeditmer@hotmail.com, Igor Linkov

Risk Assessment (RA) and Operational Risk Management (RM) have been invoked as tools for organizing and managing the execution of military and homeland security strategies in Chemical, Biological, Radiological, and Nuclear environments. This presentation makes three arguments: 1. RA should not be an end unto itself; 2) RA criteria must be based on risk management objectives; 3) integration of RA and RM based on a solid foundation of multicriteria decision analysis is necessary.

4 - MCDA and Risk Assessment: Applications at Military Sites

Elizabeth Ferguson, Associate Technical Director, USACE, 3909 Halls Ferry Rd, Vicksburg, MS, 39180, United States, Elizabeth.A.Ferguson@erc.usace.army.mil, Burton Suedel, Jongbum Kim

Remediation activities offer an opportunity to utilize multi-criteria decision analysis (MCDA) with substantial benefit. Often these activities have impediments to sound and transparent decisions. MCDA offers a solution to these difficulties through the process from planning to risk and remedial decisions. This presentation will show how decision analysis can be used in this process and provide examples of other uses of MCDA within the U.S. Army Corps of Engineers.

■ MA16

San Cristobal

Optimization and Simulation Applications

Cluster: OR in the Americas
Invited Session

Chair: Idalia Flores de la Mota, Ph.D, UNAM, Avenida Universidad 3000, Mexico City, DF, 04330, Mexico, idalia@servidor.unam.mx

1 - Improving CPN Model Simulations by Intelligent Evaluation Techniques

Miguel Mújica, Master, UNAM, Club Leon 19 Col. Villa Lazaro Cardenas, 14370, Mexico, miguelantonio.mujica@uab.es

A methodology based on Coloured Petri Nets (CPN) for a fast transition evaluation would be presented. This one evaluates the combinations of tokens which enable the transition, taking advantage of principles taken from constraint logic programming reduces the time spent if the testing were done with the classical generate and test approach. Infertile combinations of tokens are avoided and time for exploring all the combinations reduced, making it promising for coding an efficient CPN Simulator.

2 - Sensitivity Analysis for Binary Integer Programming

Irma Glinz, Master, UNAM, Antonio Caso 19. Educadores. Satélite, Naucalpan, 53100, Mexico, iglinz@hotmail.com

An innovating method to solve the sensitivity analysis problem in Binary Integer Programming, which is based on the Reoptimization Techniques will be presented. This method radically changes the focus by proposing reutilization over linear structures.

3 - Quadtree Algorithm Approach for Euclidean TSP Problems

Eshter Segura, Master, UNAM, Posgrado de Ingenieria, 04510 D.F.Mex., 10830, Mexico, esthersp_1976@yahoo.com.mx, Idalia Flores de la Mota

TSP is one of the most studied problems in combinatorial optimization, which applied in many related fields. Using typical mathematical methods consume a large computer time to solve it. This study look for a solution for Euclidean TSP using convex hull, geometry structure and a variant of quadtree. This new method was compared with greedy and nearest neighbour algorithms in some examples from TSPLIB to validate its best solution and effectiveness.

■ MA17

Egret

Quality Management I

Contributed Session

Chair: David Heimann, Professor, University of Massachusetts Boston, Management Sci. & Information Sys. Dept, 100 Morrissey Blvd, Boston, MA, 02125, United States, david.heimann@umb.edu

1 - Kernel-Based Monitoring Procedure for Forest Products Manufacturing

Myoung K. Jeong, Assistant Professor, University of Tennessee, 311 EST, Knoxville, TN, 37996, United States, mjeong@utk.edu, Seong J. Kim, Seung H. Baek, Hyun W. Cho

This paper aims at developing kernel-based monitoring procedure for forest products manufacturing. Traditional multivariate calibration technique of partial least squares (PLS) is considered here. Nonlinear kernel version of PLS is used to capture nonlinearities of the data to improve the predictive performance of PLS. Case studies using real life process data is presented to demonstrate the performance of the proposed methods.

2 - Design of Control Strategy for Product Variation Reduction in Manufacturing Systems

Shichang Du, PhD, Department of Industrial Engineering and Management, School of Mechanical Engineering, Shanghai Jiaotong University, China, Dept. IE, Sch. of ME, Shanghai Jiaotong, Shanghai, 200240, China, lovbin@sjtu.edu.cn, Lifeng Xi, Ershun Pan, Jiwen Sun

Product variation control is critical to enhance product quality. The variation control strategies and laws in manufacturing systems are developed. Furthermore, concepts of variation compensability and uncompensability are explored using linear algebra concepts. The methodology is demonstrated by a machining case to be able to generate a substantially influence in the final part quality.

3 - The Search for Excellence in Spanish Companies: A Study Based on the EFQM

Manuel Martinez, Mr., University of la Coruna, E.U. Diseno Industrial, Campus Esteiro, Ferrol, 15403, Spain, mmc@udc.es, Eduardo Guillen, Susana Barbeito

In this research work is carried out a diagnosis of the search for Excellence models in North West Spain based on the EFQM Model. Firstly, the paper presents the importance of the quality that nowadays arises in businesses and organizations. Secondly, the historical evolution of the quality is confronted. In the third section the methodology of the empirical research is outlined and finally, the conclusions and the future research topics are exposed.

4 - Statistical Monitoring Yield and Spatial Dependence in the Silicon Wafer Manufacturing

Seong J. Kim, University of Tennessee, 302 EST, Knoxville, TN, 37996, United States, skim47@utk.edu, Myong K. Jeong

Monitoring defective chips at wafer-level plays a key role in yield management and quality improvement in IC fabrication. We present an improved approach to monitoring wafer yield and spatial dependence at the same time. An autologistic regression is employed for modeling simultaneously wafer yield and spatial dependence on the wafer map.

5 - A Bipartite Metrics Program for Agile Software Development

David Heimann, Professor, University of Massachusetts Boston, Management Sci. & Information Sys. Dept, 100 Morrissey Blvd, Boston, MA, 02125, United States, david.heimann@umb.edu

We outline metrics for an agile process being used at a company producing manufacturing automation equipment. The process uses lightweight metrics at the development team level and more heavyweight metrics at the project management level. We carry out a goal-question-metric (GQM) analysis to determine the goals and questions for the process. We then examine the metrics used in the process, compare their scope to the GQM analysis, and identify issues and approaches to rectify those issues.

MA18

Heron

Using OR Students in Consulting and Cases

Cluster: Educational Issues

Invited Session

Chair: Karla Hoffman, Professor, George Mason University, Mail Stop 4A6, 4400 University Drive, Fairfax, VA, 22030, United States, khoffman@gmu.edu

1 - Case Learning in a Mathematical Environment: Observations From a Course in Optimization

Dawn Strickland, Winthrop University, 156 Bancroft Hall, Rock Hill, SC, 29733, United States of America, stricklandd@winthrop.edu

Mathematics students pose an interesting challenge to OR instructors as these students are largely unaccustomed to solving real-world problems. We discuss teaching LP modeling using cases in an OR course composed entirely of advanced mathematics majors.

2 - A Summer Internship Experience in the Forest Products Industry

Jeffrey L. Arthur, Professor, Oregon State University, Department of Statistics, 44 Kidder, Corvallis, OR, 97331-4606, United States, arthur@science.oregonstate.edu, Aimee Taylor

Resulting from a chance meeting at an INFORMS conference, Aimee had the opportunity to intern at a major forest products industry. During that time she had the opportunity to work on several interesting projects. One project involved optimally cutting stock to fill incoming orders. We discuss some of the problems encountered and how the group at the company went about diagnosing and fixing them. We will also provide comments on what was learned from the internship and working in the industry.

3 - Consulting and Capstone Design

Paul Griffin, Professor, Georgia Institute of Technology, School of Industrial, and Systems Engineering, Atlanta, GA, 30332-0205, United States, pgriffin@isye.gatech.edu

In this presentation we discuss how capstone design courses can be used as an effective mechanism for student consulting. In particular, we discuss the structure of the course and the importance of evaluation for replicating the consulting environment. Example projects will be used to motivate the presentation.

4 - Industry/University Collaboration: The Use of Design and Project Courses

Karla Hoffman, Professor, George Mason University, Mail Stop 4A6, 4400 University Drive, Fairfax, VA, 22030, United States, khoffman@gmu.edu

Seniors in systems engineering take a one-year design course, while all graduate students take a one-semester project course. We divide classes into teams working with an industrial partner. These courses have improved our student's analytic skills and enhanced our relationships with multiple companies. This talk describes the successes and challenges of running such courses.

MA19

Sea Gull

Dynamic Programming Applications

Cluster: Bellman Continuum

Invited Session

Chair: Tom Archibald, University of Edinburgh Management School, 50 George Square, Edinburgh, EH, EH3 5QU, United Kingdom, TArchibald@ed.ac.uk

1 - General Indexability and the Dynamic Allocation of Individuals to Service Teams

Kevin Glazebrook, Professor, Lancaster University, Department of Mathematics and Statistics, Lancaster University, Lancaster, UK, LA1 4YF, United Kingdom, k.glazebrook@lancaster.ac.uk

We develop notions of indexability appropriate for problems which concern the dynamic allocation of a divisible resource (in our case, manpower). We illustrate ideas by reference to a problem in which individuals are assigned dynamically to one of a collection of service teams, each of which mans a station. We develop simple index policies for server assignment which are close to optimal for a cost objective which is linear in customer waiting times.

2 - Modeling the Transshipment Decision in Retail Networks With Periodic Replenishments

Tom Archibald, University of Edinburgh Management School, 50 George Square, Edinburgh, EH, EH3 5QU, United Kingdom, TArchibald@ed.ac.uk, Dan Black, Kevin Glazebrook

We consider the transshipment decision in a retail network with periodic replenishments. We propose a Markov decision process model that allows transshipments to occur throughout the period, both in response to, and in anticipation of, stockouts. We propose approximate solution methods based on simple calibrations of individual locations. Numerical experiments show strong performance of the proposed methods compared to standard policies.

3 - Large-Scale R&D Investment Portfolio Analysis

Joseph Hartman, Lehigh University, 200 W. Packer Ave., Mohler Lab, Bethlehem, PA, 18015, United States, jch6@lehigh.edu, Pinar Keles

We model investment decisions (continue, terminate, or delay) for a portfolio of R&D investment projects over time with stochastic dynamic programming. As the problem is intractable for long horizon problems, we approximate end-of-horizon state values. Furthermore, we utilize information generated in the approximation process to provide insight into the probability that the optimal time zero decision is selected. We illustrate with numerous examples.

MA20

Parrot

Using System Dynamics to Tame Complexity

Cluster: Complex and Dynamic Systems

Invited Session

Chair: Humberto Alvarez, Professor of Industrial Engineering, Technological University of Panama, P. O. Box 0819-12425, El Dorado, Panama, NA, NS, Panama, humberto.alvarez@utp.ac.pa

1 - System of Systems Simulation

Luis Rabelo, Professor, University of Central Florida, 4000 Central Florida Blvd., Orlando, FL, United States, lrabelo@mail.ucf.edu, Nabeel Yousef, Humberto Alvarez, Jose Sepulveda

An interesting concept called system of systems (SoS), which aims to describe this interaction between systems has been gaining attention in the last few years. This presentation discusses the use of distributed simulation and system dynamics to model and simulate systems of systems. We illustrate our idea with two different examples from the Aerospace & Defense Industry and the Expansion of the Panama Canal.

2 - System Dynamics Technique to Evaluate Military Situation Awareness in a MOUT Scenario

Sergio Quijada, Colonel, Chilean Army, Valenzuela LLanos 623, Block a 401, La Reina, RM, Chile, sergioquijada@sergioquijada.com

We used the technique of System Dynamics to evaluate a MOUT (Military Operation in Urbanized Terrain) scenario in the context of the defined levels of situation awareness; the technique was applied to squads and platoon leaders who performed tasks of peacekeeping operations.

3 - Applying Hybrid System Dynamics Techniques to Capability Test Planning and Evaluation

David Dryer, Lead Systems Engineer, JTEM JT&E Program, 7025 Harbour View Blvd., Suite 105, Suffolk, VA, 23435, United States, david.dryer@jte.osd.mil, Mark Fiebrandt, Hugh Way, Timothy Beach

The Joint Test and Evaluation Methodology (JTEM) program is currently developing a Capability Test Methodology (CTM) to deliver system of systems evaluations across an acquisition life cycle. A metamodel-test-metamodel systems analysis approach is being developed and rehearsed with hybrid system dynamic and agent-based models to distill and analyze the capability test design during pre- and post-test complex system analysis.

4 - Hybrid System Dynamics Discrete Event Simulation Approach to Simulating the Manufacturing Enterprise

Magdy Helal, Doctor Candidate, University of Central Florida, Industrial Engi & Mgmt System Dept., 4000 Central Florida Blvd, Orlando, FL, United States, mhelal@mail.ucf.edu, Luis Rabelo, Albert Jones

We propose a methodology to integrate system dynamics (SD) simulation and discrete event simulation (DES) for simulating the manufacturing enterprise. Previously we have shown that SD and DES can complement each other for that purpose. The methodology calls for a modular structure for the simulation models that we describe here. We also propose a synchronization mechanism and describe the design of the communication controller unit that will manage the integration of the two simulation paradigms.

■ MA21

Canary

Management Information Systems and Technology

Contributed Session

Chair: Ping- Yu Chu, Professor, National Sun Yat-Sen University, 70 Lien-Hai Rd, Kaohsiung Taiwan, Kaohsiung TW, Taiwan, vchu@mail.nsysu.edu.tw

1 - The Role of IS Enabled Knowledge Exploration in Manufacturing Innovation

Qiang Tu, Associate Professor, Rochester Institute of Technology, E. Philip Saunders College of Business, Rochester, NY, 14623, United States, jqtbu@rit.edu

This paper presents an empirical survey study to understand antecedents to manufacturing innovation performance. More specifically, the study attempts to answer two research questions: 1) The impact of knowledge scanning practices on manufacturing innovation performance; 2) The role of information systems usage in enhancing knowledge exploration and manufacturing innovation. SPSS and structural equation modeling methods are used to validate measurement instruments and test research hypotheses.

2 - The Effect of Competition on the Rate of Innovation in High-Tech Product Industry

Wonjoon Kim, Assistant Professor, KAIST, 373-1 Guseong-dong, Yuseong-gu, Daejeon, 305-701, South Korea, wonjoon.kim@kaist.ac.kr

This paper measures the effect of competition on the rate and degrees of innovation in high-tech product industry, esp. semiconductor industry. Although cannibalization from new generation introduction can substantially decrease its overall profit, monopolistic firms keep innovating their products in order to confirm the profit from inter-temporal price discrimination originated from its product differentiation.

3 - Understanding Knowledge Management and Corporate Performance: A Test of an Integrated Model

Ping- Yu Chu, Professor, National Sun Yat-Sen University, 70 Lien-Hai Rd, Kaohsiung Taiwan, Kaohsiung, TW, Taiwan, vchu@mail.nsysu.edu.tw, Ling-Tsen Lin

This paper develops an integrative model to understand how KM factors affect KMP and corporate performance. Our model is examined from 5,000 enterprises in Taiwan. Furthermore, we also gather the corresponding financial data of surveyed enterprises from Taiwan MOPS. It provides decision makers with specific advice to improve corporate performance via KM. Thus, it appears that the integrated KM and corporate performance model has significant potential for supporting both research and practice.

■ MA22

Pelican

Improving Health Care Service Operations

Sponsor: Health Applications
Sponsored Session

Chair: Steve Thompson, Assistant Professor, University of Richmond, 28 Westhampton Way, Richmond, VA, 23173, United States, sthompson3@richmond.edu

1 - ICT & Optimization of Emergency Response: Innovations in the Emergency Care Sector of Crete

Panos Constantinides, Lecturer, Lancaster University, Lancaster University Management School, Lancaster, LA1 4YX, United Kingdom, p.constantinides@lancaster.ac.uk, Angelina Kouroubali, Michael Barrett

Dealing with life threatening situations demands efficiency and effectiveness of operations including optimizing the emergency response time, and utilizing resources as best appropriate for each incident. In this paper, we look at the joint efforts of the regional Emergency Medical Department of Crete and a private research and development institute in Greece to introduce new technologies for optimizing emergency response, including the computerization of triage protocols and telemedicine.

2 - A Comparison of Real-Time Allocation Schemes for Cardiac Diagnostic Testing Time Slots

Matthew Dean, PhD Student, University of Connecticut, 2100 Hillside Road, Unit 1041, Storrs, CT, 06269, United States, Matthew.Dean@business.uconn.edu

We look at the problem of real-time allocation of time slots for cardiac diagnostic testing. Specifically, we focus on determining which type of patient should be tested when a conflict for a time slot arises throughout the day. We explore and compare various alternatives for solving this problem. We show that by taking a holistic view of the hospital by incorporating information about its current state, we are able to improve several hospital-wide metrics.

3 - Impact of Walk-in Patients and Non-Punctuality in an Outpatient Clinic

Jose Zayas-Castro, josezaya@eng.usf.edu, Alcides Santander, Laila Cure

Our research considers common characteristics in scheduling patient appointments, namely unexpected patients and non-punctuality. The literature presents studies considering no-show probability, service time variability and different scenarios for customers per session (Ho and Lau 1997). However, it does not show the consideration of factors affecting existing appointment practices.

Monday, 10:00 - 11:30am

■ MB01

Rio Mar Salon 1

Project and Risk Management II

Contributed Session

Chair: Patrick Leach, Engagement Leader, Decision Strategies Inc., 3902 Gallaher Court, Missouri City, TX, 77459, United States, peleach@decisionstrategies.com

1 - Solving Time-Cost Tradeoff Problem in Project Management Using a Transformed LP Formulation

Edward Y. H. Lin, Professor, National Taipei University of Technology, Department of Business Management, 1, Chong-Hsiao East Road, Taipei, 106, Taiwan, line@ntut.edu.tw

For the time-cost tradeoff problem with discrete timing and fluctuating activity crash cost, we introduce a solution procedure through a transformed LP formulation. We show that, in practice, such transformed problem can be directly constructed and efficiently solved. Furthermore, the decision variables in the final solution of this transformed problem have more meaningful interpretations towards the desired optimal project crashing strategy.

2 - A Study on Pricing for Install-Based Commodities

Takeshi Koide, Univ. Marketing & Distribution Sciences, 3-1 Gakuen-Nishimachi, Nishi-ku, Kobe, 651-2188, Japan, koide@umds.ac.jp, Hiroaki Sandoh

The present study considers an install-base business where a manufacturer deals in both a system and its associated expendable suppliers. The expendable suppliers are indispensable for the system to show its function. Typical examples are printers with ink cartridges and water purifiers with filter cartridges. We discuss an optimal pricing for the system and the expendables within a Stackelberg game framework.

3 - Why Do We Still See 25-50-25?

Patrick Leach, Engagement Leader, Decision Strategies Inc.,
3902 Gallaher Court, Missouri City, TX, 77459, United States,
peleach@decisionstrategies.com

Many modelers in industry use discretizations to approximate continuous distributions - usually the P10, P50, and P90 values. A surprising number weight these discrete points at 25%, 50%, and 25%, respectively, despite the fact that this weighting does a poorer job of preserving the characteristics of the original distribution than does a weighting of 30-40-30. This paper uses three approaches to support this point: preservation of the moments, Keefer's paper of 1994, and empirical testing.

■ MB02

Rio Mar Salon 2

Managing Supply Chains with Multiple Products and/or Multiple Stages

Sponsor: Manufacturing & Service Operations Management
Sponsored Session

Chair: Srinagesh Gavirneni, Assistant Professor of Operations Management, Johnson School, Cornell University, Ithaca, NY, 14853, United States, sg337@johnson.cornell.edu

1 - The Final Order Problem for Repairable Spare Parts Under Condemnation

Tarkan Tan, Assistant Professor, Technische Universiteit Eindhoven, Dept. of Technology Management, Paviljoen F-07, P.O. Box 513, Eindhoven, 5600MB, Netherlands, T.Tan@tm.tue.nl, John van Kooten

We consider a manufacturer of complex machines that offers service contracts to her customers, committing herself to repair failed spare parts throughout a fixed service period. The suppliers of spare parts often discontinue the production of some parts as technology advances and ask the manufacturer to place a final order. We model the final order problem for a repairable spare part with a repair probability and lead time by means of a transient Markov chain and we present our results.

2 - Coordinating Multi-Indenture Service Supply Chains Through Performance Incentives

Sang-Hyun Kim, University of Pennsylvania, Wharton School of Business, Philadelphia, PA, 19104, shkim@wharton.upenn.edu, Morris A. Cohen, Serguei Netessine

In recent years, we have witnessed the emergence of a new maintenance and repair service contracting strategy called Performance Based Logistics (PBL), which is gaining wider acceptance in the aerospace and defense industries. Under PBL, the basis of supplier compensation is actual uptime of the product instead of physical assets such as spare parts. We investigate a tradeoff between product reliability and spares inventory in the presence of multiple subsystem providers and show how a PBL contract helps balance the two decisions.

3 - Hierarchical Supply Chain Network Design: An Application in the Building Products Industry

Funda Sahin, Assistant Professor of Logistics, University of Tennessee, Department of Marketing & Logistics, College of Business Administration, Knoxville, TN, 37996, United States, fsahin@utk.edu, Powell Robinson

We provide a hierarchical framework for supply chain network design and propose a three-level approach consisting of global, regional and community planning models. We document the effectiveness of the procedures in supporting managerial decisions through marginal, sensitivity, net present value analysis, and development of an implementation plan for supply chain consolidation.

4 - Technological Evolution and New Product Introductions: Competition, Capability and Uncertainty

Sreekumar Bhaskaran, Southern Methodist University, sbhaskar@mail.cox.smu.edu, Karthik Ramachandran

Firms developing new generation products often face the following choice: they can either introduce a product based on a proven and immediately available technology, or delay product introduction to incorporate a superior, yet unproven, technology. We show that this technology selection decision depends on the evolution of technology trajectories, the risk involved in developing advanced versions, and most importantly, the competitive intensity in the end-product market.

5 - Untruthful Probabilistic Demand Forecasts in Vendor-Managed Revenue-Sharing Contracts

Lawrence W. Robinson, Johnson Graduate School of Management, Cornell University, Ithaca, NY, 14853, United States, lwr2@cornell.edu, Yigal Gerchak, Eugene Khmelnitsky

Under vendor-managed revenue-sharing arrangements, the supplier decides on the level of inventory while the retailer operates under consignment, sharing sales revenue with her. When the supplier is unable to observe demand, she must base her decisions on the retailer's reported demand distribution. We show that the retailer's best choice of a distribution to report to his supplier will not be the true

demand distribution, but instead will be a degenerate distribution that coordinates the chain.

■ MB03

Rio Mar Salon 3

Managing Reverse Flows

Cluster: Supply Chain Optimization
Invited Session

Chair: Ana Muriel, Associate Professor, University of Massachusetts, 160 Governors Drive, Amherst, MA, 01003, United States, muriel@ecs.umass.edu

1 - A Model for Reverse Channel Design for Consumer Electronics

Prashant Yadav, Professor of Supply Chain Management, MIT-Zaragoza International Logistics Program, Zaragoza Logistics Center, Avenid Gomez Laguna, Zaragoza, 50009, Spain, pyadav@zlc.edu.es, Francisco Cebrian, Santiago Blasco

New regulatory requirements, shorter product life-cycles and higher customer return rates are forcing companies to manage their reverse logistics channels more efficiently. This paper attempts to understand and model the key tradeoffs involved in the design of the reverse logistics channel for consumer electronics items. We also study potential economies of scope and scale that may arise from integrating forward and reverse distribution networks for consumer electronics items.

2 - Supply Chain Coordination and Commercial Returns: The Return Allowance Credit Contract

Rocio Ruiz Benitez, University of Massachusetts, 160 Governors Drive, Amherst, MA, United States, rocio@acad.umass.edu, Ana Muriel

We investigate the effect that commercial returns have in supply chain coordination and in the optimal decision variables in a two-echelon supply chain with stochastic demand. Logistics costs related to returns may be incurred at both retailer and manufacturer sites. In many practical settings, the manufacturer faces the larger share. In others, such as the apparel industry, returns are handled exclusively at the retailer and the manufacturer typically gives certain return allowance credit.

3 - When is Market Segmentation the Major Driver in the Profitability of Remanufacturing Operations?

Ana Muriel, Associate Professor, University of Massachusetts, 160 Governors Drive, Amherst, MA, 01003, United States, muriel@ecs.umass.edu, Yue Jin, Yihao Lu

We investigate the profitability of remanufactured products for a monopoly firm in a single period setting. We characterize a threshold for the remanufacturing cost below which it is optimal to offer remanufactured products, and focus on analyzing its dependence on the consumer profile. The analysis shows when it is customer segmentation and not price differences that drive the decision. The results are applicable to the evaluation of the common marketing practices of branding and generics.

■ MB05

Rio Mar Salon 5

Decision Analysis Arcade

Sponsor: Decision Analysis
Sponsored Session

Chair: Eva Regnier, Assistant Professor, Naval Postgraduate School, Defense Resources Management Institute, 699 Dyer Road, Monterey, CA, 93943, United States, eregnier@nps.edu

1 - Doing Something About the Weather

Eva Regnier, Assistant Professor, Naval Postgraduate School, Defense Resources Management Institute, 699 Dyer Road, Monterey, CA, 93943, United States, eregnier@nps.edu

Integrating weather forecast creation with the operational uses of weather forecasts has tremendous potential to save lives and dollars. This talk describes barriers to this integration and frameworks for improving use and value of weather forecasts in the commercial and government sectors and in emergency preparedness and response.

2 - Repeat Purchase Decisions in Technology Adoption

Canan Ulu, Fuqua School of Business, Duke University, 1 Towerview Drive, Durham, NC, 27708, United States, canan.ulu@duke.edu, James E. Smith

In this paper, we study when consumers should replace or "upgrade" a technology. The tradeoff is between using a profitable technology now and waiting for better technologies that are to come in the future. We model this problem as a dynamic programming model and study structural properties of the value function and optimal policies.

3 - Using Simulations to Teach Risk Management to Farmers and Ranchers

Jay Parsons, Assistant Professor, Colorado State University,
3226 Ledgestone Court, Fort Collins, CO, 80528, United States,
parsons@OptimalAg.com, Dana Hoag

Through the use of simulation software and support materials, the RightRisk Education Team has delivered over 150 risk management workshops to agricultural producers throughout the U.S. As founding members of that team, the presenting authors will share their experience in the development and delivery of this experiential learning program that lets producers gain first hand experience of the risk management decision making process in a non threatening environment.

4 - Beyond Cutting Across the Board or All-Round Distribution: Effective Allocation of Public Funds

Dinah Vernik, PhD Candidate, Duke University, Fuqua School of
Business, Box 90120, Durham, NC, 27708, United States,
dinah.vernik@duke.edu, Martin Schilling

In the context of scarce financial resources, the Berlin Government Senate Department for Economics engaged the applied research project group MARA 2006 to develop an MCDA-based approach to evaluate business-related infrastructure funding requests and to select the optimal portfolio of to-be-funded projects. This presentation summarizes the socio-technical process followed in building a multicriteria model and provides the empirical proof of effectiveness based on the post-project analysis.

■ MB06

Rio Mar Salon 6

Tutorial: An Introduction to Semidefinite Programming and its Applications

Cluster: Tutorials

Invited Session

Chair: Sam Burer, Assistant Professor, University of Iowa, Pappajohn
Business Building, Iowa City, IA, 52242, United States,
samuel-burer@uiowa.edu

1 - Tutorial: An Introduction to Semidefinite Programming and its Applications

Sam Burer, Assistant Professor, University of Iowa, Pappajohn
Business Building, Iowa City, IA, 52242, United States,
samuel-burer@uiowa.edu

Over the past 15 years, the field of semidefinite programming — which fits somewhere between linear programming and general convex programming — has grown tremendously. This growth can be attributed to a wealth of applications in areas such as combinatorial optimization, machine learning, and probability theory. In this tutorial, we introduce semidefinite programming, trace its history, touch on algorithms and software for its solution, and detail a number of applications.

■ MB07

Rio Mar Salon 7

Latest Applications in Mixed Integer Programming

Sponsor: Interface of Computing Science & OR

Sponsored Session

Chair: Huanyuan Sheng, Northwestern University, 2145 Sheridan Rd, Tech
C231, Evanston, IL, 60201, United States, h-sheng@northwestern.edu

1 - Characteristics of Distribution Systems

Iqbal Agha, University of Massachusetts, aiali@som.umass.edu,
Debra O'Connor

We examine characteristics of distribution systems using echelon-flow-based valid inequalities to explicate the extent to which problem characteristics impact computational tractability of the model. Truckload-equivalent-of-demand and inventory-value-of-truckload are introduced to encapsulate system characteristics. We find that model size and initial duality gap are lesser determinants of computational tractability than system demand, spatial, and temporal characteristics.

2 - Mixed Integer Linear Programming for Haplotype-Based Phylogenetics

Russell Schwartz, Carnegie Mellon University,
russells@andrew.cmu.edu, Fumei Lam, Guy Blesloch, R. Ravi,
Srinath Sridhar

Optimal evolutionary tree inference from genetic variation data is intractable for even modest-sized data sets. We use mixed integer linear programming to solve for hard instances of an important version of this problem: maximum parsimony inference from binary genetics variations. A graph flow formulation allows us to solve substantially more difficult data sets than was feasible by prior methods and has led to several practical applications in variation analysis on a whole-genome scale.

3 - Generalized Branching Hyperplane Methods and Distributed Computing Technologies

Huanyuan Sheng, Northwestern University, 2145 Sheridan Rd, Tech
C231, Evanston, IL, 60201, United States, h-sheng@northwestern.edu

We studied the generalized branching hyperplane methods and distributed computing technologies for mixed integer nonlinear programming research.

4 - LGO Solver Suite for Nonlinear (Global/Local) Optimization - Recent Developments

Janos Pinter, Pinter Consulting Services Inc., PCS Inc.,
129 Glenforest Drive, Halifax, NS, Canada, jdpinter@hfx.eastlink.ca

The LGO software package serves to solve global optimization problems under basic (continuity or Lipschitz) analytical assumptions. LGO incorporates several - global and local - solver strategies. In this talk, we will review its key functionality, including several recently added features. LGO's numerical performance will be illustrated by examples.

■ MB08

Rio Mar Salon 8

Joint Session: Optimization/Minority Issues

Sponsor: Optimization, Minority Issues

Sponsored Session

Chair: Illya Hicks, Associate Professor, Rice University, Dept. of
Computational & Applied Math, 6100 Main St. - MS 134, Rice University,
Houston, TX, 77005, ivhicks@rice.edu

1 - The Co-2-plex Polytope

Benjamin McClosky, Rice University, bjm4@rice.edu, Illya Hicks

2-plexes are cohesive subgraphs which were introduced to relax the structure of cliques. A co-2-plex is the complement of 2-plex and is therefore similar to a stable set. We discuss the co-2-plex analogue for certain properties of the stable set polytope.

2 - Strong Valid Inequalities for 0-1 Knapsack Sets With Cardinality Constraints

Jean-Philippe Richard, Purdue University, jprichar@ecn.purdue.edu,
Bo Zeng

The 0-1 knapsack set with cardinality constraints is a generalization of the classical 0-1 knapsack and the 0-1 knapsack with GUBs. It appears as a substructure of various practical optimization problems from fields as different as telecommunication and finance. We present exact and approximate lifting techniques to derive strong valid inequalities for this set using an extension of the classical concept of a cover.

3 - Separation Algorithms for Hypergraphic Structures

Eva Lee, Associate Professor & Director, Georgia Institute of
Technology, Industrial and Systems Engineering, Atlanta, GA,
30332-0205, United States, evakylee@isye.gatech.edu,
Siddhartha Maheshwary

In this talk, we report our recent computational advances in designing separation algorithms and generation of hypergraphic structures for solving a class of dense MIP instances arising from marketshare problems.

■ MB09

Rio Mar Salon 9

Industry-Research Applications / 2006 Wagner Prize Winning Paper

Cluster: Industry-Research Interface

Invited Session

Chair: John Tomlin, Yahoo!, Inc., 701 First Avenue, Sunnyvale, CA,
94089, United States, tomlin@yahoo-inc.com

Co-Chair: Ravindra K. Ahuja, Professor, University of Florida, Industrial
and Systems Engineering, 303 Weil Hall P.O. Box 116595, Gainesville, FL,
32611, United States, ahuja@ufl.edu

1 - Bid Optimization for Internet Graphical Ad Auction Systems via Special Ordered Sets

John Tomlin, Yahoo!, Inc., 701 First Avenue, Sunnyvale, CA, 94089,
United States, tomlin@yahoo-inc.com, Ralphe Wiggins

This paper describes an optimization model for setting bid levels for certain types of advertisements on web pages. This model is non-convex, but we are able to obtain optimal or near-optimal solutions rapidly using branch and cut open-source software. The financial benefits obtained using the prototype system have been substantial.

2 - Solving Real-Life Railroad Blocking and Train Scheduling Problems

Ravindra K. Ahuja, Professor, University of Florida, Industrial and Systems Engineering, 303 Weil Hall P.O. Box 116595, Gainesville, FL, 32611, United States, ahuja@ufl.edu, Krishna C. Jha, Arvind Kumar, Jian Liu

The railroad blocking and train scheduling problems are solved while designing a railroad's operating plan. These are very large-scale multi-commodity network flow design and routing problems containing billions of integer decision variables. This talk will describe practical algorithms to solve these problems efficiently and present computational results on the real-life data demonstrating significant cost savings. These algorithms are now being used by several US railroads.

■ MB10

Rio Mar Salon 10

Mining Applications

Sponsor: Energy, Natural Resources, & the Environment/ Mining Applications in OR
Sponsored Session

Chair: Alexandra Newman, Associate Professor, Colorado School of Mines, Division of Economics and Business, Golden, CO, 80401, United States, newman@mines.edu

1 - Long Term Optimization of the Production Chain in Open-Pit and Underground Copper Mines

Felipe Caro, Assistant Professor, UCLA Anderson School of Management, 110 Westwood Plaza, Suite B420, Los Angeles, CA, 90095, United States, fcaro@anderson.ucla.edu, Rafael Epstein, Jaime Catalan, Andres Weintraub, Pablo Santibanez, Marcel Goic

Based on our experience in modeling Chilean open pit and underground copper mines, we discuss the importance of modeling in an integrated way the production chain from the initial extraction to the delivery of final products. In particular, we show the impact of a model used to optimize long term mining plans that has been implemented at Codelco, Chile.

2 - Sequence Optimization for Block Cave Mining

Anita Parkinson, Doctoral Candidate, University of British Columbia, Vancouver, BC, Canada, Anita.Parkinson@sauder.ubc.ca, S Thomas McCormick, Maurice Queyranne

An early step in planning a block cave mine is sequence optimization, or deciding where to mine and when. Current practice is a trial and error process. In this work we computationally test several integer programming formulations to find a sequence that maximizes the Net Present Value. When the durations of drawpoints are not constant, the problem is similar to the NP Hard problem of scheduling jobs on parallel machines. Requiring a single, contiguous cave makes the problem more challenging.

3 - Optimizing the Transition From Surface to Underground Mining

Alexandra Newman, Associate Professor, Colorado School of Mines, Division of Economics and Business, Golden, CO, 80401, United States, newman@mines.edu, Enrique Rubio

Although many mines commence as open pit to take advantage of the relatively low cost of the mining method and the proximity of the ore to the surface, in order to remain economically viable, mine planners must often transition extraction operations to underground methods. We present an optimization model and results on the optimal timing of this transition.

4- Open Pit Mine Sequencing

Alexandra Newman, Associate Professor, Colorado School of Mines, Division of Economics and Business, Golden CO 80401, United States, newman@mines.edu, Kevin Wood

Open pit mines are notionally divided into a set of production blocks, and a mine sequence consists of determining the time period in which each block is extracted. The goal of the corresponding optimization model is usually to maximize net present value subject to a series of capacity, grade, and sequencing constraints. We present methods to improve tractability of this traditional problem and means for addressing ore grade uncertainty.

■ MB11

Caribbean Salon 1

Routing Problems

Cluster: Combinatorial Optimization
Invited Session

Chair: Andrea Lodi, Professor, DEIS, University of Bologna, Viale Risorgimento, 2, 40136 Bologna, Italy, alodi@deis.unibo.it

1 - On Time Dependent Models for Vehicle Routing Problems

Thomas Magnanti, Professor, MIT, Room 1-206, Cambridge, MA, 01239, United States, magnanti@mit.edu, Teresa Godinho, José Pires, Pierre Pesneau, Luis Gouveia

For Unit-Demand Vehicle Routing, we study LP relaxations of a single-commodity flow model (SCF) and a pure time-dependent formulation (TDF). We show that TDF implies a new large class of upper and lower bounding flow constraints not implied by the LP relaxation of the SCF and we use the TDF to generate new inequalities in the space of design variables related to well-known multistar constraints. Using the TDF we easily solve instances with up to 80 nodes and reasonably small vehicle capacities.

2 - Projection Results for Vehicle Routing Problems With Lower Capacities

Luis Gouveia, University of Lisbon, Operations Research Center, Lisbon, Portugal, legouveia@fc.ul.pt, Juan-Jose Salazar-Gonzalez

Reverse Multistar (RMS) inequalities are redundant for the Capacitated Vehicle Routing Problem. Here we study a variant of the problem, where a minimum number of customers Q' are specified for each route in the solution, where the corresponding RMS inequalities are of interest. We will also introduce rounded RMS inequalities and exhibit a simple case showing the interest of the rounded inequalities.

3 - On TSP Compatible Tours

Andrea Lodi, Professor, DEIS, University of Bologna, Viale Risorgimento, 2, 40136 Bologna, —, Italy, alodi@deis.unibo.it, Matteo Fortini, Adam N. Leitchford, Klaus Wenger

We describe the 'compatible tour' heuristic for the symmetric TSP, which attempts to exploit the structure inherent in the so-called subtour elimination polytope. Several algorithms for finding the best compatible tour are described and analyzed theoretically and computationally on standard TSPLIB problems.

■ MB12

Caribbean Salon 2

Non-Linear and PDE-Constrained Stochastic Optimization

Sponsor: Optimization/Stochastic Programming
Sponsored Session

Chair: Harald Held, University of Duisburg-Essen, Forsthausweg 2, Duisburg, 47057, Germany, held@math.uni-duisburg.de

1 - Including Power Flow into Power Optimization under Uncertainty

Sebastian Kuhn, University of Duisburg-Essen, Forsthausweg 2, Duisburg, 47057, Germany, kuhn@math.uni-duisburg.de, Rüdiger Schultz

Power optimization models involving power flow lead to highly nonlinear structures and require adequate model simplifications and transformations. Three programming models with linear and nonlinear representation handling these issues are presented. Special attention is paid to establish relations between these models. Algorithms and stochastic extensions are presented. We end the talk with some numerical results.

2 - Shape Optimization under Uncertainty - Deterministic Preparations

Martin Pach, University of Duisburg-Essen, Forsthausweg 2, Duisburg, 47057, Germany, pach@math.uni-duisburg.de, Harald Held, Rüdiger Schultz, Martin Rumpf, Sergio Conti

Shape optimization deals with problems where the variables to optimize are no longer functions or parameters but the topological structure of a domain. Introducing shape sensitivity analysis we are able to define a gradient in terms of a diffeomorphism of a reference domain. Thus it is possible to apply a gradient method to find local minima. This provides a wide range of applications. We made use of this approach to optimize elastic structures numerically.

3 - Shape Optimization under Uncertainty - A Stochastic Programming Perspective and Examples

Harald Held, University of Duisburg-Essen, Forsthausweg 2, Duisburg, 47057, Germany, held@math.uni-duisburg.de, Martin Pach, Martin Rumpf, Thomas Heinze, Sergio Conti

We consider an elastic body subjected to internal and external forces which are uncertain. The deformations are described by PDEs that are solved by Composite Finite Elements. The objective is, for example, to minimize a least square error compared to a target displacement. A gradient method using the shape derivative together with a level-set method is employed to solve the problem. We show that the structure of this problem is similar to that of a linear stochastic programming problem.

■ MB13

Caribbean Salon 3

Metaheuristics for Routing and Location

Sponsor: Joint Sponsored/Invited: Transportation and Logistics
Sponsored Session

Chair: Sin C. Ho, Postdoctoral Fellow, Department of Systems Engineering & Engineering Management, The Chinese University of Hong Kong, Shatin, NT, Hong Kong - ROC, scho@se.cuhk.edu.hk

1 - Pickup and Delivery Problem with Time Windows (PDPTW) Using Geo Clustering and Genetic Algorithms

Kevin Sobczak, Undergraduate, Slippery Rock University, Artificial Intelligence and Robotics Lab, Computer Science Department, 250 ATS, Slippery Rock, PA, 16057, United States, kds8253@sru.edu, Sam Thangiah

In the PDPTW problem each customer requires a pickup and delivery completed within a defined time window using trucks that have constraints on capacity and travel time. In this research we used geometric shapes to conform the routes to obtain solutions that minimize the cost and the number of trucks while servicing all customers. A Genetic Algorithm was employed to determine placement of the shapes. The results on 102 problems from the literature show improvement over alternate heuristics.

2 - Solving a Manpower Scheduling Problem for Airline Catering Using Tabu Search

Sin C. Ho, Postdoctoral Fellow, Department of Systems Engineering & Engineering Management, The Chinese University of Hong Kong, Shatin, NT, Hong Kong - ROC, scho@se.cuhk.edu.hk, Janny Leung

We study a manpower scheduling problem with job time-windows and job-skills compatibility constraints. Given the jobs to be serviced and the roster of workers, the problem is to form teams and assign teams and start-times for the jobs, so as to service as many flights as possible. Workload balance among the teams is also a consideration. We present a tabu search heuristic which employs strategic oscillation and diversification strategies to solve the problem. Preliminary results indicate that the proposed heuristic finds good solutions.

■ MB14

El Morro 1

Intelligent Transportation

Cluster: OR in the Public Sector
Invited Session

Chair: Naveen Lamba, Senior Managing Consultant, IBM, 12902 Federal Systems Park Dr, Fairfax, VA, 22033, United States, naveen.lamba@us.ibm.com

1 - Development and Performance Evaluation of a Vehicle-Miles-Traveled Revenue Collection System

David Porter, Associate Professor, Oregon State University, Covell 118, Corvallis, OR, 97331, United States, David.Porter@orst.edu, David Kim

In 2001, Oregon State University in collaboration with the Oregon Department of Transportation and the Road User Fee Task Force began investigating a Vehicle Miles Traveled based alternative to the fuel tax. The culminating phase of this five year effort is the execution of a pilot test involving approximately 280 volunteer drivers. This paper discusses the lessons learned in the design and development of the pilot test technology configuration.

2 - Real-Time Prediction of Road Traffic

Laura Wynter, IBM Research, 1101 Kitchawan Road, Yorktown Heights, NY, 10598, United States, lwynter@us.ibm.com, Wanli Min

We present a model developed for near-term prediction of road traffic using real-time data feeds. The model makes use of an auto-regressive paradigm generalized to take into account flow-dependent link interactions. Numerical experiments support the

high quality of the predictions. The model was developed as part of a traffic prediction tool and is being used by clients of IBM to predict near-term traffic speeds and volumes.

3 - The Traffic and Incident Management Systems in Kansas City Metropolitan Area

Pei Wei Lin, Assistant Professor, University of Missouri, Kansas City, 370G RHFH, 5100 Rockhill Rd, Kansas City, MO, 64110, United States, linp@umkc.edu, Jason Sims

The need to implement an effective Traffic and Incident Management Systems has received increasing attention by general public, media and policy makers. The MoDOT and KDOT are operating the Kansas City Scout System. This system is able to provide real-time travel information via DMS on highways and its website. The incident detection feature of the system along with a highway motorist assistant program can reduce the incident duration, and hence decrease the impact of an incident.

■ MB15

El Morro 2

Deterministic Operations Research in Military Applications

Sponsor: Military Applications
Sponsored Session

Chair: Shane Knighton, Air Force Institute of Technology, shane.knighton@afit.edu

1 - An Advanced Tabu Search Approach to the Dynamic Airlift Loading Problem

August Roesener, Assistant Professor of Operations Research, USAF—Air Force Institute of Technology, AFIT/ENS, Bldg 641, 2950 Hobson Way, Wright-Patterson AFB, OH, 45433, United States, august.roesener@afit.edu, J. Wesley Barnes

We present an algorithm to solve the Dynamic Airlift Loading Problem (DALP) which involves partitioning a set of cargo items into aircraft loads, selecting an efficient and effective set of aircraft from available aircraft, and placing the cargo in allowable positions on those aircraft. In addition to spatial constraints, cabin load limits, and center of balance constraints, temporal restrictions on cargo loading availability and cargo delivery requirements must be considered in the DALP.

2 - Pilot Training Planning Problem in Turkish Naval Air Force

Bülent Çatay, Assistant Professor, Sabanci University, FENS, Tuzla, Istanbul, 34956, Turkey, catay@sabanciuniv.edu, Tevfik Altınalev

We address the pilot training planning problem in a Turkish Naval Air Base. We formulate the problem as a linear mixed-integer program to maximize the number of combat-ready pilots such that training mission and pilot-related constraints are satisfied. We discuss some relaxation and heuristic approaches to obtain weekly training plans.

3 - Network Flow Model for Optimizing Fighter Squadron Scheduling

Shane Knighton, Air Force Institute of Technology, shane.knighton@afit.edu, Case Cunningham, Jay Boyd, Darren Gray, John Parker

This research proposes a methodology to automate and optimize the process of operational fighter squadron scheduling in the USAF. Through a detailed examination of the current manual scheduling process in operational fighter squadrons, a network flow model with side constraints is developed to produce an optimized weekly schedule. The network flow model efficiently scheduled and optimized a representation of a typical operational fighter squadron using an Excel-based solver.

■ MB16

San Cristobal

Multicriteria Decision Making: Practical Applications

Cluster: OR in the Americas
Invited Session

Chair: Viviana Cesani, Associate Professor, Department of Industrial Engineering, University of Puerto Rico, Mayagüez Campus, Mayagüez, 00680, Puerto Rico, vcesani@uprm.edu

1 - Risk Analysis in Project Management Using a System Dynamics Approach

Victoria Bastidas, Master's Student, Industrial Engineering, Univ. Puerto Rico, Mayagüez Campus, Mayagüez, PR, 00681, Puerto Rico, victoriabastidas@hotmail.com

Researchers have developed tools that can provide information for the projects selection. Many works though, have been faced with the dilemma that their data is

plagued by uncertainty, making risk analysis an essential element. The research proposes the use of a methodology based on system dynamics to model the risks a project may encounter during its development. Using cognitive mapping to provide an idea of the cause and effects of different factors and their consequences in project success.

2 - A Multi-Criteria Decision Making Approach to the Supplier Selection Problem in the Medical Devices

Mara Ruiz, Quality Engineer, Boston Scientific, Lot 12 Road 698, Dorado, 00626, Puerto Rico, maramruiz@gmail.com

Selecting the best supplier is often a difficult process. Engineers are often required to make decisions on the basis of the criteria which vary widely in scope, complexity and usually are vague and difficult to quantify. Fuzzy logic allows for quantitative representation of a vague or fuzzy criteria. This work presents an application of Fuzzy Logic and the criteria used for Supplier Selection in medical devices industry. Final step was the performance comparison between two different methods.

■ MB17

Egret

Quality Management II

Contributed Session

Chair: Ximena Patrick, University of Houston, 5710 Iron Horse, Missouri City, TX, 77459, United States, Mena_21@hotmail.com

1 - Developing an Unique Model to Evaluate Organisation's Performance With Sigma as Metric

Lakshmi Ranganathan, Executive Quality, TVS-Electronics, South Phase Plot, Guindy, Chennai, Tamil, Chennai, TN, 600094, India, r.lakshmi@tvs-e.in

The paper presents a systematic approach to establish Company Wide Sigma Level and considers further improvements to the existing methodology for managing overall organization at six-sigma level. It forces the organization to make decisions based on sigma measurement. Simply put, Organization Sigma Level is an unique powerful metric that can determine the performance level of any Organization.

2 - Findings From the Information System Audit on 7 RFID/USN Pilot Projects

SoJung Kim, National Information Society Agency, NIA Bldg, 77, Mugyo-dong, Jung-gu, Seoul, South Korea, ksju@nia.or.kr, JaeGyu Rim, HyunMok Oh

NIA has been the steward of ISA that is audit scheme for last 20 years. This study is for continued needs of ISA on emerging domain including RFID/USN(Ubiquitous Sensor Network). In this paper, we conduct a close examination of practices in 7 pilot projects sponsored by different 7 organizations. Our analysis indicates that key inspection factors are 1) to define and finish required task, 2) to define Ad hoc network topology, 3) to define ONS system and middleware, 4) to tune perception rate.

3 - A Stochastic Model for Condition Based Maintenance

Samaneh Balali, PhD Student, Dep of Management Science, Strathclyde Business School, University of Strathclyde, Flat 1/2 131 Ingram Street Glasgow G1 1D, Glasgow, G1 1DJ, United Kingdom, samaneh.balali@strath.ac.uk

A condition based maintenance model is proposed which can be applied in different environmental conditions. At each monitoring check not only the maintenance action, but also the next inspection time is determined so that a desired level of reliability is satisfied in a cost effective way. To illustrate the model, a numerical example is used based upon the experimental data taken from gearboxes run to failure on the Mechanical Diagnostic Test Bed at the Penn State Applied Research Lab.

4 - An Experimental Study to Quantify the Effectiveness of RFID Technology

Ximena Patrick, University of Houston, 5710 Iron Horse, Missouri City, TX, 77459, United States, Mena_21@hotmail.com, Jami Kovach

Radio frequency identification (RFID) is a well accepted tool for controlling inventory. Few studies, however, have examined the specific cause-and-effect relationship between the use and the benefits of this technology. To address this issue, we conduct an experiment to quantify the bottom line performance gains created as a result of using electronic tags.

■ MB18

Heron

Issues in Modeling and OR Education

Cluster: Educational Issues

Invited Session

Chair: Jeff Camm, University of Cincinnati, ML 0130, Cincinnati, OH, 45221, United States, Jeff.Camm@uc.edu

1 - More Math, Please!

Moshe Sniedovich, University of Melbourne, Department of mathematics and Statistics, Melbourne, VI, 3010, Australia, moshe@unimelb.edu.au

In this presentation I make the case for more math in introductory OR/MS education.

2 - Research on Assessment of Management of Technology Educational Programs

Michael Badawy, Professor, Virginia Tech University, POB 2931, Merrifield, Va, 22116, United States, mbadawy@vt.edu

The purpose of this paper is to explore the orientation, similarities, and differences among university academic graduate degree programs in management of technology, engineering management, and master of business administration(MBA). A comparative analysis of the scope, thematic content, and instructional technologies adopted in these programs will be presented. Best practices, lessons learned, and action mechanisms for improvement will be provided.

3 - Chasing the Holy Grail: Teaching MBA Students Optimization Under Uncertainty

Jeff Camm, University of Cincinnati, ML 0130, Cincinnati, OH, 45221, United States, Jeff.Camm@uc.edu

Most MBA management science courses correctly focus on modeling and the use of accessible software tools. This often results in a compartmentalized course, a portion on optimization models and a portion on simulation models. We discuss approaches to unify these two topics for MBAs under the banner of optimization under uncertainty.

■ MB20

Parrot

Panel Discussion: Algebraic Modeling Languages Roundup

Cluster: OR in Practice

Invited Session

Chair: Stephen Strauss, PTSM, AT&T, 180 Park Avenue, Building 103, Florham Park, NJ, 07932-1003, United States, sstrauss@att.com

1 - Panel Discussion: Algebraic Modeling Languages Roundup

Moderator: Stephen Strauss, PTSM, AT&T, 180 Park Avenue, Building 103, Florham Park, NJ, 07932-1003, United States, sstrauss@att.com, Panelist: Alex Meeraus, Robert Fourer, Mary Crissey, Carol Tretkoff

This panel is intended to give a broad overview of the state-of-the-art of algebraic modeling languages today. The panel will be represented by the key developers and/or business people for several modeling languages: GAMS - Alex Meeraus, GAMS Development Corp. AMPL - Robert Fourer, AMPL Optimization LLC OPL - Carol Tretkoff, ILOG Inc. SAS - Mary Crissey, SAS Institute Inc. We will start with each representative giving a brief overview of their software, discussing what the main benefits are for their customers, with a special emphasis on highlighting the contrasts between the different languages. After the presentations we will have an open panel discussion with questions from the audience focusing on five specific areas: language design, connectivity, user interface, end-user deployment, and the future of optimization modeling.

■ MB21

Canary

Data Envelopment and Decision Support Systems I

Contributed Session

Chair: Mauricio Cabrera-Ríos, Assistant Professor, Universidad Autónoma de Nuevo León, Posgrado FIME, Av. Universidad S/N, San Nicolás de los Garza, NL, 66450, Mexico, mcabrera@mail.uanl.mx

1 - Case Studies in Decision Support Systems Utilizing Genetic Algorithms

Hongwei Du, Associate Professor, California State University, East Bay, 25800 Carlos Bee Blvd, Hayward, CA, 94542, United States, hongwei.du@csueastbay.edu

This paper is an examination of four cases studies in the use of genetic algorithms in real world decision support systems, as well as a brief description and history of genetic algorithms and their place in business decision making. Findings of these four case studies and what they can tell us about the use of genetic algorithms is presented at the end after discussing the four cases.

2 - Decision Support for Slaughterhouses Based on Integer Programming (IP)

Niels Kjaersgaard, PhD Student, Technical University of Denmark / Danish Meat Research Institute, Informatics and Mathematical Modelling, Building 305, Lyngby, 2800, Denmark, nck@imm.dtu.dk

The presentation reports on a project re. the use of IP as a tool for improving strategic decisions in the pig meat industry. The models developed investigate the optimal utilization of raw materials under varying production conditions. Models covering the following topics are developed: Economic effect of improved measurements, enabling the industry to decide which level of measuring accuracy it is worthwhile to invest in. Economic effects of a general increase in the slaughtering weight.

3 - Nonparametric Congestion Test

Laurent Cavaignac, PhD Student, University of Perpignan, 52, Ave Paul Alduy, Perpignan, 660000, France, laurent.cavaignac@univ-perp.fr, Carlos Barros, Nicolas Peypoch

We show how the Fare, Grosskopf and Lovell (1985) input congestion nonparametric test can be performed to reach a statistical conclusion. We use Simar and Wilson (1998) distance functions bootstrap technique which introduces statistical foundations in DEA. An empirical illustration on airports congestion is provided. The technology is found to be significantly congested and nine airports are input congested. The method provides operational results by identifying the congested inputs.

4 - Data Clustering Applied to Multiple Criteria Optimization Through Data Envelopment Analysis

Mauricio Cabrera-Ríos, Assistant Professor, Universidad Autónoma de Nuevo León, Posgrado FIME, Av. Universidad S/N, San Nicolás de los Garza, NL, 66450, Mexico, mcabrera@mail.uanl.mx, María Guadalupe Villarreal Marroquín

In manufacturing it is not uncommon to try to meet several performance measures with varying degrees of conflict among them at once. Finding solutions in an efficient manner to this kind of problems is critical if optimization is to be applied in these cases. In this work, data clustering techniques are explored to make the solution process to multicriteria optimization problems efficient via Data Envelopment Analysis. The results of different clustering schemes are reported.

■ MB22

Pelican

Health Systems Research

Cluster: Operations Research in Medicine and Health Care
Invited Session

Chair: Kalyan Pasupathy, Assistant Professor, University of Missouri, 311 Clark Hall, Health Management & Informatics, Columbia, MO, 65211, United States, pasupathyk@health.missouri.edu

1 - Improving Quality in Pediatric Emergency Departments

Francois Sainfort, Director, Health Systems Institute, Georgia Tech, 901 Atlantic Drive, Atlanta, GA, 30332, United States, francois.sainfort@hsi.gatech.edu, Harold Simon, Paula Edwards

Pediatric Emergency Department (PED) overcrowding is a nationwide problem. A new methodology is presented to identify a subset of patients who frequently visit and disproportionately utilize PED resources and offer an intervention through an established pediatric call center, which triages over 250,000 calls per year. The new system allows both decreasing unnecessary PED utilization and improving the quality of care provided to this subset of patients.

2 - Patient Allocation During the Initial Hours of a Mass Casualty Event

Nezih Altay, University of Richmond, Robins School of Business, Richmond, VA, 23173, United States, naltay@richmond.edu, Steve Thompson

During the initial response to a disaster available capacity of nearby hospitals is depleted rapidly. We develop a multi-commodity maximum flow network model to optimally allocate patients to hospitals in the area within the initial hours of the incident. A variety of disaster conditions are simulated and the model is compared against existing allocation strategies.

3 - Advanced Modeling Approaches in Health Care

Kalyan Pasupathy, Assistant Professor, University of Missouri, 311 Clark Hall, Health Management & Informatics, Columbia, MO, 65211, United States, pasupathyk@health.missouri.edu

The health care sector has received lots of recent attention owing to undesirable outcomes including safety and quality issues, attributed to processes embedded in the service delivery structure. Several concepts and techniques, including but not limited to the simulation of complex dynamics and decision analysis with a systems perspective have been identified as potential solutions for process related problems. Such modeling approaches as it relates to the health care sector are discussed.

Monday, 1:30 - 3:00pm

■ MC01

Rio Mar Salon 1

Scheduling

Contributed Session

Chair: Guvenc Sahin, Assistant Professor, Sabanci University, Manufacturing Systems/Industrial Eng., Orhanli, Tuzla, Istanbul, 34956, Turkey, guvencs@sabanciuniv.edu

1 - An Adaptive Scheduler for Data Broadcasting Model in a Mobile Computing Environment

John Tsiligaris, Assistant Professor, Heritage University, 905 S 44th Avenue, A12, Yakima, WA, 98908, United States, itsili13@hotmail.com, Hilde Velasco

The expanding wireless communication technology enables mobile users access data at any time and place. The server fetches the requests and broadcasts the data to the air. To increase the server broadcasting capabilities for the non uniform data the HOL waiting time group (HOL-WTG) scheduler is developed.

2 - Non-Identical Parallel Machine Scheduling Where Rework is Permitted

Yong Ha Kang, Dept. of Information Management Engineering, Korea University, Anam5-ka, Sungbuk-ku, Seoul 136-701, Korea, Seoul, South Korea, yyjgj@korea.ac.kr, Hyo Heon Ko, Sung Schick Kim

For each pair of a machine and a job type, the processing time and rework probability of the job on the machine are known. The objective of the scheduling is to minimize weighted tardiness. Noting the key to successful schedule is to have good estimations of sojourn time of jobs in the system, this study presents an implementation oriented heuristic scheduling scheme for the case.

3 - Optimal Due Date Assignment in Multi-Machine Scheduling Environments

George Steiner, Professor, McMaster University, 1280 Main W., MGD-415, Hamilton, ON, L8S4M4, Canada, steiner@mcmaster.ca, Dvir Shabtay

We study two due date assignment problems in various multi-machine scheduling environments: Minimizing the sum of earliness, tardiness and due date assignment costs and minimizing the number of tardy jobs and due date assignment costs. We settle the complexity of many of these problems by either showing that they are NP-hard or by providing a polynomial time solution for them. We also include approximation and non-approximability results for several parallel-machine problems.

4 - Stepwise Tardiness Costs With Release Times in Machine Scheduling and Railroad Planning

Guvenc Sahin, Assistant Professor, Sabanci University, Manufacturing Systems/Industrial Eng., Orhanli, Tuzla, Istanbul, 34956, Turkey, guvencs@sabanciuniv.edu, Ravindra K. Ahuja

We study a fairly new machine scheduling problem with stepwise tardiness costs and release times. We develop mathematical programming formulations of the problem, and propose heuristic solution methods for difficult cases along with some complexity results of easier ones. The same problem can be applied in the railroad scheduling area that is our original motivation in this study; we demonstrate our solution methods on the hump sequencing problem in the context of railyard operations planning.

■ MC02

Rio Mar Salon 2

Operations Management in the Process Industries

Sponsor: Manufacturing & Service Operations Management
Sponsored Session

Chair: Kumar Rajaram, Associate Professor, UCLA Anderson School, 110 Westwood Plaza, Los Angeles, CA, 91403, United States, kumar.rajaram@anderson.ucla.edu

1 - Long Term Optimization of Investment and Production Plans in Open-Pit and Underground Copper Mines

Felipe Caro, Assistant Professor, UCLA Anderson School of Management, 110 Westwood Plaza, Suite B420, Los Angeles, CA, 90095, United States, fcaro@anderson.ucla.edu, Marcel Goic, Andres Weintraub, Jaime Catalan, Rafael Epstein, Pablo Santibanez

We describe a model to optimize long term mining plans that has been implemented at Codelco, Chile. The computational system can be used to evaluate production plans of a complete division with several mines, either underground or open-pit, which might share processing stages (e.g. a concentration plant) and/or means of transportation (e.g. a railway network). The system has become an essential component of the planning process that has consistently increased the value of the company.

2 - An Optimization Based Decision Support System for Strategic Planning in Different Process Industries

Narain Gupta, Doctoral Student, Indian Institute of Management, Ahmedabad, FPMH-05, IIM Campus, Vastrapur, Ahmedabad, Gu, 380015, India, naraingupta@iimahd.ernet.in, Goutam Dutta

We discuss application of an optimization based Decision Support System (DSS) in different process industries including steel, pharmaceutical, polymer and aluminum. The DSS is based on five fundamental elements: Materials, Facilities, Activities, Storage Areas, and Times. This DSS is user friendly and requires little knowledge of optimization techniques. The results demonstrate substantial improvement of profit in all industries.

3 - Buffer Location and Sizing to Optimize Cost and Quality

Kumar Rajaram, Associate Professor, UCLA Anderson School, 110 Westwood Plaza, Los Angeles, CA, 91403, United States, kumar.rajaram@anderson.ucla.edu

We consider the problem of optimizing the location and size of buffers in semi-continuous manufacturing processes. This problem is formulated as a non-linear integer program that optimizes buffer inclusion, holding, quality, process undershoot and overshoot costs. Methods are developed to solve this problem and is implemented at three glucose and three sorbitol production processes at a leading food-processing company.

4 - Capacity Decisions for High-Tech Products With Obsolescence

Michael Pangburn, Asst. Prof. of Decision Sciences, University of Oregon, 2209 Comstock Ave., Eugene, OR, 97408, United States, pangburn@uoregon.edu, Shankar Sundaresan

We consider capacity decisions for a high-tech producer, recognizing that prices are declining in both time (obsolescence) and volume (market heterogeneity) factors. We model price as a multiplicative function of these two (linear) factors, and treat capacity as fixed throughout the sales horizon. By considering the ensuing price trajectory, we derive the optimal capacity. We also validate the structure of the embedded pricing model using empirical data from the microprocessor industry.

■ MC03

Rio Mar Salon 3

Supply Chain Response to Risks, Disruptions, and Disasters

Cluster: Supply Chain Optimization
Invited Session

Chair: Emmett Lodree, Jr., Assistant Professor, Auburn University, Industrial and Systems Engineering, 207 Dunstan Hall, Auburn, AL, 36849, United States, elodree@auburn.edu

1 - Managing Large-Scale Operations and Supply Chain Risk Using Distributed Options

Daniel Ball, University of Massachusetts, Dept. Mechanical & Industrial Engin., E-Lab, 160 Governors Drive, Amherst, MA, United States, dan@cddm.ecs.umass.edu, Abhijit Deshmukh, Nikunj Kapadia

Management of global operations and supply chains is subject to risk due to ongoing production uncertainty and discrete disruptions, such as those from competitive agents, natural disasters, or terrorist actions. This study utilizes distributed real options to hedge multi-agent risks posed by system uncertainties, and explores the endogenous relationships between agent decisions and the evolution of these uncertainties.

2 - Supply Chain Planning for the Hurricane Season

Emmett Lodree, Jr., Assistant Professor, Auburn University, Industrial and Systems Engineering, 207 Dunstan Hall, Auburn, AL, 36849, United States, elodree@auburn.edu

This study is motivated by the impact of hurricane activity in the United States, particularly in the Gulf Coast region. In particular, this research addresses supply chain planning problems encountered by manufacturing and service organizations who provide emergency supplies such as food, water, and gas-powered generators that support initial response activities. We present supply chain problems characterized by hurricane forecasts, information updating, and pre-positioning decisions.

3 - Vaccine Inventory Design for a Breakout of Epidemic Disease

Yifan Liu, George Mason University, 10332 Layton Hall Drive, Apt 407, Fairfax, VA, 22030, United States, yliu9@gmu.edu, Hui Jiang

We employ operations research to cope with a potential regional shortage of vaccine, in case of a natural breakout of an epidemic disease, or a bio-terror attack. We aim at answering two questions: 1. Are the current vaccine inventory levels enough to meet the urgent demand? 2. What is the optimal inventory design to minimize the total cost on the wasted vaccine and on the medical and social loss of infected people due to lack of vaccine?

4 - US Army Center for Innovation in Logistics Systems

Greg Parlier, Senior Systems Analyst/Adjunct Research Staff, SAIC/IDA, 255 Avian Lane, Madison, AL, 35758, United States, 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, consisting of four complementary modeling approaches collectively referred to as "dynamic strategic logistics planning". An organizational construct is presented to accelerate and sustain continual improvement for Army logistics and supply chain management in a "Center for Innovation in Logistics Systems".

■ MC05

Rio Mar Salon 5

Behavioral Decision Making

Sponsor: Decision Analysis
Sponsored Session

Chair: Ayse Onculer, Assistant Professor of Decision Sciences, INSEAD, Blv de Constance, Fontainebleau, 77305, France, Ayse.ONCULER@insead.edu

1 - The Effects of Temporal Distance on Attitudes Toward Ambiguity

Selcuk Onay, PhD Candidate, INSEAD, Boulevard de Constance, Fontainebleau, 77305, France, selcuk.onay@insead.edu, Ayse Onculer

Building on a recent paradigm which emphasizes the importance of the source of ambiguity, we distinguish between outcome vagueness and probability vagueness. Then, using Construal Level Theory we predict that temporal distance would affect attitudes toward these two types of ambiguity differently. In a series of experiments we found that while temporal distance does not have any effect on attitudes toward probability vagueness, it affects attitudes toward outcome vagueness considerably.

2 - Probability and Time Tradeoff: Experimental Evidence

Antonio Villasis, Professor, IDE Business School, Nicolas Lopez 518 Y Marco Aguirre, Quito, NA, Ecuador, avillasis@ide.edu.ec, Manel Baucells, Franz Heukamp

In a previous paper we specified how probability and time are related in simple prospects. Based on that framework we present results from two experiments. The first experiment fills test how the common ratio effect is affected by adding a delay. The second experiment studies whether the probability-time tradeoff is constant across delays and probability levels. The two experiments also establish in a separate way the magnitude effects associated with discounting and risk attitudes.

3 - Probability Weighting Function Over Time

Ayse Onculer, Assistant Professor of Decision Sciences, INSEAD, Blv de Constance, Fontainebleau, 77305, France, Ayse.ONCULER@insead.edu, Mohammed Abdellaoui, Enrico Diecidue

This study is an elicitation of the probability weighting function over time. By adding a temporal component to the probability weighting function, we can capture the impact of delay on risk preferences. Our experimental results imply that such a model has a better predictive power than existing models of risky intertemporal choice.

4 - Reference Point Formation Over Time: A Weighting

Function Approach

Frank Welfens, University of Mannheim, L5, 2, Mannheim, 68131, Germany, welfens@bank.bwl.uni-mannheim.de, Manel Baucells, Martin Weber

We still know very little about how decision makers form their reference points given a sequence of prices. Our paper provides both a theoretical framework on reference point formation over time, based on cumulative prospect theory's weighting function, and a new experimental method for eliciting reference points in a finance context. Consistent with our model, we document reference points to be best described by the first and the last price of the time series.

■ MC06

Rio Mar Salon 6

Tutorial: Does More Money Buy You More Happiness?

Cluster: Tutorials

Invited Session

Chair: Rakesh Sarin, The Anderson School, University of California, Los Angeles, rakesh.sarin@anderson.ucla.edu

1 - Tutorial: Does More Money Buy You More Happiness?

Rakesh Sarin, The Anderson School, University of California, Los Angeles, rakesh.sarin@anderson.ucla.edu

We examine empirical evidence on the relationship between income and happiness. The first empirical finding is that, within a society, richer people are happier than poorer ones. The second finding is that, for a given country, average well-being has not improved over time in spite of large gains in per capita income. We propose a model of adaptation and social comparison for valuing time streams of consumption. The model explains the puzzle: Why do we believe that more money will buy us more happiness (when in fact it does not)?

■ MC07

Rio Mar Salon 7

Panel: Benchmarking Solvers: Who, What, When, Why, How, How Much?

Sponsor: Interface of Computing Science & OR
Sponsored Session

Chair: Matthew Saltzman, Clemson University, Mathematical Sciences Department, Clemson, SC, 29631, mjs@clemson.edu

1 - Panel: Benchmarking Solvers: Who, What, When, Why, How, How Much?

Moderator: Matthew Saltzman, Clemson University, Mathematical Sciences Department, Clemson, SC, 29631, mjs@clemson.edu
Panelist: Steven Dirkse, Lloyd Clarke, Robert Fourer, William Hart, Leon Lasdon

Benchmarks and comparative performance analyses are a staple of computational research and an important tool for users considering adoption of software tools. The panel will offer perspectives on issues that should be considered when carrying out computational comparisons or using the results in software selection. Open discussion will follow panelist remarks.

■ MC08

Rio Mar Salon 8

Tutorial: Combinatorial Auctions

Cluster: Tutorials

Invited Session

Chair: S. Raghavan, Associate Professor, The Robert H. Smith School of Business, University of Maryland, University of Maryland, College Park, MD, 20742, United States, raghavan@umd.edu

1 - Tutorial: Combinatorial Auctions

S. Raghavan, Associate Professor, The Robert H. Smith School of Business, University of Maryland, University of Maryland, College Park, MD, 20742, United States, raghavan@umd.edu

Combinatorial auctions allow bidders to bid on combinations of goods being sold in an auction. When there are complement or substitution effects amongst goods being sold, combinatorial auctions permit bidders to better express their preferences, allowing for the efficient allocation of goods. However, this comes at a significant price in terms of the computational complexity of the auction. In this tutorial we provide an overview of current research in mathematical programming related issues

in combinatorial auctions. We also discuss a number of applications of combinatorial auctions in both the public and private sector. Finally, we examine the topic of search auctions that today are the largest source of revenue for search sites like Yahoo and Google.

■ MC09

Rio Mar Salon 9

Optimization Problems in Industry

Cluster: Industry-Research Interface

Invited Session

Chair: Manoj Chari, Analytical Solutions Manager, SAS Institute, 100 SAS Campus Drive, Cary, NC, United States, Manoj.Chari@sas.com

1 - An Analytical Solution to a Size Profiling and Pack Optimization Business Problem

Robert Pratt, Senior Optimization Solutions Developer, SAS Institute, SAS Campus Drive, Cary, NC, 27513, United States, Rob.Pratt@sas.com

Fashion retailers face the problem of how to improve fulfillment decisions by identifying the size profiles for product-locations and optimizing the order, allocation, and replenishment decisions in fulfilling the size-specific demand patterns. The presentation will cover the business problem, data and analytical challenges, and analytical methodology supporting the SAS Size Profiling and SAS Pack Optimization solutions.

2 - Contact Economics: Allocation Under Uncertainty

Michael Haydock, Managing Partner & Director, Decision Intelligence, Inc., 6460 Fox Path, Chanhassen, MN, 55317, United States, mike.haydock@dii-online.com

When constructing decision making models a key consideration is the aspect of uncertainty when making projections in future time periods. Representing these uncertainties in a form that is suitable to practical decision makers is at the heart of marketing executives effectively using advanced mathematical optimization techniques. This presentation describes a six period asset allocation investment model under uncertainty utilizing linear goal programming.

3 - Applied Combinatorial Optimization Problems: A Canadian Perspective

Arvind Gupta, Scientific Director, MITACS, 8888 University Drive, Simon Fraser University, Burnaby, BC, V5A 1S6, Canada, arvind@mitacs.math.ca

In 1999 Canada launched the MITACS Network of Centres of Excellence to form industry-university research linkages. Within MITACS, optimization problems have been at the forefront of industrial interactions. I will present a broad cross-section of the problems tackled by MITACS scientists in this area and highlight new directions being taken by the network.

■ MC11

Caribbean Salon 1

Integer Programming

Cluster: Combinatorial Optimization

Invited Session

Chair: Deepak Rajan, Research Staff Member, IBM Research, 19 Skyline Drive, Hawthorne, NY, 10532, United States, drajan@us.ibm.com

1 - Generalized Network Inequalities

Simge Kucukyavuz, Assistant Professor, University of Arizona, Systems and Industrial Engineering, 1127 James E Rogers Way, Tucson, AZ, 85721-0020, United States, simge@sie.arizona.edu

We propose a generalization of the network inequalities valid for capacitated fixed-charge network flow polyhedra. We show the relationship between the generalized network inequalities and submodular inequalities. We give separation algorithms to identify violated generalized network inequalities.

2 - IP Instances That are Hard for Column Basis Reduction

Bala Krishnamoorthy, Washington State University, P.O. Box 643113 WSU, Pullman, WA, 99164-3113, United States, kbala@wsu.edu

Column Basis Reduction (CBR) has been effective to solve decomposable knapsack problems, whose coefficients have the form $a_i = p_i M + r_i$. Here we study certain classes of IPs on which CBR performs poorly. The motivation to create such problems comes from knapsack cryptosystems, which could be attacked using CBR.

3 - Strengthened GMICs for 0-1 Mixed Integer Programs

Jean-Philippe Richard, Purdue University, jprichar@ecn.purdue.edu

Generating strong cuts for unstructured mixed integer programs is an important but difficult problem. A traditional way of circumventing this difficulty is to generate cuts from single row relaxations of the problem, often using superadditive lifting. In this talk, we describe a sequential lifting procedure to obtain strong valid inequalities that can produce, among other cuts, strengthened GMICs for 0-1 mixed integer programs.

MC12

Caribbean Salon 2

Stochastic Programming and ApplicationsSponsor: Optimization/Stochastic Programming
Sponsored Session

Chair: Lewis Ntamo, Assistant Professor, Dept. of Industrial & Systems Engineering, Texas A&M University, 3131 TAMU, College Station, TX, 77843, United States, ntamo@tamu.edu

Co-Chair: Guzin Bayraksan, Assistant Professor, Dept. of Systems & Industrial Engineering, University of Arizona, Tucson, AZ, 85721, United States, guzinb@sie.arizona.edu

1 - A Computational Study of Lift-and-Project Cuts for Stochastic Mixed 0-1 Programs

Matthew Tanner, PhD Student, Texas A&M University, Dept. of Industrial & Systems Eng., College Station, TX, 77843, United States, mtanner@tamu.edu, Lewis Ntamo

Two-stage stochastic mixed-integer programming (SMIP) problems with recourse are generally difficult to solve. In this talk we present a first computational study of a disjunctive cutting plane method for stochastic mixed 0-1 programs that uses lift-and-project cuts based on the extensive form of the two-stage SMIP problem. Computational results obtained from several large-scale problem instances from the literature will be presented.

2 - Disjunctive Decomposition for Two-Stage Stochastic Mixed 0-1 Programs With Random Recourse

Lewis Ntamo, Assistant Professor, Dept. of Industrial & Systems Engineering, Texas A&M University, 3131 TAMU, College Station, TX, 77843, United States, ntamo@tamu.edu, Matthew Tanner

In this talk, we present a disjunctive decomposition (D2) method for two-stage stochastic mixed 0-1 programs with random recourse. D2 allows for a disjunctive cut generated for one scenario to be made valid for other scenarios. The motivation for this method is the need for algorithms for problems arising in applications requiring corrective actions that adapt to the outcomes. Preliminary computational results on resource allocation problems arising in wildfire management will be presented.

3 - Parallelizing the D2BAC Algorithm

Yang Yuan, PhD Student, The Ohio State University, Industrial and Systems Engineering, Columbus, OH, 43210, United States, yuan.65@osu.edu, Suvrajeet Sen, Christian Valente

The solution of two stage stochastic integer programs is always constrained by the efficiency of the algorithm and the current available computational resource. In this presentation, we discuss the steps that are necessary for parallelizing the D2BAC algorithm so that we can use supercomputers for the largest of SIP instances. We will report our computational experience on computers at the Ohio Supercomputing Center, using the COIN open source optimization solver.

4 - Stopping Rules for Sequential Sampling Procedures

Guzin Bayraksan, Assistant Professor, Dept. of Systems & Industrial Engineering, University of Arizona, Tucson, AZ, 85721, United States, guzinb@sie.arizona.edu

We consider Monte-Carlo sampling-based methods to solve a class of stochastic programs, where the sample size is increased until an arguably good solution is obtained. We develop and compare several stopping rules and rules to increase the sample size. We provide conditions under which these procedures terminate with probability one and find a high-quality solution with a desired probability. Finally, we compare empirical performance of different methods on problems from the literature.

MC13

Caribbean Salon 3

Robust and Dynamic RoutingSponsor: Joint Sponsored/Invited: Transportation and Logistics
Sponsored Session

Chair: Martin Savelsbergh, Professor, Georgia Institute of Technology, martin.savelsbergh@isye.gatech.edu

1 - Robust Duration-Constrained Tours for Vehicle Routing Problems with Stochastic Demands

Alan Erera, Georgia Tech, Atlanta, GA, United States, alan.erera@isye.gatech.edu, Juan Morales, Martin Savelsbergh

We study robust optimization for routing problems with uncertain demands and tour duration considerations. Customer demand is uncertain, but assumed to fall within a known range. Efficient methods are developed for determination of the maximum additional time required for the recourse actions of each individual vehicle under any demand realization, and embedded within a tabu search route generation heuristic.

2 - Robust Network Schedule and Route Design

Cynthia Barnhart, MIT, Cambridge, MA, United States, cbarnhart@mit.edu, Lavanya Marla, Nicoleta Neagu

We consider large-scale, network-based, resource allocation problems under uncertainty. Because uncertainty causes optimal deterministic solutions to be rarely executed, we examine methods to produce "robust" solutions, that is, solutions that are more likely to be executed or easier to repair when disrupted. We propose a modeling and algorithmic framework that involves a decomposition scheme and evaluate our approach using data from major carriers involving network schedule and route design.

3 - The TSP with Pickups and Deliveries With Stochastic Demands

Juan-Jose Salazar-Gonzalez, Spain, jjsalaza@ull.es, Francois Louveaux

We study the one-commodity Pickup-and-Delivery Travelling Salesman Problem where some of the customer demands are stochastic. We consider feasibility issues. This includes finding the smallest vehicle capacity and some initial load such that a given tour is feasible for all scenarios. We analyze the case where penalties are paid for routing a tour unable to handle customer demands. We study properties of the minimal expected penalty of a given tour.

MC14

El Morro 1

Topics in Public Sector Operations ResearchCluster: OR in the Public Sector
Invited Session

Chair: Arnold Greenland, Distinguished Engineer, IBM, 6710 Rockledge Drive, Bethesda, MD, 20817, United States, agreenland@us.ibm.com

1 - IBM Proposes Optimization Systems to Improve the Scheduling of the Traffic Courts of New York

Spyros Kontogiorgis, Senior Consultant, IBM, 12902 Federal Systems Park Dr., Fairfax, VA, 22033, United States, spyros@us.ibm.com

NY traffic courts hear thousands of cases daily. We present IBM's proposed solution for optimizing the scheduling of the hearings, the operating environment, and our efforts to address the needs of diverse stakeholders (DMV officials, judges, police officers and IT managers). Solution benefits include: better service to the public, better utilization of resources (judges, police officers, clerks, court rooms), lower admin and IT costs, and the ability to process revenue faster.

2 - A Delivery Point Sequencing Algorithm for the United States Postal Service

Mariah Jeffery, Consultant, IBM Global Business Services, 12902 Federal Systems Park Dr, Fairfax, VA, United States, mjeffery@us.ibm.com, Emily Rosenberf

We discuss the development of a tool for creating sort schemes for the United States Postal Service's Delivery Point Sequencing (DPS) operation. The tool uses a polynomial time algorithm to assign mail to DPS machines for sorting with an objective of minimizing the total equipment required while meeting service standards.

3 - Real-Time Disability Determination Scoring at the Social Security Administration

Arnold Greenland, Distinguished Engineer, IBM, 6710 Rockledge Drive, Bethesda, MD, 20817, United States, agreenland@us.ibm.com

This paper will discuss an approach to real-time disability determination using data and text mining. The algorithms and implementation approaches developed brought substantial improvement to disability management at the Social Security Administration. The paper will discuss the business issues encountered and details of the technical solution, both the algorithm and the technical architecture required to implement that solution in real-time.

■ MC15

El Morro 2

US Military Academy Operations Research Support of Defense Issues

Sponsor: Military Applications
Sponsored Session

Chair: John Willis, Asst. Prof., US Military Academy, Dept. of Systems Engineering, Mahan Hall, West Point, NY, 10996, United States, john.willis@usma.edu

1 - Automatic Identification Technology for Arms Room Management

John Willis, Asst. Prof., US Military Academy, Dept. of Systems Engineering, Mahan Hall, West Point, NY, 10996, United States, john.willis@usma.edu

Current arms room management systems are not positioned to provide reporting or inventory control beyond the level of the individual arms room nor are there opportunities to integrate the arms room into other activities. This paper describes the use of proven automatic identification technology (AIT) and supporting software/hardware to automate the personnel identification and sensitive item issue, turn-in, and inventory processes.

2 - An Application of Lean Methods to the Army Rapid Fielding Initiative

Scott Crino, Major, United States Military Academy, Mahan Hall, Bldg 752, West Point, NY, 10996, United States, scott.crino@us.army.mil, Greg Griffin, Daniel McCarthy

The Army's Rapid Fielding Initiative (RFI) is the process by which new equipment is distributed to soldiers either at home station or in a theater of operations. Equipment is shipped from over 50 suppliers around the United States to a warehouse on the east coast where it is packaged into sets. Sets are shipped to the end user stationed at one of over 40 locations around the world. This paper investigates the use of Lean Methods to significantly improve efficiency of the RFI process.

3 - Condition Based Maintenance: A Effective Life Cycle Study of Small Arms Weapons

Gary Kramlich, Instructor and Research Analyst, Operations Research Center - USMA, Department of Systems Engineering, Bldg 752, 3rd Floor, Room 306, West Point, NY, 10996, United States, Gary.Kramlich@usma.edu, Simon Goerger

United States Army Tank-automotive & Armament Command (TACOM) sought an improved method to estimate remaining life for various small arms under different environmental conditions. Using data from a small arms reliability test, a mathematical model that estimates a weapon's remaining effective life was developed. The study extends the frontier of Conditions Based Maintenance to include relatively low cost, large volume items for which failure rates during operation can have catastrophic effects.

4 - Further Insights Into Using Agent Based Models to Assess Strategies Against Asymmetric Warfare

Gregory Griffin, Instructor and Research Analyst, Operations Research Center - USMA, Department of Systems Engineering, Bldg 752, 3rd Floor, Room 306, West Point, NY, 10996, United States, Gregory.Griffin@usma.edu, Paul Richmond, Simon Goerger, Niki Goerger

Insurgents have effectively employed asymmetric tactics, such as suicide bombers, as viable threats in urban environments against counterinsurgent (COIN) forces conducting Stability, Security, Transition, and Reconstruction (SSTR) Operations. This presentation discusses the latest round of experiments using agent based model(s) to gain insights into the effects traffic control measures have on traffic flow and insurgent path choice.

■ MC16

San Cristobal

Forecasting and Decision Analysis using Bayesian Theory

Cluster: OR in the Americas
Invited Session

Chair: David F. Muñoz, Head Dept. of Ind. & Oper. Eng., ITAM, Rio Hondo # 1, Colonia Tizapan San Angel, Mexico City, 01000, Mexico, davidm@itam.mx

1 - Checking the Reliability of Reliability Models

Victor Aguirre, Professor, ITAM, Rio Hondo # 1, Colonia Tizapan San Angel, Mexico City, DF, 01000, Mexico, aguirre@itam.mx, Humberto Gutiérrez, Andrés Christen

Experiments to get reliability data are usually very limited, they consist of a small number of runs probably censored. We apply the Bayesian approach of model

selection to assess the model specification. We consider the normal, lognormal, extreme value, Weibull and exponential models. Data could be censored. Prior elicitation is based on prior information on moments of observables. The methodology is illustrated with two experiments reported in the literature.

2 - Simultaneous Incorporation of Forecast and Historical Data in Simulation Experiments

David F. Muñoz, Head Dept. of Ind. & Oper. Eng., ITAM, Rio Hondo # 1, Colonia Tizapan San Angel, Mexico City, 01000, Mexico, davidm@itam.mx, David G. Muñoz

We present an approach to estimate performance measurements in simulation experiments that consider simultaneous incorporation of historical data from a random component and forecasts on input parameters of the simulation model. We propose consistent estimators and asymptotic confidence intervals to estimate conditional expectations. The applications and properties of the proposed methodologies are illustrated through experiments using a simulation model of an inventory system.

3 - A Framework to Forecasting Using Simulation

José E. Detta, edetta_82@yahoo.com, David F. Muñoz

We present a general framework to forecasting using simulation. Our approach allows the incorporation of historical data in a model and a simulation-based methodology to produce a forecast is proposed. Our methodology allows the construction of confidence intervals that incorporate both stochastic and parametric uncertainty. We illustrate how this methodology can be applied and discuss experimental results from a comparison between regression v.s. other model using real data to forecast demand.

■ MC17

Egret

Concepts and Applications in Quality Control

Cluster: Quality Control
Invited Session

Chair: David R. González-Barreto, Associate Professor, Industrial Engineering Department, University of Puerto Rico at Mayagüez, Box 9043, Mayagüez, PR, 00681, Puerto Rico, davidg@ece.uprm.edu

1 - Reliability of Partially Filled SAC305 Through-Hole Joints

Ernesto Ferrer, Engineering, Hewlett Packard, Hwy 110 North Km 5.1, Aguadilla, PR, Puerto Rico, ernesto.ferrer@hp.com, Gary Freedman, David R. González-Barreto, Francois Billaut, Elizabeth Benedetto, Helen Holder

Achieving acceptable wave solder through-hole fill on thick boards is a well-known process challenge, but the introduction of lead free solders has created additional difficulties. It seemed then critical to gather more information for lead free solders in order to support the possibility of lowering the fill requirements. This study considered joints made with SAC305 solder and a range of fill percents. This work has shown that lower fill levels required by IPC610D standard will produce reliable SAC solder joints.

2 - Automated Monte Carlo Simulation Techniques for Statistical Process Control

Ariel Sepúlveda, Pronto Analytics, ariel.sepulveda@prontoanalytics.com, José Santos

This talk is about the use of real-time Monte Carlo simulations for the evaluation of the adequacy of different process control techniques in a real application. Initially a brief demonstration of several simulators will be presented to show the type of analyses used in the solution of the problem. Then a technical description of the capabilities of the simulators will be shown to highlight the reasons why this approach to solving statistical quality control types of problems is so effective.

■ MC18

Heron

Undergraduate Research in OR

Contributed Session

Chair: Hector J. Carlo, Assistant Professor, Industrial Engineering Department, University of Puerto Rico, P.O. Box 9043, Mayagüez, PR, 00681, Puerto Rico, hcarlo@uprm.edu

1 - Non-Traditional Exam Seating Arrangements that Minimize Academic Dishonesty

Hector J. Carlo, Assistant Professor, Industrial Engineering Department, University of Puerto Rico, P.O. Box 9043, Mayagüez, PR, 00681, Puerto Rico, hcarlo@uprm.edu, Cristina Pomales-García, Sharlyn García, Tanya Ramos

In this study, a series of spatial models for exam seating arrangements are generated to minimize the probability of cheating. Assuming that the work desks (chairs) are

identical and can be moved freely within a room, we propose a series of non-traditional seat configurations and evaluate them using several objectives.

2 - Holistic and Systematic Thinking vs. Traditional Simulation Coursework

Alexandra Medina-Borja, University of Puerto Rico at Mayagüez, Industrial Engineering Building, II-205, Mayagüez, 00680, Puerto Rico, amedina@uprm.edu, Gretchen Molina

We present the results of applying two of the Systems Thinking Inventory tasks, to sixty-eight Industrial Engineering undergraduate students whose level range from 4th to last semester before graduation. It is hypothesized that students in the last semesters of IE training would have a better understanding of system dynamics. The results with controls of gender, high school of origin, and English language proficiency will be discussed.

3 - Design Kanban System as a Standardization Method

Ahad Ali, Assistant Professor, University of Puerto Rico, 250 North Post Street, Mayagüez, PR, 00681, United States, aali@uprm.edu, Neriliz Santini

A Kanban production planning system is presented for a company which makes temperature control products for trailers and other types of transportation. A Kanban supplier system was established to control the quantity of raw material. Its production process is composed of thermoforming, routing and gluing. This tool will be used to make negotiations with the supplier in order to incorporate the scrap percent into the daily demand looking for a standardization size of the raw material.

4 - Predictors of Partnership Success for Emergency Relief: Data Mining With CHAID

Alexandra Medina-Borja, University of Puerto Rico at Mayagüez, Industrial Engineering Building, II-205, Mayagüez, 00680, Puerto Rico, amedina@uprm.edu, Ricardo Molina

The lack of coordination shown by disaster relief agencies during the most recent disasters have demonstrated that organizational partnerships are crucial for an efficient and effective response and relief. But what exactly makes partnerships of this nature a success? We uncovered the predictors based on a database of over ten thousand "partner" organizations of the American Red Cross.

5 - Comparing Linear Models for Rectilinear Quadratic Assignment Problem

Hector J. Carlo, Assistant Professor, Industrial Engineering Department, University of Puerto Rico, P.O. Box 9043, Mayagüez, PR, 00681, Puerto Rico, hcarlo@uprm.edu, Yavuz Bozer, Karola Negron

In this study, an in-depth comparison between the rectilinear Quadratic Assignment Problem (QAP) model proposed by Carlo (2007) and other existing practical linear models is performed. The models are compared using all ("solvable") instances of the rectilinear QAPs available in the QAPLIB using both CPLEX and LINDO.

■ MC19

Sea Gull

Honoring Alex Rubinov- Memorial Session

Cluster: Honoring Alex Rubinov
Invited Session

Chair: Janos Pinter, Pinter Consulting Services Inc., PCS Inc., 129 Glenforest Drive, Halifax, NS, Canada, jdpinter@hfx.eastlink.ca

1 - Honoring Alex Rubinov- Memorial Session

Janos Pinter, Pinter Consulting Services Inc., PCS Inc., 129 Glenforest Drive, Halifax, NS, Canada, jdpinter@hfx.eastlink.ca, Alex Kruger, Adil Bagirov

This memorial session is devoted to Alexander M. Rubinov (1940-2006). Alex was an outstanding scholar and a most remarkable human being. We will review his professional achievements, and also provide a glimpse at his personal life. Attendees are invited to share their personal remembrances.

■ MC20

Parrot

Success Stories: OR Impacts ROI

Cluster: OR in Practice
Invited Session

Chair: Mary Crissey, Analytical Marketing Manager, SAS Institute, 17030 Vista Park Dr, San Antonio, TX, 78247, United States, mary.crissey@sas.com

1 - Predictive Analytics for Law Enforcement, Security and Intelligence Agencies

Colleen McCue, Senior Research Scientist, RTI International, 3040 Cornwallis Rd, P.O. Box 12194, RTP, NC, 27709-2194, United States, cmccue@rti.org

The ability to make informed decisions about resource allocation, while increasing public safety and clearance rates has become key for most police executives. O.R. can assist law enforcement by guiding resource deployment decisions. The results of this strategy highlight the value of O.R. in public safety. O.R. also resulted in cost savings through the efficient allocation of resources. See how behavioral science, crime and intelligence analysis combined with O.R. answers urgent concerns today.

2 - Brazil Applications of OR: Customer #1

Luis Neves, Bunge, Brazil, luis.neves@bunge.com

Recently there has been a surge of interest - backed by \$\$ availability - to implement analytical software in several different industries across Latin America. Operations Research is proving itself as Direct Value added. As more businesses have computer databases and business intelligence tools in place — they are primed to start moving up the ROI curve eager to solve tough real world challenges with linear programming and optimization techniques.

3 - Brazil Success Story: Customer #2

Mary Crissey, Analytical Marketing Manager, SAS Institute, 17030 Vista Park Dr, San Antonio, TX, 78247, United States, mary.crissey@sas.com

To follow Murillo's presentation, I'll introduce another Brazil Customer who will share what caught their eye and motivated them to apply OR in their operations. ROI is not always measured by \$\$ saved and we'll share some unexpected insights and lessons learned as the business issues were addressed with www.scienceofbetter.org approach.

■ MC21

Canary

Decision Support Systems II

Contributed Session

Chair: Muhammad Obeidat, Professor, Southern Poly State Univ, Dept. Of Business Administration, 1100 S. Marietta PKWY, Marietta, GA, 30060, United States, mobeidat@spsu.edu

1 - When Does the Future Really Start: Non-Monotonic Time Preference

Kan Takeuchi, University of Michigan, 611 Tappan St., 238 Lorch Hall, Ann Arbor, MI, 48109-1220, United States, ktakeuch@umich.edu

I present experiments to elicit time preference and characterizes the relationship between time preference and risk-taking attitudes. Unlike existing ones, our experiment does not impose any parametric assumptions on the utility function, so we can identify the time discount function independently of the utility function. Findings: 1) subjects exhibit future bias, 2) the time discount function is an inverse S-curve, and 3) risk takers have a hyperbolic discount function.

2 - Towards an Automatic Vehicle Flow Characterization System: Count and Classification

Mauro Maldonado Chan, Universidad Autonoma de Nuevo Leon, Ave. Pedro de Alba s/n, Ciudad Universitaria, Monterrey, NL, 66450, Mexico, maldonado80@gmail.com, Rafael Gallegos López, Juan Antonio Sandoval Cortina, Federico López Vázquez, Mauricio Cabrera Ríos

In this work, the first part of an automatic vehicle flow characterization system is described. The system in its current phase of development is capable of counting and classifying vehicles in an offline fashion based on previously recorded video streams and the use of artificial neural networks. The results on test videos are reported and discussed. The current challenges as well as those for the second part of the system consisting of the identification of vehicle direction are outlined.

3 - Sinmaf APS: A Multi-Objective DSS System for Supply Network Optimization

Carlos Paternina-Arboleda, Chaimarn, Dpt. of Industrial Engineering, Universidad del Norte, Km 5 Via a Puerto Colombia, Barranquilla, Colombia, cpaterni@uninorte.edu.co, Johanna Amaya, Ivan Saavedra, Julian Lopez, Luis Ramirez, Diana Ramirez

This paper presents Sinmaf APS, a generic software for strategic and tactical planning of supply chains, multi-objective and stochastic in nature. Sinmaf APS simulates the supply chain and optimizes the utilization of resources, allowing the logistics division of a company to make decisions on facility location, what type of facilities should be used and how material and product flows should be directed in order to increase revenue and provide a better use of the resources.

4 - The Missing Link Between Technology Improvement and Capacity Planning in Manufacturing

Muhammad Obeidat, Professor, Southern Poly State Univ, Dept. Of Business Administration, 1100 S. Marietta PKWY, Marietta, GA, 30060, United States, mobeidat@spsu.edu

A large number of American manufacturing firms have excess capacity buildup that is far from minimizing total average cost. As a result, excess capacity drives total cost to be higher and ultimately higher prices which make competition a war that is hard to win. Determining the proper capacity size and timing of capacity expansion and contraction is one of the critical decisions for an organization to be competitive and profitable.

■ MC22

Pelican

OR in Biology and Medicine

Cluster: Operations Research in Medicine and Health Care
Invited Session

Chair: Eva Lee, Associate Professor & Director, Georgia Institute of Technology, Industrial and Systems Engineering, Atlanta, GA, 30332-0205, United States, evakylee@isye.gatech.edu

1 - Steiner Minimal Trees, Twist Angles and the Protein Folding Problem

James MacGregor Smith, Professor, University of Massachusetts, 111B Marston Hall, Amherst, MA, 01003, United States, jmsmith@ecs.umass.edu

Steiner minimal trees have been shown to be useful in the geometric modelling and characterization of proteins. Building upon previous work, the twist angle properties and other geometric properties unique for the remaining amino acids are documented. The relationship between the Steiner ratio and the torsion energy in amino acids is also examined. Finally, the Steiner ratio is utilized to evaluate folded and mis-folded protein structures.

2 - Application of Fault Tree Analysis to Radiotherapy

Edidiong Ekaette, Research Associate, University of Calgary, 110, 15412 - 84 Avenue, Edmonton, AB, T5R 3L2, Canada, eekaette@ucalgary.ca, Peter Craighead, David Cooke, Sandra Iftody, Robert Lee

Misadministration of radiotherapy (RT) for cancer treatment can result in death or appreciably impaired quality of life. This study describes the application of fault tree (FT) methods to RT in a large Canadian cancer treatment centre. We constructed FTs for the RT preparation process, analyzing tasks and incident pathways. The FTs were populated with subjective data from experts. The results of the FT analysis were comparable to the analysis of collected incident reports.

3 - LAD for Medical Analysis

Anupama Reddy, RUTCOR, Rutgers University, 640 Bartholomew Rd., Piscataway, NJ, 08854, United States, areddy@rutcor.rutgers.edu, Tiberius Bonates, Irina Lozina, Peter Hammer, Vimla Gulabani

Logical Analysis of Data (LAD) is a combinatorial optimization based data analysis methodology. In this study we use LAD to identify potential biomarkers, and develop high accuracy classification models to distinguish between patients and controls in a proteomic dataset. In addition, we also derive effective risk scores for the patients.

Tuesday, 8:00 - 9:30am

■ TA01

Rio Mar Salon 1

Production and Scheduling I

Contributed Session

Chair: Ali Ardalan, Associate Dean, Old Dominion University, College of Business and Public Admin, Norfolk, VA, 23529, United States, aardalan@odu.edu

1 - A Predictive-Reactive Approach for Batch Production Scheduling in the Process Industries

Rafael Fink, Clausthal University of Technology, Institute of Management and Economics, Julius-Albert-Str. 2, Clausthal-Zellerfeld, 38678, Germany, rafael.fink@tu-clausthal.de

We present a priority-rule based method for operations scheduling of a multi-purpose chemical batch plant. At first, we generate a baseline schedule based on predictive values of the processing times with the objective of minimizing the makespan. Then, we show how to implement the baseline schedule when the processing times differ from their predictive values. In case of further disruptions like unit breakdowns or yield losses we have to react by constructing a new baseline schedule.

2 - Heuristic Short-Term Planning of Multipurpose Continuous Plants in the Process Industries

Sascha Herrmann, Clausthal University of Technology, Institute of Management and Economics, Julius-Albert-Str. 2, Clausthal-Zellerfeld, 38678, Germany, sascha.herrmann@tu-clausthal.de, Christoph Schwindt

We propose a two-level decomposition approach to short-term planning of continuous production in the process industries. At the planning level, operational conditions like input and output proportions, processing rates, and processing times are optimized via the solution of a nonlinear program. At the scheduling level, the resulting operations are then scheduled on the processing units with a new priority-rule based method. Computational experience with this decomposition approach is reported.

3 - Heuristic Rules Using a Tardiness Criteria for Two-Stage Hybrid Non Identical Multiple Processors

Ivan Roa, Professor, ITESM-CEM, Carretera Lago de Guadalupe, Km 3.5, Col. Margarita Maza de Juárez, Atizapan, 52926, Mexico, ivanroa@itesm.mx

Flow shop with multiple processors scheduling involves sequencing jobs in a flow shop where, at any processing stage, there exists one or more uniform processors. To the optimum solution is NP-complete. This necessitates the use of sub-optimal heuristic to address problems of moderate to large scale. This paper presents the comparison of heuristics rules on FSMP minimum tardiness problems where the multiple processors at a stage are not identical but are in the class of uniform processors.

4 - A Simulation Analysis of Local and Global Priority Rules in Job Shops

Ali Ardalan, Associate Dean, Old Dominion University, College of Business and Public Admin, Norfolk, VA, 23529, United States, aardalan@odu.edu, Rafael Diaz

The progress in production flexibility and the reduction in setup time allow the use of JIT concepts in job shops. This paper compares performance of several policy variables: number of kanbans, withdrawal cycle times, local, and global priority rules with respect to customer wait time, total work in process inventory, and each station's work in process inventory in a five station job shop. The effect of interactions of policy variables on the measures of performance are discussed.

■ TA02

Rio Mar Salon 2

Supply Chain Models Including Inventory and Logistics Considerations

Sponsor: Manufacturing & Service Operations Management
Sponsored Session

Chair: Michael Fry, Assistant Professor, University of Cincinnati, 532 Lindner Hall, Cincinnati, OH, 45221-0130, United States, FRYML@UCMAIL.UC.EDU

Co-Chair: Jeff Ohlmann, University of Iowa, jeffrey-ohlmann@uiowa.edu

1 - Vendor-Managed Inventory Policies for an Integrated Production-Distribution System

Luca Bertazzi, Associate Professor, Università di Brescia, Contrada Santa Chiara 50, Brescia, Bs, 25122, Italy, bertazzi@eco.unibs.it, Giuseppe Paletta, M. Grazia Speranza, Claudia Archetti

We consider a production-distribution system where a facility produces several products which are distributed to a set of retailers by a fleet of vehicles. The aim is to determine VMI policies that minimize the sum of production, transportation and inventory costs. We first show the computational complexity of the problem in which the transportation is outsourced and the worst-case performance of the policies. Then, we propose a branch-and-cut and a heuristic for the solution of the problem.

2 - Challenges and Opportunities in Attended Home Delivery

Ann Campbell, Associate Professor, University of Iowa, W244 Pappajohn Business Bldg, Iowa City, IA, 52242, United States, ann-campbell@uiowa.edu, Niels Agatz, Martin Savelsbergh

In recent years, many new and existing businesses have adopted a home delivery service model that allows customers to purchase goods online and have them delivered directly to their front door. In addition to the traditional routing issues, several novel challenges and opportunities arise in developing a successful home delivery strategy. In this talk, we will discuss some of these challenges and opportunities.

3 - Order Commitment Timing in Multi-Retailer Systems

Joseph Geunes, Associate Professor, University of Florida, 303 Weil Hall, P.O. Box 116595, Gainesville, FL, 32611, United States, geunes@ise.ufl.edu, Ismail Bakal

We consider a single-supplier, multi-retailer system where one retailer is the supplier's primary customer, and evaluate expected profit under early and delayed order timing. We provide conditions under which a commitment scheme benefits the supplier, the primary retailer, and the system. We characterize the retailer's preference based on the tradeoff between supply and inventory risk, and highlight settings where the supplier and primary retailer benefit from the presence of a second customer.

4 - Designing Routes for Lean Production System

Jeff Ohlmann, University of Iowa, jeffrey-ohlmann@uiowa.edu, Michael Fry, Barrett Thomas

We consider the problem of routing a fleet of vehicles to pick up supply from a network of supplier locations and return it to a plant adhering to the lean manufacturing philosophy. The pursuit of low work-in-process inventory and production smoothing throughout the system introduces complicating side constraints creating a vehicle routing problem with time windows and split deliveries. We present computational results and compare them to industry and academic benchmarks.

■ TA03

Rio Mar Salon 3

Production Planning in the Supply Chain

Cluster: Supply Chain Optimization

Invited Session

Chair: Reha Uzsoy, Professor, Purdue University, School of Industrial Engineering, West Lafayette, IN, 47907-1287, United States, uzsoy@ecn.purdue.edu

1 - Life Support Supply Chain for Long-Term Distant Manned Planetary Exploration

Seza Orcun, Research Scientist, Purdue University, West Lafayette, IN, 47907-1287, United States, orcun@ecn.purdue.edu, Joseph Pekny, S. Aydogan

Providing life support for distant manned planetary exploration presents complex supply chain challenges. The system must meet crew demand for basic life support elements and must process the loads generated by the crew to ensure a habitable environment. We present two algorithms to design life support systems that combine a stochastic discrete-event simulation and a deterministic mathematical programming approach to generate multiple realizations of the system evolution.

2 - Optimization-Based Batching and Scheduling in Semiconductor Wafer Manufacturing

Erhan Kutanoglu, Professor, University of Texas at Austin, United States, erhank@mail.utexas.edu

Scheduling production in the diffusion area in semiconductor wafer fabs is challenging due to inherent batching and interaction between stages. Simulation or dispatching-based approaches occasionally miss opportunities for improved utilization and cycle time performance. We propose an optimization-based model that captures the essentials of the actual problem, analyze its special cases, and offer several heuristics to obtain near-optimal solutions to large-scale instances.

3 - Production Planning: Load, Lead Time and Safety Stock Circularity

Reha Uzsoy, Professor, Purdue University, School of Industrial Engineering, West Lafayette, IN, 47907-1287, United States, uzsoy@ecn.purdue.edu, Seza Orcun, Karl Kempf

In production planning a release pattern can be easily created using lead times and safety stock levels. However, given the releases, the lead time depends nonlinearly on utilization, and also the safety stock levels used in determining the releases, creating circular dependence. We propose a column generation framework for this problem using a clearing function and a similar relation between lead time and utilization.

TA04

Rio Mar Salon 4

Software Seminar: SAS

Cluster: Software Seminars
Invited Session

Chair: Mary Crissey, Analytical Marketing Manager, SAS Institute, 17030 Vista Park Dr, San Antonio, TX, 78247, United States, mary.crissey@sas.com

1 - Delivering OR Bundled With SAS Analytics via a Spreadsheet

Mary Crissey, Analytical Marketing Manager, SAS Institute, 17030 Vista Park Dr, San Antonio, TX, 78247, United States, mary.crissey@sas.com

SAS delivers unlimited access to full analytical capabilities with our new powerful modeling language called OPTMODEL. With SAS Business Intelligence offerings SAS can deliver OR customizable solution as a "stored process". Embed your tailored scenario as a pull down menu item from Microsoft Excel. See why consultants are opening eyes of their clients as they demo the power of Operations Research inside a familiar interface of Microsoft office.

TA05

Rio Mar Salon 5

Decision Analysis in Societal Health Issues

Sponsor: Decision Analysis
Sponsored Session

Chair: Anke Richter, Associate Professor, Defense Resources Management Institute, Naval Postgraduate School, 699 Dyer Rd, Bldg. 234, Monterey, CA, 93950, United States, arichter@nps.edu

1 - A High Cost to Missing the Mark: Dealing With Uncertainty in HIV Prevention Resource Allocation

Katherine Hicks, Operations Research Analyst, RTI International, 3040 Cornwallis Rd, P.O. Box 12194, RTP, NC, 27709, United States, khicks@rti.org, Anke Richter

Mathematical programming techniques are used for allocating HIV prevention funds with the goal of maximizing the number of infections that interventions will avert. A challenge in that effort is accurately forecasting disease spread when data is difficult to acquire and the dynamics involved are constantly changing. We observe historical examples of inaccurate forecasting, then propose the use of equity constraints to hedge against the risks of overlooking sources of new HIV infections.

2 - The Effect of Social Mixing Controls on the Spread of Smallpox

Moshe Kress, Professor, OR, Naval Postgraduate School, 699 Dyer Rd, Monterey, CA, 93943, United States, mkress@nps.edu

Responding to a Smallpox attack is a major concern of governments. Many studies that model and evaluate response strategies consider only vaccination policies and assume homogeneous mixing. We developed a two-level social interaction model where an individual moves between home and a daily meeting site, possibly passing through mass transit systems or other crowded areas. We evaluate the effect of social mixing controls, situational awareness of the public health system and mass vaccination.

3 - A Shadow Price Framework for Quantifying Health Care Spending and Discrimination

Chris Lee, Assistant Professor, The Wharton School, Univ. of Pennsylvania, 3730 Walnut St., Suite 500, Philadelphia, PA, 19104, United States, cplee@wharton.upenn.edu, Stefanos Zenios, Glenn Chertow

Has health care spending become excessive? What is your life worth? Does the health care system discriminate based on race? Researchers have tried to answer these questions empirically. We take on an alternative approach and use a large-scale, population-based optimization model coupled with observed data to answer these questions.

4 - Preliminary Analysis of Alternate Modes of Dispensing for LA County

Anke Richter, Associate Professor, Defense Resources Management Institute, Naval Postgraduate School, 699 Dyer Rd, Bldg. 234, Monterey, CA, 93950, United States, arichter@nps.edu, Sinan Khan

Comprehensive mass prophylaxis plans are currently completely dependent on "Points of Dispensing" (POD) distribution sites for dispensing medicine/medical supplies during a large-scale public health emergency. Alternate modes of dispensing exist, but it is unclear how to judge their relative merit. We apply a decision analytic approach to determine ways of quantifying overall effectiveness of the alternate dispensing options within LA County.

TA06

Rio Mar Salon 6

Tutorial: Linking Decision Analysis and Behavioral Decision Research

Cluster: Tutorials
Invited Session

Chair: Robert Clemen, Professor, Duke University, Fuqua School of Business, Box 90120, Durham, NC, 27708, United States, clemen@duke.edu

1 - Tutorial: Linking Decision Analysis and Behavioral Decision Research

Robert Clemen, Professor, Duke University, Fuqua School of Business, Box 90120, Durham, NC, 27708, United States, clemen@duke.edu

Results from behavioral decision research can be used to improve prescriptive decision analysis (DA) methods. I will review several examples in the modeling of uncertainty and preferences and point toward possibilities for future work. Developing new DA methods will also require techniques for evaluating how well they work; the talk will also suggest procedures for studying the effectiveness of DA methods. My goal is to provide a starting point for reading and thinking about these issues.

TA07

Rio Mar Salon 7

Information Security - I

Sponsor: Interface of Computing Science & OR
Sponsored Session

Chair: Ram Pakath, Gatton Endowed Research Professor of DSIS, School of Management, Gatton College of Business & Economics, University of Kentucky, Lexington, KY, 40506-0034, pakath@uky.edu

1 - Web Services Bread Crumbs

Ronald Dodge, Lt. Col. & Academy Professor - Department of Electrical Engineering and Computer Science; Director, Information Technology and Operations Center, United States Military Academy, 601 Thayer Rd, Room 113, West Point, NY, 10996, United States, Ronald.Dodge@usma.edu

The internet has brought us everything from instant information to a means to stay connected with our colleagues. However with this increased functionality, we make our systems more vulnerable. The applications that provide the most exposure are instant messaging applications and web based email applications. In this talk I will review the more prolific exploits from this past year and walk through the file system and registry on a windows system, uncovering the information bread crumbs.

2 - Research Into Advances in Digital Forensics

Rayford Vaughn, Billie J. Ball Professor of Computer Science and Engineering, Mississippi State University, P.O. Box 9637, Mississippi State, MS, 39762, United States, vaughn@cse.msstate.edu

This presentation provides details on four successful digital forensics research efforts within the Mississippi State University Center for Computer Security Research (CCSR). The efforts presented will include honeynets, honeytokens, a Google search tool, and an FPGA based tool. Each of these separate activities has been successful and published. The field of digital forensics is relatively new and has many research opportunities available for the interested investigator.

3 - Trust-Based Policies for Information Security

S. Srinivasan, Professor of Computer Information Systems, University of Louisville, College of Business, Louisville, KY, 40292, United States, srini@louisville.edu

Information systems protection methods use mainly access control. Including trust here enhances security. The dynamic nature of information systems today requires distributed trust. Ubiquitous access to information requires seamless interaction of people and applications. Facilitating this requires the presence of flexible security policies. In this talk we articulate the importance of policies for a trusted environment and the integration of trust aspects with other security related actions.

TA08

Rio Mar Salon 8

Tutorial: Introduction to Social Network Analysis for the Operations Research and Management Science Community

Cluster: Tutorials

Invited Session

Chair: Mary Helander, IBM Research, Yorktown Heights, NY, helandm@us.ibm.com

1 - Tutorial: Introduction to Social Network Analysis for the Operations Research and Management Science Community

Mary Helander, IBM Research, Yorktown Heights, NY, helandm@us.ibm.com, Kate Ehrlich

This tutorial introduces basic concepts of social network analysis (SNA) for the OR/MS community. SNA will be explored as an established methodology for revealing patterns of human communication and decision-making. Examples will illustrate SNA use to detect communication and other issues impacting team performance. Current advances in data capture, analysis and interpretation, as well as the connection to the current "social computing" movement will also be discussed.

TA09

Rio Mar Salon 9

Industry Related Research in a Global Environment

Cluster: Industry-Research Interface

Invited Session

Chair: Claribel Bonilla, Assistant Professor, University of San Diego, 5998 Alcalá Park, San Diego, CA, 92110, United States, cbonilla@sandiego.edu

1 - Development of Logistics Platforms for International Fresh Produce Commerce

Rene Villalobos, Associate Professor, Arizona State University, Department of Industrial Engineering, Ira A. Fulton School of Engineering, Tempe, AZ, 85287-5906, United States, rene.villalobos@asu.edu, Octavio Sanchez, Omar Ahumada

We discuss the development of a commercialization and logistics platform to efficiently reach a cross-border market. In particular we discuss the case of accessing the US fresh produce market by Mexican farmers. The analysis includes market assessment, the location of the logistics platform, the sizing of the facility and transportation decisions.

2 - Healthcare Logistics and Access

Paul Griffin, Professor, Georgia Institute of Technology, School of Industrial, and Systems Engineering, Atlanta, GA, 30332-0205, United States, pgriffin@isye.gatech.edu, Rene Villalobos, Julie Swann, Martin Savelsbergh

New technologies such as remote monitoring devices are likely to change the care environment for patients with chronic illnesses. This could alleviate some of the anticipated resource shortages and potentially reduce the number of occurrences of serious, costly complications. In this talk we discuss some of the key problems of access to health with regards to logistics. We also discuss the potential benefit of remote monitoring in the US and the global impact.

3 - Critical Path for Inventory Control Method in a Global Supply Chain

Roberto Seijo, PhD Candidate, Texas A&M University, 326 WRC, Mailbox TAMU 3126, College Station, TX, 77843-3126, United States, rlseijo@neo.tamu.edu, Gary Gaukler, Claribel Bonilla, Cesar Malave

Globalization has increased competition around the world forcing companies to reduce transportation and inventory costs as product availability is increased. A large part of the literature related to Supply Chain Management (SCM) assumes a stock product and an exogenously given penalty cost incurred when a customer order is backordered. The main objective of this research is to determine inventory policies for different scenarios in which the penalty cost is endogenous to the system.

TA10

Rio Mar Salon 10

OR Methods in the Energy Sector

Sponsor: Energy, Natural Resources, & the Environment/Energy Sponsored Session

Chair: Chris Marnay, Staff Scientist, Berkeley Lab, 1 Cyclotron Rd MS 90R4000, Berkeley, CA, 94720-8136, United States, c_marnay@lbl.gov

1 - Optimal Equipment Selection and Operation in Microgrids With Combined Heat and Power with Storage

Chris Marnay, Staff Scientist, Berkeley Lab, 1 Cyclotron Rd MS 90R4000, Berkeley, CA, 94720-8136, United States, c_marnay@lbl.gov

An approach is presented for choosing equipment for small (~<1-2 MW) on-site power systems involving waste heat recovery and use (including absorption cycle cooling) requirements, tariff and prices, and technology options. The output is the optimal equipment choice and operating schedule over a test period, typically an historic year.

2 - Risk Analysis for Construction and Operation of Gas Pipelines in Pakistan

Sajjad Mubin, PhD student, Gubkin state university of Oil and Gas, 65-Lininsky Prospect, Moscow, Russia, sajjadmubin@yahoo.com

Looking its high energy demand, Pakistan is planning to import natural gas through pipelines from neighboring countries. The infrastructure of gas pipeline transmission is also being developed. There is always risk of earthquake, landslides and floods, high rate of inflation, war and terrorism. All these factors make the situation very complex in quantifying the risk especially when the project is gas pipeline. Efforts have been made to quantify the risks in gas pipeline projects.

TA11

Caribbean Salon 1

Theory and Practice of Integer Programming

Cluster: Combinatorial Optimization

Invited Session

Chair: Andrea Lodi, Professor, DEIS, University of Bologna, Viale Risorgimento, 2, 40136 Bologna, Italy, alodi@deis.unibo.it

1 - On the Unconstrained 3-State Quadratic Programming Problem

Deepak Rajan, Research Staff Member, IBM Research, 19 Skyline Drive, Hawthorne, NY, 10532, United States, drajan@us.ibm.com, Sanjeeb Dash, Andrea Lodi

We study the unconstrained 3-state Quadratic Programming problem. Our main contributions are cutting planes that strengthen its linearization, and a branching strategy that allows us to add these cuts in the branch-and-bound tree, and yet maintain sufficient problem structure to transform the new formulation into a min-cost network flow (MCF) problem. We present computational results using this approach on real-world problem instances.

2 - Facets of Two-Dimensional Group Problems

Jean-Philippe Richard, Purdue University, jprichar@ecn.purdue.edu, Santanu Dey

In this talk, we describe different tools that can be used to study facets of two-dimensional infinite group problems (2DIGP). We then use these tools to prove that two different families of two dimensional inequalities derived using inequalities of the one dimensional infinite group problem as building blocks are facet-defining for 2DIGP.

3 - Topics in Symmetric Integer Programming

James Ostrowski, Lehigh University, 200 W Packer, Bethlehem, PA, 18015, United States, jao204@lehigh.edu, Fabrizio Rossi, Stefano Smriglio, Jeff Linderoth

We discuss computational methods when using orbital branching, a new way to exploit symmetry in integer programming. Topics include branching decisions and generating cutting planes.

4 - Stochastic 0-1 Integer Linear Programming under Limited Distributional Information

Michael Wagner, California State University East Bay, 25800 Carlos Bee Blvd, Hayward, CA, 94542, United States, michael.wagner@csueastbay.edu

We study 0-1 integer linear programs where the constraint vectors are random with limited distributional information: we are only given the moments, up to order k . We give a robust formulation for the 0-1 integer program under this limited distributional information. We characterize this formulation as a function of k .

■ TA13

Caribbean Salon 3

Travel Behaviour Models

Sponsor: Joint Sponsored/Invited; Transportation and Logistics Sponsored Session

Chair: Bruno Agard, Professor, École Polytechnique de Montréal, C.P. 6079, succ Centre-ville, Montréal, QC, H3C 3A7, Canada, bruno.agard@polymtl.ca

1 - Modeling the Usage of Traffic Information Obtained by GPS-based Advance Traveler Information Systems

Maria Velazquez, The Pennsylvania State University, 102 Ray hall, University Park, PA, United States, mav189@psu.edu, Jose Holguin-Veras, William Wallace

The success of an ATIS system depends on the driver's decision with respect to re-routing. The purpose of this research is to develop an econometric model that predicts the frequency of usage of the traffic information given by the ATIS system. An ordered probit model to predict such usage was derived using data from a field experiment with ATIS devices. It will be demonstrated that the driver's re-routing decisions are influenced by socio-economic and commute characteristics.

2 - A Methodology to Compare Distances Traveled by Performance-Equivalent Fixed-Route and DRT Services

Luca Quadrifoglio, Assistant Professor, Texas A&M University, Zachry Department of Civil Engineering, CE/TTI Bldg, College Station, TX, 77843-3136, United States, lquadrifoglio@civil.tamu.edu, Marco Diana, Cristina Pronello

Our goal is to understand how the organizational form of the transit system impacts the system productivity. We compare the performance in terms of distance traveled of two competing transit services, a traditional fixed route and a DRT, while assuring a comparable service to the same set of customers. According to our findings, DRT services perform better for high quality service level and low demand density scenarios.

3 - Predicting Individual Activity Patterns Using Household Surveys and Data Mining

Bruno Agard, Professor, École Polytechnique de Montréal, C.P. 6079, succ Centre-ville, Montréal, QC, H3C 3A7, Canada, bruno.agard@polymtl.ca, Joel Quashie, Martin Trépanier, Catherine Morency

Large transportation household surveys collect data on individual trips of thousand of urban travelers. In this paper, we apply data mining techniques to identify clusters of travelers presenting similar behaviours, especially their activity patterns and activity location choices. Individual attributes like age, gender, car ownership, place of residence and activity locations are brought into analysis. Behaviours are compared through four different years of data collection.

■ TA14

El Morro 1

Representing Human Behavior in Virtual Environments

Cluster: OR in the Public Sector
Invited Session

Chair: Charles Worrell, MITRE Corporation, 7515 Colshire Drive, F410, McLean, VA, 22102-7508, United States, cworrell@mitre.org

1 - Propagating Perceptions Across a Social Network to Influence System Performance in Virtual Environments

Charles Worrell, MITRE Corporation, 7515 Colshire Drive, F410, McLean, VA, 22102-7508, United States, cworrell@mitre.org

This research demonstrates a method for propagating people's beliefs across a network of simulated people and systems to represent their impact on the performance of systems and processes. System performance is impacted by changes in the productivity of people that result from changes in their perceptions.

2 - Risk Evaluation Framework for Enterprise Modernization Programs

Gregory Love, Principal Economics/Business Analyst, MITRE Corporation, 7515 Colshire Drive, McLean, VA, 22102, United States, glove@mitre.org

Enterprise modernization programs are high stakes endeavors. This framework characterizes the acquisition life-cycle using system dynamics to describe how complex systems produce observed behavior. Causal factors that include program definition, innovation, and complexity were identified and influence diagrams developed to model cost growth. The framework and influence diagrams identify important controllable factors affecting program outcomes.

■ TA15

El Morro 2

Military Applications Arcade

Sponsor: Military Applications
Sponsored Session

Chair: Robert Taft, Mathematician, Naval Surface Warfare Center, Code K61, 17320 Dahlgren Road, Dahlgren, VA, 22448, United States, robert.l.taft@navy.mil

1 - Architecture Considerations for Regional Ballistic Missile Defense

George Mayernik, Manager III Systems Engineering, Raytheon Company, 235 Presidential Way, MS 26/3127, Woburn, MA, 01801-1060, United States, George_E_Mayernik@raytheon.com

Evaluate several Ballistic Missile Defense (BMD) architectures for defense of Europe. Demonstrate the value of Areas of Responsibility within each country with communication gateways. BMD Netted Solutions are evaluated to demonstrate the performance sensitivity to changes in architecture. Forward Based Radars are included for use in the network with long range Early Warning Sensors and local Theater Missile Defense Radars. Sensitivity to firing doctrine and engagement rules are considered.

2 - Optimizing U.S. Navy Resource Allocation for Mission Accomplishment in the Gulf of Guinea

Greta Spitz, Student, US Navy/US Naval Postgraduate School, 1411 Cunningham Rd, Rm 220B, Monterey, CA, 939, United States, gspitz@nps.edu

Maritime Security and Theater Security Cooperation are strategic U.S. Navy priorities. The Navy's goal in Gulf of Guinea is to provide persistent presence; assisting host nations in developing their ability to provide for their own maritime security. A challenge exists in scheduling, sustaining, and allocating mission resources in a logistically constrained environment. This work demonstrates an optimization model to aid in the mission planning and scheduling process.

3 - Exploring Pareto Boundaries

Robert Taft, Mathematician, Naval Surface Warfare Center, Code K61, 17320 Dahlgren Road, Dahlgren, VA, 22448, United States, robert.l.taft@navy.mil, Michael Kuchinski

ParBoX is an architecture and implementation built to nominate a handful of significantly different, non-dominated solutions to multi-criteria decision problems (MCDPs). Problems we have examined include notional theater level planning for cruise missile strikes and selecting a college semester schedule. With the smaller problem of selecting a college semester schedule we are measuring the breath and quality of the ParBoX coverage compared to the entire Pareto Boundary.

■ TA16

San Cristobal

OR Analysis for Leadership Decisions

Cluster: OR on the Edge
Invited Session

Chair: Ray Hill, Professor, Wright State University, 207 Russ Eng Center, 3640 Col Glenn Hwy, Dayton, OH, 45435, United States, ray.hill@wright.edu

1 - Reliable Supply Chain Design Considering Facility Failures

Edward Pohl, University of Arkansas, Department of Industrial Engineering, Fayetteville, AR, epohl@uark.edu, Dinakar Gade

Modern supply chains are complex structures and are subject to various disruption risks such as natural disasters, terrorist attacks etc. The risk profile of a supply chain depends on how its primary components (plants, warehouses, distribution centers etc) are configured. We develop a scenario based formulation for a capacitated network and solve it using a Sample Average Approximation Technique.

2 - Percentile-based Cycle Time Predictions That Achieve Performance Guarantees

Frank Ciarallo, Associate Professor, Wright State University, 207 Russ Eng Center, 3640 Col Glenn Hwy, Dayton, OH, 45435, United States, frank.ciarallo@wright.edu, Rupa Celamkoti

Traditional cycle time prediction models are based on mean values. Many situations in today's data rich environments require performance guarantees greater than the approximately 50% achieved by predictions based on mean values. We use classic queueing models to demonstrate how percentile-based cycle time predictions achieve performance guarantees. Furthermore, we show how prediction errors can be significantly reduced by using insights from classic operational models to enhance the predictions.

3 - Optimizing a Production Line's "End State": An Implementation

Blake Nicholson, Department of Industrial and Operations Engineering, 1205 Beal Avenue, University of Michigan, Ann Arbor, MI, 48109-2117, United States, blaken@umich.edu, Robert Smith, Marina Epelman

Leaving a production line in a certain state upon shutdown can dramatically increase the productivity of work crews during downtime, which in turn improves system performance and product launches. During this talk, we present a dynamic programming approach to the "End State" problem, and our experience with a software implementation of our algorithm at an automotive manufacturing plant.

■ TA17

Egret

Quality Control

Contributed Session

Chair: Richard Marcellus, Associate Professor, Northern Illinois University, Industrial and Systems Engineering, Northern Illinois University, DeKalb, IL, 60115, United States, marcellus@ceet.niu.edu

1 - Hotelling's T2 UCL Correction Considering the Condition Number in the Variance-Covariance Matrix in a Multiple Regression Model

Noel Artilles, Professor Department Industrial Engineering, University of Puerto Rico at Mayagüez, Industrial Eng. Department, P.O. Box 9043, Mayagüez, 00681, Puerto Rico, nartilles@uprm.edu, Wilfredo Yushimito

It is well known that the condition number of a matrix is a measurement of instability of numerical results to little changes in the data. In Hotelling's T2 Control Charts' literature, the attention has been centered in the estimation of the variance-covariance matrix and, recently, corrections of the traditional UCL approximation has been proposed using Monte Carlo Simulation (Champ. et al., 2005). However, the true variance-covariance can be, from the point of view of the condition number, an ill-conditioned matrix. This work provides regression models, based on the condition number of the estimated correlation matrix, number of samples, number of variables and the desired in-control ARL, for the prediction of the in-control average run length (ARL) in Phase II of T2 Control Charts. When large samples are not available, the regressions can be used to correct the UCL to achieve values that are more exact.

2 - A Vector Autoregressive Scheme for Multivariate Autocorrelated Processes

Muer Yang, University of Cincinnati, Lindner Hall 501, University of Cincinnati, Cincinnati, OH, 45221, United States, yangmr@email.uc.edu, Jing Sun

Traditional statistical process control techniques cannot effectively monitor multivariate processes with autocorrelation and crosscorrelation. This paper proposes a control chart using vector autoregressive model to monitor multivariate autocorrelated processes, and an approach to evaluate the chart's performance thoroughly using Monte Carlo simulation and to give the relationship between average run lengths and mean shifts in multivariate autocorrelated processes.

3 - Structural Models for Statistical Process Control Systems

Richard Marcellus, Associate Professor, Northern Illinois University, Industrial and Systems Engineering, Northern Illinois University, DeKalb, IL, 60115, United States, marcellus@ceet.niu.edu

Modeling of the interacting sources of variability in a statistical process control system is important to estimating the performance of candidate sampling and inspection policies, and also to evaluating resource requirements and risks. Possible models for the inter-relationships of process, design, and performance variables are discussed, along with problems associated with modeling statistical process control systems.

■ TA18

Heron

Increasing Student Engagement in Their OR Educations

Cluster: Educational Issues

Invited Session

Chair: James Cochran, Associate Professor, Louisiana Tech University, College of Business, P.O. Box 10318, Ruston, LA, 71272, United States, jcochran@cab.latech.edu

1 - Technology Intervention in OR/MS Teaching

Kala Seal, Loyola Marymount University, One LMU Drive, Hilton Bldg. 2nd Floor, Los Angeles, ca, 90045, United States, kseal@lmu.edu

IT tools have made profound changes to educational models in OR/MS and forced the OR/MS educators to be innovative in content explanation and delivery, and provided students new ways to learn. However, it is not clear if they can be applied

to all areas of OR/MS. I want to discuss capabilities of various technology tools readily available to the instructors for innovative content delivery and for engaging students and discuss the applicability of the various tools for different areas of OR/MS.

2 - Immediate Return on Investment in University-Industry Partnership

Kenneth Chelst, Professor, Wayne State University, Industrial & Manufacturing Engineering D, Detroit, MI, 48202, United States, kchelst@wayne.edu, Kenneth Riopelle, Leslie Monplaisir

Academia markets education to companies as a long-term investment in their people. We describe an unusual engineering management master's degree initiative begun in 1992 that culminates in a major team project that includes implementation. These projects routinely produce results with high immediate return on investment. In this talk, we discuss what it takes to maintain the quality and consistency of the projects and explore a major conceptual gap in the OR literature about implementation.

3 - Case Studies for Environmental and Water Resources Systems Analysis Education

David Watkins, Department of Civil and Environmental Engineering, Michigan Technological University, Houghton, MI, 49931-1295, dwatkins@mtu.edu, Eric Loucks, Emmanuel Nzewi, Avi Ostfeld

This paper presents a set of environmental and water resources systems analysis case studies that are being developed for use in upper level undergraduate and graduate engineering courses. Along with providing active learning opportunities, a goal of these cases is to introduce students to applications of modeling and analysis in the engineering profession. For each case study, students are given background information pertinent to a current water or environmental management issue, including geographic, hydrogeological, and other natural resource information; as well as any social, economic, and political information that may be relevant. A series of exercises is provided related to each case study, consisting of additional research, team participation, and computer exercises. Through the computer exercises, students will gain familiarity with technologies commonly used in the profession, including simulation and optimization models, visualization tools, and geographic information systems. This paper provides an overview of some of the case studies developed through these efforts, along with a preliminary assessment of their impact based on student and faculty evaluations. Following case study use, evaluation, and revision, the cases will be made freely available for use in water resource and environmental engineering courses at universities worldwide.

4 - Pop Culture - A Wealthy Source of Active Learning Exercises

James Cochran, Associate Professor, Louisiana Tech University, College of Business, P.O. Box 10318, Ruston, LA, 71272, United States, jcochran@cab.latech.edu

As instructors of quantitative methods, we understand our message is more resonant, relevant, and important than ever before. But how do we convince students of this? Active learning exercises are very effective, but where does one find inspiration for creative new activities? In this presentation we demonstrate several simple and easily transferable exercises based on pop culture icons such as Who Wants to be a Millionaire, Jeopardy, Family Feud, Altoids candies, and Donald Trump (?).

■ TA19

Sea Gull

Game Theory

Contributed Session

Chair: Kholekile Gwebu, Assistant Professor, University of New Hampshire, 434 Bennett Way, Newmarket, NH, 03857, United States, khole.gwebu@unh.edu

1 - Strategic Power in the EU Council in Union's Decision-Making Procedures

Mika Widgren, Professor, Turku School of Economics, Rehtorinpellonkatu 3, Turku, 20500, Finland, mika.widgren@tse.fi, Stefan Napel

This paper analyses strategic power in the EU Council. The evaluation is based on Strategic Measure of Power, which is based on non-cooperative equilibrium analysis, developed by Napel and Widgren (2004). The novelties of the paper are that the Council is not analysed in isolation from other EU bodies and decision-making procedures and that we assume spatial voting with true Council voting weights.

2 - Games With Externalities: Games in Coalition Configuration Function Form

M. Josune Albizuri, Dr, UPV-EHU, Lehendakari Agirre, 83, Bilbao, Bi, 48015, Spain, mj.albizuri@ehu.es

In this paper we introduce a model of cooperative game with externalities which generalizes games in partition function form by allowing players to take part in more than one coalition. We provide an extension of the Shapley value (1953) to these games, which is a generalization of the Myerson value (1977) for games in partition function form.

3 - The Effects of Feedback on Multi-Attribute Auction Performance

Kholekile Gwebu, Assistant Professor, University of New Hampshire, 434 Bennett Way, Newmarket, NH, 03857, United States, khole.gwebu@unh.edu, Michael Hu, Murali Shanker

Recent research on multi-attributes auctions suggests that the type and amount of information bidders are exposed to during the bidding process could have a significant impact on auction performance. The objective of this study is to deepen our understanding of the manner in which information disclosure interventions affect the performance of multi-attribute auctions. A conceptual model is formulated by identifying seven information elements suggested by previous research and employing Information Asymmetry Theory and Signaling Theory as theoretical backdrops for modeling the relationships between information disclosed to bidders and multi-attribute auction performance. Finally, we perform an initial assessment of the proposed conceptual model through a series of experiments where subjects are exposed to various information disclosure policies.

TA20

Parrot

Optimization Modeling in Practice

Cluster: OR in Practice

Invited Session

Chair: Carol Tretkoff, ILOG, ilustig@ilog.com**1 - A Practical Tool for Sensitivity Analysis**Carol Tretkoff, ILOG, Inc., tretkoff@ilog.com

Sensitivity analysis methods for mathematical programs are based on duality theory, and do not work for mixed integer programs. We will illustrate a new tool, ILOG ODM, that allows users to do sensitivity analysis for any type of optimization problem that can be modeled with ILOG's modeling language OPL. These tools make it easy to do what-if analyses, comparisons of alternative solutions, and permit the end user to gain a deeper understanding why the underlying optimizer obtained its answer.

2 - Recent Advances in CPAlex Fleischer, ILOG, 9 rue de Verdun, Gentilly, 94250, France, afleischer@ilog.fr

Constraint Programming (CP) has often been successfully applied, but has in practice been hard to master, because of the custom search strategies required. Recent advances show that parameterizable black box search is possible for CP, which leads to a model-and-run methodology comparable to that of Mathematical Programming.

3 - Optimization Modeling: Recent Enhancements and Future ExtensionsMichael C. Ferris, Professor, University of Wisconsin, 1210 West Dayton Street, Madison, WI, 53706, United States, ferris@cs.wisc.edu

Modeling systems are an efficient way to develop the constraints and objectives for optimization and equilibrium problems. We outline several recent enhancements of such systems that facilitate grid solution techniques, complementarity or equilibrium constraints within optimization problems, model embedding, and explicit formulation of soft constraints and extended nonlinear programming problems. Further extensions of these systems to ease the modeling burden will also be proposed.

TA21

Canary

Panel Discussion: How to Write a Good Practice Paper. What Makes a Good Practice paper, Why You Should Write One, Who is the Audience and What are You Trying to Accomplish

Cluster: OR in Practice

Invited Session

Chair: Stephen Strauss, PTSM, AT&T, 180 Park Avenue, Building 103, Florham Park, NJ, 07932-1003, United States, ss Strauss@att.com**1 - Panel Discussion: How to Write a Good Practice Paper. What Makes a Good Practice Paper, Why You Should Write One, Who is the Audience and What are You Trying to Accomplish**

Moderator: Stephen Strauss, PTSM, AT&T, 180 Park Avenue, Building 103, Florham Park, NJ, 07932-1003, United States, ss Strauss@att.com, Panelist: Jeff Camm, Harlan Crowder, Benjamin Lev, Michael Rothkopf

There are multiple reasons to write a practice-oriented paper. Come to the session and find out what they are. There is a difference between an academic oriented paper and a practice-oriented paper and many of the practice-oriented journals and publications have gained in prestige. By changing the focus, more than one paper can be generated out of a single project. See how this can benefit your career.

TA22

Pelican

Health Care-Modeling

Contributed Session

Chair: Prashant Yadav, Professor of Supply Chain Management, MIT-Zaragoza International Logistics Program, Zaragoza Logistics Center, Avenid Gomez Laguna, Zaragoza, 50009, Spain, pyadav@zlc.edu.es

1 - Optimize Workflow for New Hospital Using Simulation

Andrew Ganti, Master Black Belt, GE Healthcare, 300 Winged Terrace Dr., San Ramon, CA, 94582, United States, andy.ganti@med.ge.com, David Kopetsky

This paper for optimizing workflows for a new hospital using simulation will aid you in planning and design of a new department or hospital whether it involves new construction or renovation. This will help the occupants of the department to have a clear picture of the workflow to aid them in developing other operational details. Furthermore, this will help the hospital avoid costly mistakes while helping the decision makers to select alternatives meeting quality and cost criteria.

2 - Markov Decision Process for Optimizing Chemotherapy Scheduling

Hui Jiang, Stanford University, ICME, Stanford, CA, 94305, United States, jhui2001@hotmail.com, Zheng Su, Yifan Liu

We illustrate how MDP can be employed to optimize chemotherapy scheduling. We regard the density of host and cancer cells as the states, and derive the equation satisfied by the optimal values of objective function at different states. Since the treatment time in our model are integer-valued, we develop some new theory and algorithm as a variation from traditional value iteration method. Some ideas to further elaborate the model are discussed.

3 - Scheduling Surgical Cases: A Branch-and-price Approach

Erik Demeulemeester, Professor, FETEW, Katholieke Universiteit Leuven, Naamsestraat 69, Leuven, B-3000, Belgium, Erik.Demeulemeester@econ.kuleuven.be, Brecht Cardoen

We will present an IP formulation in order to optimize a surgery schedule that incorporates different types of objectives that are either hospital related (leveling recovery beds) or patient related (priority for children, travel distance). A column generation approach, in which the pricing problem is solved using dynamic programming, will be combined with multiple branching schemes in order to ensure integral solutions. Extensive computational results will be provided.

4 - Timing of Testing and Treatment of Hepatitis C and other Diseases

Julie Swann, Georgia Institute of Technology, julie.swann@isye.gatech.edu, Daniel M. Faissol, Paul Griffin, H. Eser Kirkizlar

Many papers in the medical literature analyze the cost-effectiveness/savings of screening by simulating the disease and a limited number of a priori testing policies. However, this may be insufficient to determine the best timing of the tests or incorporate changes over time. In this research, we develop a Markov Decision Process (MDP) model for diseases where our goal is to determine the best timing for testing (and treatment) decisions when the presence of the disease is not known in advance. We develop a model that allows for the awareness of a disease to change behavior and analyze the model for structural results and find that under certain assumptions, the immediate costs and rewards determine a condition that is sufficient to establish that testing (and treatment) is beneficial, and we discuss the insights for healthcare practice. Using the model and medical data, we solve for the optimal timing of a limited number of tests and treatments for the case of Hepatitis C, and we also apply the model results to screening for Chlamydia.

5 - Supply Chain Impact of a Subsidy on Developing Country Health Products

Prashant Yadav, Professor of Supply Chain Management, MIT-Zaragoza International Logistics Program, Zaragoza Logistics Center, Avenid Gomez Laguna, Zaragoza, 50009, Spain, pyadav@zlc.edu.es, Kirsten Curtis

In order to make the new drugs for malaria, HIV/AIDS and TB affordable to much of the developing country population and to drive out cheaper antiquated treatments, a global drug subsidy at a high level has been proposed. We model the effect of this subsidy on the public and private sector supply chains and study how overall access is likely to be affected by this intervention.

Tuesday, 10:00 - 11:30am

■ TB01

Rio Mar Salon 1

Production and Scheduling II

Contributed Session

Chair: Weida Chen, School of Economics and Management Southeast University, Si Pai Lou 2, Nanjing 210096, China, chenwd@public1.ptt.js.cn

1 - Multi-Criteria Sequence Dependent Job Shop Scheduling Using Genetic Algorithms

Andrew Manikas, Student, Georgia Tech, Georgia Institute of Technology, 800 West Peachtree Street, Atlanta, GA, 30332, United States, andrew.manikas@mgt.gatech.edu, Yih-Long Chang

Job shop scheduling is a complex problem made even more difficult when the sequence dependent setup times are included. The problem becomes more complex when businesses judge solution goodness according to multiple competing criteria. We demonstrate that Genetic Algorithms can be applied and modified quickly to produce better solutions than common heuristics in a job shop environment that include sequence dependent setup times.

2 - Multiobjective Parallel Machine Scheduling Using Memetic Algorithms

Felipe Baesler, Professor, Universidad del BioBio, Av Collao 1202, Concepcion, Chile, fbaesler@ubiobio.cl, Luis Ceballos, Milton Ramirez

This work presents a multiobjective optimization algorithm based on Memetic Algorithms. This algorithm proposed by the authors, uses the local search operator to find compromise solutions. The algorithm was applied to a scheduling problem of the wood industry in Chile and compared against four multiobjective techniques available in the literature. The results of the proposed approach outperformed the benchmark techniques based on two objectives of industrial interest.

3 - Base on Double Volatility Index Ant Colony Algorithm to Optimize Job-Shop Scheduling

Weida Chen, School of Economics and Management, Southeast University, Si Pai Lou 2, Nanjing, 210096, China, chenwd@public1.ptt.js.cn, Qingli Da, Wenping Wang

According to the characteristics of Job-shop Scheduling, the double volatility index ACO algorithm is designed to be as pheromone reinforcement rule. The simulation results show that the algorithm is feasible and effective for minimizing the make-span in job-shop scheduling. At last, the parameters of the double volatility index ACO algorithm is optimized.

■ TB02

Rio Mar Salon 2

Risk Management Applications

Cluster: Risk Management

Invited Session

Chair: Eleni Pratsini, IBM Zurich Research Lab, Saeumerstrasse 4, Rueschlikon, 8803, Switzerland, pra@zurich.ibm.com

1 - Managing Compliance and Quality Risk in Supply Chains

Eleni Pratsini, IBM Zurich Research Lab, Saeumerstrasse 4, Rueschlikon, 8803, Switzerland, pra@zurich.ibm.com, Andre Elisseeff

Manufacturing companies working in regulated industries must develop supply chain strategies that consider those elements of risk that affect the reliability of their products and conform to industry regulations. We present a statistical approach to quantitatively measure a company's exposure to compliance and quality risk and tie it into an optimization model to determine the optimal risk remediation actions. We apply this to a pharmaceutical company.

2 - Learning Across and Within Projects to Improve Project Risk Management

Lea Deleris, Post-Doctoral Researcher, IBM Research, 1101 Kitchawan Road, 31-222, Yorktown Heights, NY, 10598, United States, Lea.Deleris@us.ibm.com

In this research, we build a risk management tool designed to learn within a project and across projects. We combine project non-specific risk factors with project activity durations in a Bayesian network. Activities durations are linked to risk factors through dependence relationships. This enables managers to update their beliefs about future activities duration based on completed activities durations, adjust the project plan, and decrease the risk not to finish on time.

3 - Counter-Measure Portfolio Optimization for Operational Risk

Dharmashankar Subramanian, Research Staff Member, IBM Research, 1101 Kitchawan Rd, Route 134, IBM TJ Watson Research Center, Yorktown Heights, NY, 10598, United States, dharmash@us.ibm.com

Operational Risk is defined as the risk of loss resulting from inadequate or failed processes or systems, human factors or external events. Operational risk modeling provides a systematic way of identifying the causes of such risks, estimating the frequency/severity of events, and developing a quantitative distribution of loss. This paper addresses the Counter-measure Portfolio Optimization, which seeks to identify the optimal portfolio of countermeasure investments.

■ TB03

Rio Mar Salon 3

Customer Assignment and Inventory Transportation Planning

Cluster: Supply Chain Optimization

Invited Session

Chair: Kevin Taaffe, Assistant Professor, Clemson University, 110 Freeman Hall, Clemson, SC, 29634, United States, taaffe@CLEMSON.EDU

1 - Heuristics and Bounds for the Storage Constrained, Inbound Inventory Routing Problem

Chuck Sox, Professor & Director of Operations Management, University of Alabama, Dept. of ISM, Box 870226, Tuscaloosa, AL, 35406, United States, csox@cba.ua.edu, Jennifer Stacey, Malini Natarajarathinam

We present heuristics and a lower bound for route design and inventory management of inbound parts for a facility that has a limited amount of storage space in which to store inventory. We develop a lower bound as a benchmark for the heuristic solutions and show that near optimal solutions can be obtained in a reasonable amount of time by utilizing information about the amount of storage space in the route selection process.

2 - Comparison of Solution Approaches to the Stochastic Demand Assignment Problem

Kevin Taaffe, Assistant Professor, Clemson University, 110 Freeman Hall, Clemson, SC, 29634, United States, taaffe@CLEMSON.EDU, Edwin Romeijn, Joseph Geunes

We study a supplier that utilizes a set of distinct facilities to satisfy stochastic demands from different customers or markets. Our model simultaneously assigns customers to facilities and determines the best utilization of capacity at each facility. While capacity can be dynamically assigned, the supplier may be restricted by upper and lower bounds on allowable capacity at each facility. We present a comparison of solution approaches involving branch-and-price and Lagrangian relaxation.

3 - Integrated Freight Planning

Sarah Root, University of Michigan, 1205 Beal Ave, Ann Arbor, 48105, United States, seroot@umich.edu, Amy Cohn

Planning for express package carriers is difficult given the large number of decisions to be made and the tight timing constraints which must be satisfied. We demonstrate how an approach based on composite variable modeling allows us to solve an integrated planning process to simultaneously consider the assignment of volume to loads, the matching and routing of these loads, and the balancing of empty trailers. Computational results and areas for future research are also presented.

4 - Integrating Facility Location and Production Planning

Thomas Sharkey, University of Florida, 303 Weil Hall, P.O. Box 116595, Gainesville, FL, 32611, United States, sharkeyt@ufl.edu, Jiawei Zhang, Edwin Romeijn, Zuo-Jun Max Shen

We consider a metric uncapacitated facility location problem where we must assign each customer to a facility and meet the demand of the customer in future time periods through production and inventory decisions at the facility. We show that the problem, in general, is as hard to approximate as the set-cover problem. When the demand patterns of the customers are seasonal, we develop an approximation algorithm with a guarantee of 1.52.

■ TB04

Rio Mar Salon 4

Software Seminar: GAMS

Cluster: Software Seminars

Invited Session

Chair: Alex Meeraus, President, GAMS Development Corp., 1217 Potomac St. NW, Washington, DC, United States of America, ameeraus@gams.com

1 - Application Prototyping With GAMS

Steven Dirkse, GAMS Development Corporation, 1217 Potomac St. NW, Washington, DC, 20007, United States, sdirkse@gams.com, Alex Meeraus

This workshop is designed to show you how to use the GAMS modeling and rapid prototyping tools. There will be an introduction to the system and a presentation of key concepts. The bulk of the workshop consists of hands-on exercises building and deploying a GAMS application. Guided by our experts, an optimization based decision support application will be built from scratch. We will show how easily and flexibly GAMS interacts with other applications, including MS Office applications.

■ TB05

Rio Mar Salon 5

New Perspectives on Decisions: Happiness, Identity, Power, Control, and Geography

Sponsor: Decision Analysis

Sponsored Session

Chair: L. Robin Keller, Professor & Assoc. Dean, UC Irvine, Paul Merage School of Business, Irvine, CA, 92687-3125, United States, lrkeller@uci.edu

1 - Does More Money Buy You More Happiness?

Manel Baucells, Associate Professor, IESE Business School - University of Navarra, Ave. Pearson, 21, Barcelona, Spain, Mbaucells@iese.edu

Why do we believe that more money will buy us more happiness (when in fact it does not)? We propose a model to explain this puzzle. The model incorporates both adaptation and social comparison. A rational person who fully accounts for the dynamics of these factors would indeed buy more happiness with money. We argue that projection bias, the tendency to project into the future our current reference levels, precludes subjects from correctly calculating the utility obtained from consumption.

2 - Do Concerns for Power and Control Impair Decision Behavior?

Kelly E. See, New York University, Stern School of Business, New York, NY, United States, ksee@stern.nyu.edu

This talk will discuss results from two projects that use a mix of field data and lab experiments. The findings suggest that perceived threats to identity, control, and power can (1) affect managers' preferences for different types of organizational decision making approaches, such as decision analysis, and (2) hinder the extent to which individuals take advice from peers.

3 - Preference Functions for Decisions With Geographically-Varying Attributes

L. Robin Keller, Professor & Assoc. Dean, UC Irvine, Paul Merage School of Business, Irvine, CA, 92687-3125, United States, lrkeller@uci.edu, Craig Kirkwood

Regional planning decisions, such as water resources planning, often involve alternatives with impacts that vary geographically. We apply multiattribute value and utility theory to develop functional forms for preference functions to address such decisions, and provide an illustrative example.

4 - Fraud Detection in Electronic Money Transfers

Russell Walker, President, Walker Bernardo, LLC, russell@walkerbernardo.com

The detection of fraud in money transfers and other retail banking functions remains a banker's dilemma. The amount of fraud continues to grow, the speed of transactions and customers' expectations are also increasing, yet the risk is owned by the bank. Detailed and manual intervention on all cases causes an issue of false positives and involves a great deal of cost. The application of decision analysis tools has provided banks an opportunity to combat the fraud problem, without experiencing large costs or imposing inconveniences to customers. A specific methodology that makes use of a data mining approach and known economic constraints for a bank, allowed for enumeration of a fraud level of immateriality and positive identification of some 80% of fraud cases. More generally, the nature of fraud in money transfers can be cast as a game theory problem between fraudsters and bankers, and the results of this study identify an opportunity to approach the problem as such.

■ TB06

Rio Mar Salon 6

Tutorial: Toward a Science of White Collar Workforce Management

Cluster: Tutorials

Invited Session

Chair: Wally Hopp, Professor, Northwestern University, 2145 Sheridan Rd. C210, Evanston, IL, hopp@northwestern.edu

1 - Tutorial: Toward a Science of White Collar Workforce Management

Wally Hopp, Professor, Northwestern University, 2145 Sheridan Rd. C210, Evanston, IL, hopp@northwestern.edu

White collar service and professional jobs dominate the U.S. economy, but the majority of operations management models and analyses focus on blue collar manufacturing systems. In this session, we discuss a framework for organizing existing research streams in various fields relevant to knowledge-based white collar work, highlight significant emerging results and point toward future research opportunities.

■ TB07

Rio Mar Salon 7

Information Security - II

Sponsor: Interface of Computing Science & OR

Sponsored Session

Chair: Ram Pakath, Gatton Endowed Research Professor of DSIS, School of Management, Gatton College of Business & Economics, University of Kentucky, Lexington, KY, 40506-0034, pakath@uky.edu

1 - Issues in Control Systems Security

Rayford Vaughn, Billie J. Ball Professor of Computer Science and Engineering, Mississippi State University, P.O. Box 9637, Mississippi State, MS, 39762, United States, vaughn@cse.msstate.edu

This presentation will overview an emerging and important area of information assurance – that of control system security or sometimes called Supervisory Control and Data Acquisition (SCADA) systems. Control systems are computer based facilities, systems, and equipment used to remotely monitor and control sensitive processes and physical functions.

2 - Strategies for Securing Interconnected Critical Infrastructure Networks

Sujeet Sheno, F. P. Walter Endowed Professor of Computer Science, University of Tulsa, Department of Computer Sciences, 600 S. College Avenue, Tulsa, OK, 74104, United States, sujeet@utulsa.edu

The information infrastructure, comprising computers, embedded devices and networks, is vital to every sector: agriculture, food, water, public health, government, defense, telecommunications, energy, transportation, banking, chemicals. Society cannot function if critical infrastructure components are degraded, disabled or destroyed. This lecture highlights the challenges involved in securing critical infrastructure networks, and discusses solutions that weave science, technology and policy.

■ TB08

Rio Mar Salon 8

Hybrid Approaches in Constraint Programming

Sponsor: Interface of Computing Science & OR

Sponsored Session

Chair: Laurent Michel, Assistant Professor, University of Connecticut, 371 Fairfield Way, Storrs, CT, 06269, United States, ldm@enr.uconn.edu

1 - Modeling Abstractions for Hybrid CP-IP Methods

Ionut Aron, Research Staff Member, Dept of Mathematical Sciences, IBM Thomas J Watson Research Center, 1101 Kitchawan Rd, Yorktown Heights, NY, 10598, United States, idaron@us.ibm.com

We discuss a modeling approach that brings constraint and integer programming under a unified framework and present several application examples to illustrate the solution process in this framework.

2 - Model-Driven Synthesis of Local Search Algorithm

Pascal Van Hentenryck, Brown University, Providence, RI,
pvh@cs.brown.edu, Laurent Michel

The lack of automation for local search hinders experimentation and adoption of these technologies and slows down scientific progress. This paper addresses this issue and shows how effective local search procedures can be automatically synthesized from high-level models. Experimental results suggest that the synthesized procedures only induce a small loss in efficiency on a variety of realistic applications in sequencing, resource allocation, and facility location.

3 - Compositional Control Abstractions

Laurent Michel, Assistant Professor, University of Connecticut,
371 Fairfield Way, Storrs, CT, 06269, United States,
ldm@engr.uconn.edu, Pascal Van Hentenryck

The purpose of this talk is to present unified and compositional control abstractions that modularize orthogonal aspects of search procedures such as non-determinism, search strategies and parallelism and are independent of the underlying computational model. The presentation will explore support for local search meta-heuristics, complete search strategies and their parallelization or even their distribution on network of workstations.

■ TB09

Rio Mar Salon 9

Unsolved Problems in OR Practice

Cluster: Industry-Research Interface
Invited Session

Chair: Paul Thompson, IBM Global Business Services,
12902 Federal Systems Park Drive, Fairfax, VA, 22033, United States,
paul.thompson@us.ibm.com

1 - OR Opportunities in Business Service

Brenda Dietrich, Director, Mathematical Sciences, IBM Research,
1101 Kitchawan Road, Yorktown Heights, NY, 10598, United States,
dietric@us.ibm.com

Much of the OR activity in the Services industry has focused on businesses that provide service directly to end consumers. A large and growing segment of the industry involves businesses performing business processes for other businesses - contract manufacturing, IT outsourcing, call center operations to name a few. OR methods are applicable in planning, pricing, provisioning and providing such services. This talk will discuss some business service processes and identify opportunities for the use of OR.

2 - Decision Support in Vendor Services Negotiation

Hua Ni, IBM Global Business Services, huani@us.ibm.com,
Mary Helander, Paul Thompson

We describe an optimization-based approach for supporting decisions made in contract negotiations with professional services partners. These problems are interesting from a modeling perspective (1) because they include a set of subtle objectives that are not commonly found in industrial or public sector problems, and (2) because of the asymmetry of information for some input data categories.

3 - Scheduling of Airborne Surveillance Resources for Complex Imagery Requirements

Rene Seguin, Defence Research and Development Canada,
rene.seguin@drdc-rddc.gc.ca

Any organization that must observe and gather information on a set of objects of interest is faced with the problem of selecting, assigning, scheduling and routing surveillance assets. Requirements specify frequencies of observation, time constraints (due dates and dynamic time windows), combinations of imagery equipment type preferences (radar, electro-optic and/or infrared), priorities, imagery quality and object locations and types (points, lines, areas). This defines a very complex version of the classical Selective Traveling Salesman Problem (STSP).

4 - Open Problems in Disaster Response Logistics

Paul Thompson, IBM Global Business Services,
12902 Federal Systems Park Drive, Fairfax, VA, 22033, United States,
paul.thompson@us.ibm.com

We consider several open supply chain problems that arise in emergency and disaster response. These problems share many factors with commercial logistics problems but have additional characteristics because of the dynamic nature, infrequency and uniqueness of individual disasters.

■ TB10

Rio Mar Salon 10

Environmental Management

Contributed Session

Chair: Anton Burger, Research and Teaching Assistant, Vienna University of Economics and Business Administration, Nordbergstrasse 15, Vienna, 1090, Austria, anton.burger@wu-wien.ac.at

1 - A Microsimulation of the Austrian Wholesale Electricity Market

Anton Burger, Research and Teaching Assistant, Vienna University of Economics and Business Administration, Nordbergstrasse 15, Vienna, 1090, Austria, anton.burger@wu-wien.ac.at, Robert Ferstl

We solve an asymmetric n-player oligopoly problem with a simulation approach. Each company can choose between several production technologies, which differ in terms of fixed and variable costs. We use empirical data of the Austrian electricity market for the parameters of the cost functions. The results allow quantifying the impact of regulatory measures, e.g. number of players, strategic behaviour, market design and technology choice.

■ TB11

Caribbean Salon 1

Optimization-Combinatorial I

Contributed Session

Chair: Ray Hill, Professor, Wright State University, 207 Russ Eng Center,
3640 Col Glenn Hwy, Dayton, OH, 45435, United States,
ray.hill@wright.edu

1 - Extending Tabu Search Approach for Multiple-Choice Multidimensional Knapsack Problem

Chaitr Hiremath, Wright State University, 207 Russ Engineering Center,
3640 Col Glenn Hwy, Dayton, OH, 45435, United States,
hiremath.2@wright.edu, Ray Hill

Meta-heuristic techniques have been used to solve combinatorial optimization problems. We present an extension of the basic Tabu Search (TS) for the Multiple-choice Multidimensional Knapsack Problem (MMKP) by using diversification and intensification mechanisms to exploit the search space. We propose using a Sequential Fan Candidate List approach to develop extended TS procedures. We test, compare, and report improved results of our approach on benchmark problem sets and new MMKP test sets.

2 - Integer Bilevel Linear Programming: Theory and Applications

Scott DeNegre, Lehigh University, 200 W. Packer Avenue, Mohler Lab,
Rm 354, Bethlehem, PA, 18015, United States,
sdenegre@lehigh.edu, Ted Ralphs

Polyhedral and dual approaches for solving integer bilevel linear programs are given. Extensions to polyhedral techniques developed for solving mixed integer programs are derived and new classes of valid inequalities are introduced, leading to a novel branch-and-cut algorithm. IP duality is used to derive single-level reformulations of the integer bilevel program; implicit optimality conditions are replaced with those arising from the superadditive dual of the lower-level problem.

3 - Test Problem Generation for the Knapsack Problems and Their Implications

Chaitr Hiremath, Wright State University, 207 Russ Engineering Center,
3640 Col Glenn Hwy, Dayton, OH, 45435, United States,
hiremath.2@wright.edu, Ray Hill

A variety of heuristic approaches have been developed and tested for the knapsack problem (KP) and its variants using various test problem sets. We briefly review KP variants and their test problem generation schemes. We recognize the shortcomings of the existing test sets and the implications of using poorly generated problems for the empirical study of heuristics. We present an adequate and diverse problem sets for the Multiple-choice Multidimensional Knapsack Problem, a complex variant of KP.

■ TB12

Caribbean Salon 2

Finance and Risk Management

Contributed Session

Chair: Luis Chavez Bedoya, Pontificia Universidad Catolica del Peru, Av. Universitaria 1801 - San Miguel, Lima, Peru, chavez.lc@pucc.edu.pe

1 - Robust and Adaptive Portfolio Management

Michael Dziecichowicz, Lehigh University, 657 Walnut St., Easton, PA, 18042, United States, mjd404@gmail.com, Aurelie Thiele

Traditional techniques in portfolio management rely on precise knowledge of the underlying probability distributions, such as Gaussian random variables. In practice, such information is difficult to obtain because multiple factors affect stock prices daily. To address this issue, we propose an approach to dynamic portfolio management based on the sequential update of stock price forecasts in a robust optimization setting, where the updating process is driven by historical observations.

2 - Non Gaussian Approach for the Value at Risk (VaR) Calculation in Liquid Markets

Luis Chavez Bedoya, Pontificia Universidad Catolica del Peru, Av. Universitaria 1801 - San Miguel, Lima, Peru, chavez.lc@pucc.edu.pe

The article verifies the adequacy of the Brownian motion hypothesis when it is used to model returns in non-liquid markets, i.e. where jumps and several non-changing price periods are usual. Two alternative stochastic processes are considered: a discrete time random walk, and a compound Poisson process. The VaR is computed using the two models and compared with the Gaussian and Historic models. The new VaR approach outperforms the classical approaches using the usual statistical tests.

3 - Forecasting Technology Costs via the Experience Curve - Myth or Magic?

Stephan Alberth, Cambridge University, 0.13 Europahaus II, 61 Ploeck, Heidelberg, 69117, Germany, salberth@hotmail.com

To further our understanding of the effectiveness of experience curves to forecast technology costs, a statistical analysis using historical data is carried out. Single Factor Experience Curve are shown to have represented a useful forecasting model when errors are viewed in their log format. Time is also tested as an explanatory variable, however models with endogenous learning based on cumulative capacity as used in traditional experience curves are shown to be vastly superior.

■ TB13

Caribbean Salon 3

Routing

Contributed Session

Chair: Rafael Aleman, Graduate Research Assistant, Wright State University, 207 Russ Eng Center, 3640 Col Glenn Hwy, Dayton, OH, 45435, United States, aleman.2@wright.edu

1 - Heuristics for Routing School Buses in Rural Districts

Sam Thangiah, Professor, Slippery Rock University, Artificial Intelligence and Robotics Lab, Computer Science Dept., 250 ATS, Slippery Rock, PA, 16057, United States, sam.thangiah@sru.edu, Alex Cline

In this research we describe the complexities involved in routing school buses in rural areas and the heuristics implemented to solve this problem. Heuristics were implemented to solve school bus routing problems with multiple depots, mix-fleet and split-delivery with side-constraints. The objective was to service all the students while minimizing the number and type of school buses. The implemented heuristics were tested on data sets obtained from a real-life rural school bus routing problem.

2 - A Routing Algorithm for Unmanned Aerial Vehicles And Dynamic Targets

Rafael Aleman, Graduate Research Assistant, Wright State University, 207 Russ Eng Center, 3640 Col Glenn Hwy, Dayton, OH, 45435, United States, aleman.2@wright.edu, Ray Hill, Xinhui Zhang

This paper addresses assignment of unmanned aerial vehicles to mobile military targets following known trajectories over time. To solve it efficiently, a neighborhood-based metaheuristic is developed to match vehicles and targets over time by decomposing the problem into a multiple depot and split delivery vehicle routing problems with dynamic customer locations. Our approach introduces a new variant for the VRP and allows obtaining near optimal solutions in a reasonable computational time.

■ TB14

El Morro 1

Analysis to Support Emerging Democracies

Cluster: Analysis for Nation Building

Invited Session

Chair: Greg Parlier, Senior Systems Analyst/Adjunct Research Staff, SAIC/IDA, 255 Avian Lane, Madison, AL, 35758, United States, greg.h.parlier@saic.com

1 - Planning for Success: Analysis for Stability Accounting for Civilians

Dr. Paul J Deason, Analysis Fellow, U.S. Army (Retired), 4815 Agave Dr, Las Cruces, NM, 88001, United States, deasonp@zianet.com

The purpose of this paper is to characterize analyses accounting for the requirements, means and methods to sustain and support an indigenous population which may be in the area of operation of a military force engaged in combat or operations other than war, including disaster recovery and humanitarian assistance and relief.

2 - A Local-Level Approach to Peace-Building

Vicki Johnston, SAIC, 4901D Corporate Drive, Huntsville, AL, 35805, United States, vicki.v.johnston@saic.com

Emphasizing a bottoms-up approach to Peace-Building at the local levels, this discussion will explore a process of facilitated, fully-represented community development using the tenets of emergency management alongside traditional reconciliation techniques.

3 - Nation Building or Re-Building?

Mike Rose, DMG, mrose@dmgass.com

The term "Nation Building" is often included as a post-operational event after conflict or disaster in efforts to return to some degree of normalcy. What is normalcy and how can we determine when it has returned? If this task truly is nation building, how does one determine when a nation is built? How does one determine the end state, the provider or the recipient? What defines an appropriate end state? What can we provide to influence the decision making process of both provider and recipient?

4 - Analysis for Defense Reform in the Republic of the Philippines

Greg Parlier, Senior Systems Analyst/Adjunct Research Staff, SAIC/IDA, 255 Avian Lane, Madison, AL, 35758, United States, greg.h.parlier@saic.com

This presentation will summarize recent defense reform efforts supported by the Institute for Defense Analyses since the end of the Cold War, beginning with the Partnership for Peace Program initially focused on Central Europe. Emphasis will be placed on current efforts, including ongoing support to the Philippine Defense Reform Project, a joint effort undertaken by the United States and the Government of the Philippines.

■ TB15

El Morro 2

Joint Session: Military Applications Society and Decision Analysis Society

Sponsor: Military Applications, Decision Analysis

Sponsored Session

Chair: Gregory Parnell, Professor of Systems Engineering, United States Military Academy, Mahan 432, West Point, NY, 12520, United States, Gregory.Parnell@usma.edu

1 - Planning and Assessing Stability Operations: A Value-Focused Thinking Approach

Gerald Fensterer, Air Force Institute of Technology, 4950 Hobson Way, Wright-Patterson, AFB, OH, United States, gerald.fensterer@afit.edu, Gary Kinney, Dick Deckro

Stability operations (SOPS) are vital to establish peace in the aftermath of conflict and in bringing stability to failing states. The United States often supports these operations through military action. This research uses value focused thinking to analyze the SOPS values and create a model that can be used to assist in the planning and prioritizing of SOPS and to assess the progress of the SOPS in moving a failed state to a stable one.

2 - Selection of Advanced Academic Degrees Using VFT

Shane Knighton, Air Force Institute of Technology, shane.knighton@afit.edu, Katherine Gentil

Advanced academic degrees are key to the success of officers in the USAF, however, there is a lack of strategic guidance on the type of advanced degrees needed within each career field. This research develops a career field's educational profile through the use of decision analysis and value-focused thinking. VFT is used to solicit the capabilities that the career field manager desires its officers obtain from an advanced academic program and a representative portfolio of degrees is found.

3 - Decision Analysis of Counter Rockets, Artillery and Mortar Systems
 Gregory Parnell, Professor of Systems Engineering, United States Military Academy, Mahan 432, West Point, NY, 12520, United States, Gregory.Parnell@usma.edu

The nation and our allies require the capability to counter rockets, artillery and mortars (CRAM). We report on two student studies. The first study did a CRAM capability assessment for conventional, hypersonic, and laser systems. The second team developed an integrated tool to perform technology assessments and life cycle costing for hypersonic weapons used against rockets, artillery and mortars.

■ **TB16**

San Cristobal

Operations Research and Computational Biology

Cluster: OR on the Edge

Invited Session

Chair: Al Holder, Trinity University Mathematics, One Trinity Place, San Antonio, TX, 78240, United States, aholder@trinity.edu

1 - Quadratic Binary Programming Models in Computational Biology

Richard Forrester, Assistant Professor of Mathematics, Dickinson College, College and Louthers Streets, Carlisle, PA, 17013, United States, forrestr@dickinson.edu, Harvey Greenberg

We formulate four problems in computational biology as 0-1 quadratic programs. Using test problems from scientific databases, we address the question, "Can a general-purpose solver obtain good answers in reasonable time?" Our computational experiments compare three different reformulation methods: two forms of linearization and one form of quadratic convexification.

2 - Variations in the High Flux Backbone

Al Holder, Trinity University Mathematics, One Trinity Place, San Antonio, TX, 78240, United States, aholder@trinity.edu, Eivind Almaas, Timothy Nunamaker, Kevin Livingstone

The High Flux Backbone (HFB) was recently designed to identify central metabolic reactions. It is defined in terms of an optimal solution to a linear program, but analysis indicates that the problem is at least 30 percent degenerate. We investigate the variability of the HFB over the high-dimensional optimal set.

3 - Exhaustive Design: Evaluating Many Cell Signaling Networks

Leo Lopes, University of Arizona, 1127 E James E Rogers Way #111, Tucson, AZ, 85719, United States, leo@sie.arizona.edu, Matej Boguszak, Jay Konieczka, Andrew Paek, Parker Antin

Many complex interactions between molecules can be modeled using networks. To enable searching over the topology space of these networks, new technology that enables approximate evaluation of sets of related systems of differential equations is needed. Our approach to this evaluation combines trust region approaches with Markov Chain Monte Carlo techniques to quickly screen network designs for promising explanations to the expression of a given phenotype.

■ **TB17**

Egret

Research and Applications in Service-Profit Chain (SPC)

Cluster: Measurement, Analysis & Improvement of Service Operations

Invited Session

Chair: Kalyan Pasupathy, Assistant Professor, University of Missouri, 311 Clark Hall, Health Management & Informatics, Columbia, MO, 65211, United States, pasupathyk@health.missouri.edu

1 - A Framework to Evaluate Service Operations: Dynamic Service-Profit Chain

Kalyan Pasupathy, Assistant Professor, University of Missouri, 311 Clark Hall, Health Management & Informatics, Columbia, MO, 65211, United States, pasupathyk@health.missouri.edu

Managers make operational investment decisions all the time. These investment decisions have an impact on the bottom-line. Typically, not all such decisions are evaluated for their impact. We propose a dynamic model based on the Service-Profit Chain to evaluate the impact of the investments made in operational attributes, on market penetration over time. We then operationalize this model to demonstrate applicability by identifying dimensions and observed variables that are measurable.

2 - A Cost Analysis Framework for the Service-Profit Chain

Alexandra Medina-Borja, University of Puerto Rico at Mayagüez, Industrial Engineering Building, II-205, Mayagüez, 00680, Puerto Rico, amedina@uprm.edu

The service-profit chain is used as a framework to evaluate the outcome of investments in operational features of service operations. Intermediate outcomes of this investment are customer satisfaction, repeated customer, and increase in profits. One of its shortcomings is the lack of consideration of costing and pricing realities associated with the investment in operational assets. This paper introduces the cost and tax considerations components into the SPC framework.

3 - Lead Time and Price Quotation Management for Service Providers

Xuying Zhao, Assistant Professor, University of Notre Dame, Mendoza College of Business, Notre Dame, IN, 46556, United States, xuying.zhao@utdallas.edu

Lead time, in addition to price, has become a dominant factor in competition in the service industry. A service provider often provides lead time and price quotations to customers before customers place orders. When a firm offers a single lead time and price, it is called uniform quotation mode. When a firm offers a menu of lead times and prices for customers to choose from, it is called differentiated quotation mode. By modeling, analyzing, and comparing these two quotation modes, we provide guidelines for a manager to choose a suitable quotation mode for his/her firm.

■ **TB18**

Heron

Operations Research and Outreach to Middle and High Schools

Cluster: Educational Issues

Invited Session

Chair: David Goldsman, Professor, Georgia Institute of Technology, 765 Ferst Drive, NW, Atlanta, GA, 30332-0205, United States, sman@isye.gatech.edu

1 - Project MathWORKS: Operations Research in Middle and High School Classrooms

Ken Gillam, Instructor, Department of Systems Engineering, 646 Swift Road, United States Military Academy, West Point, NY, 10996, United States, Kennon.Gilliam@usma.edu, Ernest Wong, Edward Teague

Project MathWORKS reaches out to primary and secondary math and science educators and students, introduces them to operation research methods, and excites them with practical math applications. Using easy to understand material designed for their classrooms, MathWORKS integrates practical methods and tools that promote the love of learning and it empowers teachers and students with the capacity and imagination to leverage math in solving everyday problems.

2 - Operations Research Activities for Middle School and High School Students

David Goldsman, Professor, Georgia Institute of Technology, 765 Ferst Drive, NW, Atlanta, GA, 30332-0205, United States, sman@isye.gatech.edu, Donna Llewellyn, Kenneth Chelst

We discuss a number of classroom activities that introduce the field of operations research to middle school and high school students and faculty. Under the guise of "mathematics for the real world", we show that interesting and stimulating examples can easily be incorporated into grade school mathematics curricula.

■ **TB19**

Sea Gull

Social Networks Methodology and Applications I

Cluster: Social Networks

Invited Session

Chair: Mary Helander, IBM Research, Yorktown Heights, NY, helandm@us.ibm.com

1 - Centrality Concepts: Location Theory vs. Social Networks Analysis (SNA)

Jose Santivanez Guarniz, Assistant Professor, Universidad del Turabo, P.O. Box 3030, Gurabo, PR, 778, United States, santivanezj@SUAGM.EDU, Emanuel Melachrinoudis

We present an analytical comparison between generally used Social Network Analysis concepts of centrality and the location theory concepts. First, the main differences on network attributes and flow are revised. Second, location analysis models; such as the r-median, r-center, reliable 1-center, reliable 1-median, relisum, etc; are compared to SNA metrics.

2 - Identifying Coordination Gaps in Software Development Teams

Mary Helander, IBM Research, Yorktown Heights, NY,
helandm@us.ibm.com, Giuseppe Valetto, Kate Ehrlich

Software development projects are often fraught with problems which can be traced to poor alignment between the team structure and the software structure. We show how analysis of social networks in relation to software engineering artifacts and activities can be used to diagnose potential coordination gaps in development teams.

■ TB20

Parrot

Optimization- Modeling I

Contributed Session

Chair: Sydney Chu, Professor, University of Hong Kong, Department of Mathematics, Hong Kong - ROC, schu@hku.hk

1 - A Mathematical Analysis of the Division Rules of Cities for Political Redistricting

Keisuke Hotta, Bunkyo University, 1100, Namegaya, Chigasaki,
Kanagawa, 253-8550, Japan, khotta@shonan.bunkyo.ac.jp,
Toshio Nemoto

Using IP, we showed the limit of the vote-value disparity for the redistricting of the House of Representatives in Japan, and analyzed the disparity and the legislative apportionment quantitatively. As a result of this analysis, we found the disparity is heavily dependent on the rules for making divisions of cities. In this research, by changing the numerical value specified in the division rules and using it as a parameter, we analyze what kind of change appears in the marginal gap.

2 - Cost Analysis in Optimization Models

Maria Cileg, Professor, Faculty of Economics, 9-11 Segedinski put,
Subotica, Se, 24000, Serbia-Montenegro, macileg@yahoo.com,
Tibor Kis, Otilia Sedlak

This paper deals with the analysis of costs incorporated into programming models as limits, while examining appropriate economic interpretation. Possibilities of including costs into criterion functions of linear and nonlinear models are also analyzed. The algorithm suggested in this paper relates to the determination of intervals of validity of dual prices and sensitivity analysis of fractional criterion function. Paper stresses out the necessity of analyzing information content of such models.

3 - Visualization Modeling for Maximum Resolution Dichotomy of Internet Data

Sydney Chu, Professor, University of Hong Kong, Department of Mathematics, Hong Kong - ROC, schu@hku.hk

We construct topologically-driven visual model for the question of what "shape" the Global Diffusion of Internet (GDI) is in. It bases on data from sources like the GDI framework of Wolcott to visualize the dimensions of GDI data and produce the maximum resolution of usage/provider determinants of internet diffusion.

■ TB21

Canary

Simulation Applications

Cluster: Simulation Applications

Invited Session

Chair: Sonia M. Bartolomei-Suárez, Professor, University of Puerto Rico, P.O. Box 9043, Mayagüez, PR, 00681, United States, sonia@ece.uprm.edu

1 - Using SIM-Simulation to Estimate System Capacity

Lorna Cintron, Student, The Pennsylvania State University, 205A
Grubb Hall, White Course Apartments, University Park, PA, 16802,
United States, locigo7@gmail.com, Sonia M. Bartolomei-Suárez,
Aixa Cintron

This paper presents SIM-Simulation, a SIMAN-based simulation tool developed for a pharmaceutical manufacturer, with the purpose of assisting product scheduling and decision making. It encompasses a Visual Basic user interface that allows the user to input initial conditions such as work-in-process, machine breakdowns, and other available resources. Results show resource utilization, amount of finished product and the proportional change in productivity if resource capacity changes.

2 - Digital Simulation of a Catheter Assembly Line

María de los A. Irizarry, Professor, University of Puerto Rico,
Industrial Engineering Department, Mayagüez, PR, 00681-9043,
Puerto Rico, maria@ece.uprm.edu, Ana M. Gonzalez

In this research work a digital simulation model using the SIMAN programming language was built to replicate the behavior of an assembly line. The chosen line consists of 24 workstations and is dedicated to the assembly of catheters. The simulation model considered aspects such as yields, rework, machine failure rate and repair time, and variability in processing times. The simulation model was used to test line performance under various scenarios and for the selection of the best line performance scenario.

3 - Academic Planning Using Simulation Modeling

Viviana Cesaní, Associate Professor, Department of Industrial Engineering, University of Puerto Rico, Mayagüez Campus,
Mayagüez, 00680, Puerto Rico, vcesani@uprm.edu,
Sonia M. Bartolomei-Suárez, Heidi Romero-Encarnación

This work proposes the use of simulation modeling for the development of a planning tool to assist academic units schedule teaching and research resources. The data used to construct the model includes the program academic curriculum, class sizes, passing and attrition rates, and credit-hours assigned to students and professors per course. The model provides information regarding the number of professor-hours needed and allows the examination of different workload scenarios.

■ TB22

Pelican

Optimization in Radiation Therapy

Sponsor: Health Applications

Sponsored Session

Chair: Dionne Aleman, University of Florida, 303 Weil Hall, P.O. Box 116595, Gainesville, FL, 32605-6595, United States, daleman1@ufl.edu

1 - New Approaches for Fluence Map Optimization Problem With Dose-Volume Restrictions

Ali Tuncel, Research Assistant, Purdue University, School of Industrial Engineering, 315 N. Grant Street, West Lafayette, IN, 47907,
United States, atuncel@purdue.edu, Ronald L. Rardin, Mark Langer,
Richard Jean-Philippe

Fluence map optimization problem (FMOP) in radiation therapy aims to optimally adjust beam/beamlet intensities to control dose distributions over different tissues. When subject to dose-volume restrictions, FMOP becomes NP-Hard due to the combinatorial nature of these constraints. We propose new methods exploiting the problem structure to solve FMOP in a global optimization framework to obtain solutions that are provably within a certain margin of the global optimal solution value.

2 - Multi-Plan: A Paradigm Shift for IMRT

Robert Meyer, Professor, University of Wisconsin, 1210 West Dayton Street, Madison, WI, 53706, United States, rrm@cs.wisc.edu

Our goal in this work is to lay the foundation for a paradigm shift for treatment planning. Instead of the current inefficient process of employing numerous plan-evaluate-modify cycles in a trial-and-error process, we propose the generation of multiple plans for a given case. This multi-plan approach will produce large amounts of data that will be presented to the clinician via a user-friendly interface that will facilitate the selection of the most appropriate plan from the many alternatives.

3 - Modeling the Dose Deposition of a Beam in Radiation Therapy

Dionne Aleman, University of Florida, 303 Weil Hall,
P.O. Box 116595, Gainesville, FL, 32605-6595, United States,
daleman1@ufl.edu, James Dempsey, Ibrahim Karakayali

In intensity modulation radiation therapy (IMRT) treatment planning, optimization methods rely heavily on the calculation of dose received in the patient. Current techniques use linear approximations to determine the dose. Although Monte Carlo simulation can provide accurate dose measures, lengthy run times render it impractical. We propose a Monte Carlo method that uses a limited number of histories to improve the accuracy of dose calculations in a clinically acceptable amount of time.

Tuesday, 1:30 - 3:00pm

■ TC01

Rio Mar Salon 1

Supply Chain I

Contributed Session

Chair: Chanaka Edirisinghe, Professor, University of Tennessee, 610 SMC, 916 Volunteer Blvd, Knoxville, TN, 37996, United States, chanaka@utk.edu

1 - Capacity Allocation Using Past Sales: Turn-And-Earn in a Product Line

Dinah Vernik, PhD Candidate, Duke University, Fuqua School of Business, Box 90120, Durham, NC, 27708, United States, dinah.vernik@duke.edu, Debu Purohit

In the short run, if a supplier's capacity and prices are fixed, then a low demand realization leaves the manufacturer with unused capacity, while a high demand realization leaves retailers with limited supply. In this paper we generalize Cachon and Lariviere (1999) by analyzing the case where a manufacturer sells a product line and the demand for the products is interrelated. We find that turn-and-earn across items in a product line leads to higher profits for the manufacturer.

2 - Input Quantity Decision in a Supply Chain with Demand Uncertainty

Kwangtae Park, Professor, Korea University, Anam-dong, Sungbuk-gu, Seoul, 136-701, South Korea, ktpark@korea.ac.kr

We consider a supply chain. We suggest how to decide input quantity of each stage in a supply chain with demand uncertainty. We provide simulation results when closed form of input quantity of each stage is not possible to get. We may also suggest some variations of the problem considered.

3 - Channel Power Analysis Under Vendor-Managed Inventory

Bogdan Bichescu, Assistant Professor, University of Tennessee, 618 SMC, 916 Volunteer Blvd, Knoxville, TN, 37996, United States, bbichescu@utk.edu, Michael Fry

We analyze decentralized supply chains that function according to general (Q, R) policies which allow the decision-making responsibilities to be split between supply chain agents. We compare a traditional RMI scenario with a VMI scenario, in which the retailer chooses the service level, R, and the supplier chooses the order quantity, Q. Within the VMI scenario, we explore several channel power distribution schemes. A numerical analysis is performed to explore the effects of channel power.

4 - Flexible Decision Model for Alternative Selection in Reverse Logistics

Jitendra Madaan, Research Scholar, IIT Dehi, SB 8, Kumaon Hostel, Hauz Khas, IIT Delhi, New Delhi, 110016, India, jitman77@gmail.com, Subhash Wadhwa

Determining the most favorable reverse manufacturing alternative has always been a key strategic consideration in RLS. Nature of these decisions usually is complex. In this paper, we propose a MCDM model based on fuzzy-set theory. This model can help in designing effective efficient return policy. Example is shown to highlight the procedural application of the proposed model. This paper bring fuzzy based MCDM and RL together as a well suited as a GDSS tool for alternative selections.

■ TC02

Rio Mar Salon 2

Manufacturing

Contributed Session

Chair: Ghorbanali Mohammadi, Assistant Professor, University of Kerman, Industrial Engineering Dept., Kerman, 7618891167, Iran, gmohammadi@mail.uk.ac.ir

1 - Capacitated Part Routing Problem: A Comparison of Lagrangean Relaxation and Dantzig-Wolfe

Aaron L. Nsakanda, Assistant Professor, Spratt School of Business, 1125 Colonel By Drive, Ottawa, ON, K1S5B6, Canada, aaron_nsakanda@carleton.ca, Moustapha Diaby

We discuss the implementation of two decomposition approaches in solving the capacitated part-routing problem with setup times and costs. A greedy heuristic is used to ensure that the solutions obtained meet the integrality requirements of the mixed-integer model. Large instances of the problem were solved to near-optimality. We compare the efficiency and the quality of solutions obtained with both implementations.

2 - Dual Filtered EWMA Run-to-Run Controller

Lee JaeHyun, Department of Industrial Systems and Information Engineering, Korea University, Korea University, 1, 5-ka, Anam-dong, Sun, Seoul, South Korea, zoeforever@korea.ac.kr

DF-EWMA controller for manufacturing process is presented. Usually EWMA controller uses a various case. One of the disadvantages of using EWMA is that there's a tradeoff between noise reduction and trend pursuit ability. By introducing additional weight factor to the traditional EWMA, the proposed Dual filtered-EWMA controller pursues increased performance for both noise reduction and disturbance pursuit ability. The simulation results are presented to show the performance.

3 - Reliability and Process Windows: Two DOE Applications

Miguel Ángel Urbano Vázquez, Student, Universidad Autonoma de Nuevo Leon, Av. Pedro de Alba S/N, San Nicolas de los Garza, NL, 66450, Mexico, miguel.akuma@gmail.com, Mauricio Cabrera-Ríos

In this work, two DOE-related cases are presented. In the first case, DOE is used to generate information to elicit multiple criteria process windows in an injection molding operation. In the second case, DOE is used to develop a life-time prediction model for automotive lamp bulbs. Both cases are geared to illustrate DOE's contribution to engineering problems.

4 - Resource Delivery Model for Customers With Different Priorities

Aharon Gonik, Professor, Sapir AC College, Shikma 22, Omer, 84965, Israel, aharon@sapir.ac.il

The minimal and maximal amount of resources required by each customer are defined, as well as its preference rate. A real-time model reallocates optimally the total available resources among the customers, is presented. The optimized values are the actually delivered resources, while the maximized objective is the summarized product of the delivered resource and the customers' rates.

5 - Using Genetic Algorithms to Optimize Maintenance Time-Cost Trade-Off Problems

Ghorbanali Mohammadi, Assistant Professor, University of Kerman, Industrial Engineering Dept., Kerman, 7618891167, Iran, gmohammadi@mail.uk.ac.ir

In the management of a maintenance project planning and control, the project duration can often be compressed by acceleration some of its activities at an additional cost. This is so called time-cost trade-off (TCT). In this study, a practical algorithm for TCT optimization is developed using the Genetic Algorithms (GAs). The performance of the Algorithms numerically tested on standard problems. Experimentation demonstrates the relative desirable performance of the presented methodology.

■ TC03

Rio Mar Salon 3

Distribution Systems Optimization

Cluster: Supply Chain Optimization

Invited Session

Chair: Michal Tzur, Tel Aviv University, Industrial Engineering department, Faculty of Engineering, Tel Aviv, 69978, Israel, tzur@eng.tau.ac.il

1 - Facility Reliability with Site-Specific Failure Probabilities

Mark Daskin, Northwestern University, Evanston, IL, 60208, United States, m-daskin@northwestern.edu, Roger L. Zhan, Zuo-Jun Max Shen

We consider the problem of locating facilities to minimize the expected facility, transport, and failure-to-serve costs when candidate locations have site-specific failure probabilities. A non-linear model is formulated and a genetic algorithm is outlined for its solution. Computational results are provided as are insights obtained from exercising the model.

2 - Risk Diversification in a One Warehouse Multiple Retailer System With Supply Disruptions

Amanda Schmitt, PhD Candidate, Lehigh University, 200 W. Packer Ave., Bethlehem, PA, 18015, United States, amanda@lehigh.edu, Zuo-Jun Max Shen, Lawrence V. Snyder

We model supply disruptions in a One-Warehouse, Multiple-Retailer system with a centralized and a decentralized inventory setting. We demonstrate the effect of risk diversification, where disruptions in a decentralized system have a smaller impact on cost because they only affect one retailer at a time. Risk diversification causes the decentralized system to have lower cost risk, meaning it is the optimal design for OWMR systems under certain risk-averse objectives.

3 - Assignment and Scheduling of Tasks to Vehicles in a Distribution System

Michal Tzur, Tel Aviv University, Industrial Engineering department, Faculty of Engineering, Tel Aviv, 69978, Israel, tzur@eng.tau.ac.il, Ehud Drezner

We investigate a problem of pickup and delivery of less-than-truck-load transportation tasks from factories to DCs, with time-window constraints. The goal is to minimize the sum of vehicle fixed costs, traveling costs, and waiting costs. Our solution method decomposes the problem into an assignment problem and a scheduling problem, which interact with each other. The heuristic method produces solutions that are within a few percent of a lower bound.

■ TC05

Rio Mar Salon 5

Public Sector Applications of Decision Analysis

Sponsor: Decision Analysis
Sponsored Session

Chair: Don Kleinmuntz, Research Professor, Univ. of Southern California, c/o Strata Decision Technology, 2001 S First St, Suite 200, Champaign, IL, 61820, United States, dnk@strata-decision.com

1 - Evaluating Models for Regulatory Use

Robert Clemen, Professor, Duke University, Fuqua School of Business, Box 90120, Durham, NC, 27708, United States, clemen@duke.edu

When an agency like the USEPA uses models for regulatory use, there are a variety of points in the development and application process where it is important to evaluate how well the model will work for the specified regulatory purpose. This talk will discuss the idea of a model's life cycle and how a model's objectives (and hence the attributes on which it should be evaluated) may change during that life cycle.

2 - Methodology for Selecting the Best Strategy for Transporting Heavy Oil From a Field of ECOPETROL

Alvaro Mendoza, Instructor, Universidad de los Andes, Calle 19A No. 1-37 Este, Cra, 11 No. 119-39, Bogotá, DC, 11111, Colombia, a-mendoza@uniandes.edu.co

Because of the decrease of oil reserves in Colombia, the heavy oil exploitation has become a new business opportunity for the petroleum companies. The Colombian Petroleum Company, ECOPETROL, has considerable heavy oil reserves in one of its fields and must select the best alternative to transport it among the near stations. This paper presents a decision analysis methodology that considers the economic performance and the synergy with other projects of the company to select the best alternative.

3 - A Decision Making Approach for Hydropower Plant Risk Management Under Uncertainty

Lillia Christoskova, PhD Student, Electricité de France; GRID, 6 quai Watier, Chatou, 78401, France, lillia.christoskova@edf.fr, François Beaudouin, Bertrand Munier

We propose a prescriptive approach for the management of ambiguous and rare risks with potential significant impacts on hydropower plants. The decision making process implicate field and corporate actors which raises the problem of their coordination. Furthermore, as sometimes risks are assessed using experts beliefs, strategic biases may interfere with decision makers judgments on risks. The proposed approach implements an individual choice model under uncertainty.

4 - Robust Risk-Based Resource Allocation for Counter Terrorism

Don Kleinmuntz, Research Professor, Univ of Southern California, c/o Strata Decision Technology, 2001 S First St, Suite 200, Champaign, IL, 61820, United States, dnk@strata-decision.com

A method for allocating funds to counterterrorism measures under incomplete information is described. The method uses robust portfolio allocation methods that identify efficient portfolios when information on risk, benefits, and costs is limited. An example of allocation of funds to infrastructure protection projects is presented.

■ TC06

Rio Mar Salon 6

Tutorial: Symmetry in Integer Programming

Cluster: Tutorials
Invited Session

Chair: Francois Margot, Carnegie Mellon University, fmargot@andrew.cmu.edu

1 - Tutorial: Symmetry in Integer Programming

Francois Margot, Carnegie Mellon University, fmargot@andrew.cmu.edu

This talk is an overview of techniques used to handle symmetries in Integer Linear Programming problems. Three different approaches will be discussed: Reformulations (based on column generation and permutation groups), symmetry-breaking inequalities (associated with relatively simple symmetry groups), and isomorphism pruning (delete isomorphic subproblems in the enumeration tree).

■ TC07

Rio Mar Salon 7

Harvey Greenberg and Sandia National Laboratories I: Decision Support

Sponsor: Interface of Computing Science & OR
Sponsored Session

Chair: Cynthia Phillips, Distinguished Member of Tech Staff, Sandia National Laboratories, Mail Stop 1318, P. O. Box 5800, Albuquerque, NM, 87185, United States, caphill@sandia.gov

1 - Manifold-Based Learning and Search Techniques for Semi-Interactive Global Optimization

Jean-Paul Watson, Senior Member of Tech Staff, Sandia National Laboratories, Mail Stop 1318, P.O. Box 5800, Albuquerque, NM, 87185, United States, jwatson@sandia.gov, Patricia Crossno, Brett Bader, William Brown, Shawn Martin

Recent experimental evidence indicates high-quality solutions to global optimization problems can reside on low-dimensional non-linear manifolds. The existence of such manifolds has key implications for the design of both automated and semi-interactive global optimization algorithms. We discuss techniques for identifying such manifolds on standard benchmark problems, surrogate search algorithms based on the resulting manifolds, and semi-interactive search driven by human manifold analysis.

2 - Robust Optimization for Sensor Placement in Water Distribution Systems

William Hart, Distinguished Member of Tech Staff, Sandia National Laboratories, Mail Stop 1318, P. O. Box 5800, Albuquerque, NM, 87185, United States, wehart@sandia.gov, Harvey Greenberg, Robert Carr, Jean-Paul Watson, Regan Murray, Todd Morrison

Sensor placement is a crucial step in the design of contaminant warning systems for water distribution systems. However, there are many data uncertainties that complicate the evaluation of a sensor placement. We discuss techniques for robustly addressing uncertainties for contaminant impacts, and uncertainties in the location of contaminant events. Further, we will describe scalability challenges for both integer programming and heuristic optimization methods on real-world networks.

3 - Multiobjective Optimization for Sensor Placement in Municipal Water Networks

Cynthia Phillips, Distinguished Member of Tech Staff, Sandia National Laboratories, Mail Stop 1318, P. O. Box 5800, Albuquerque, NM, 87185, United States, caphill@sandia.gov, Harvey Greenberg, William Hart, Jean-Paul Watson

Competing measures of quality for a sensor network's protection against a set of contamination events in a municipal water distribution network include: population exposed to harmful contamination levels, extent of pipe contamination, and balance of coverage among water quality zones. We describe our experience finding solutions with reasonable tradeoffs among objectives. In particular, we describe new support for optimization with goal constraints in the PICO mixed-integer program solver.

TC08

Rio Mar Salon 8

Free Open-Source Software for Operations Research: An Introduction to COIN-OR

Sponsor: Interface of Computing Science & OR
Sponsored Session

Chair: Robin Lougee-Heimer, IBM Research, IBM T.J. Watson Research Center, 1101 Kitchawan Road, Yorktown Heights, NY, 10598, United States, robinlh@us.ibm.com

1 - Open Source and Software "Publication"

Matthew Saltzman, Clemson University, Mathematical Sciences Department, Clemson, SC, 29631, mjs@clemson.edu

Open source software (OSS) is arguably the most efficient technology transfer mechanism available today. We explain what OSS is and what its benefits are to the OR community. We describe various "flavors" of OSS licenses, and we discuss various issues related to publishing and using OSS. We also describe several examples of OSS resources available in the OR field.

2 - Introduction to COIN-OR: Open-Source for the OR Community

Robin Lougee-Heimer, IBM Research, IBM T.J. Watson Research Center, 1101 Kitchawan Road, Yorktown Heights, NY, 10598, United States, robinlh@us.ibm.com

Need a free solver? Modeling system? Interface? Or other computational-OR resource for your teaching, research, or application work? Over two dozen resources are available on-demand, free-of-charge at www.coin-org. Why reinvent when you can re-use? COIN-OR promotes open-source software for OR. We introduce the why, what, and how of COIN-OR.

3 - How to Publish Your Software on COIN-OR

Robert Fourer, Professor, Northwestern University, Dept. of Industrial Eng & Mgmt Sciences, Evanston, IL, 60208-3119, United States, 4er@iems.northwestern.edu

COIN-OR offers an environment tailor-made for disseminating and maintaining OR software. If you have created a software package or library that you are willing and able to "open up" for use by the OR community, you may want to consider adding it to the over two dozen projects currently supported at COIN-OR. This presentation will detail the steps involved.

TC09

Rio Mar Salon 9

Efficiency Improvements in Hospital Operations

Cluster: Industry-Research Interface
Invited Session

Chair: Eui Park, Professor, North Carolina A&T State University, 1601 E. Market Street, Greensboro, NC, 27411, United States, park@ncat.edu

1 - A Reliability Approach to Analyze Nursing Errors

Xiaochun Jiang, Assistant Professor, North Carolina A&T State University, 1601 E. Market Street, 403 McNair Hall, Greensboro, NC, 27411, United States, xjiang@ncat.edu, Jerry Watson, Younho Seong

Adverse events in hospitals are causes of national concerns. It is important for us to learn from the incidents. This research intends to apply a reliability approach to analyze medical errors, specifically, to nursing practices which constitute an important portion of all medical practices in hospitals.

2 - Improving Operating Room Operations

James Allen, VP, Operations Support, HealthSouth, One HealthSouth Parkway, Birmingham, AL, 35243, United States, james.allen@healthsouth.com

To achieve optimum Operating Room utilization the facility must focus on controllable factors such as number of rooms, hours of operation and turnover time. Once current and targeted utilization is modeled the facility can use the forecasting tool to assist in matching staffing requirements to demand. This data then becomes the foundation to identify and support many process improvement initiatives.

3 - Six Sigma Quality Improvements in the Level-1 Trauma Center ED: Increasing Patient Throughput

Ronald Smith, PhD Candidate, NC A&T, NC A&T State University, Department of Industrial Engineering, Greensboro, NC, 27411, United States, rsmith8835@triad.rr.com

Efficiency Improvements in Hospital Operations using Six Sigma Methodology as a systematic approach to improve the processes in a major medical hospital. This paper focuses on improvements in the Emergency Department of Level I Trauma Center in increasing the utilization of a holding area to increase the patient throughput of the ED and reduce the waiting times and increase department revenue.

4 - Healthcare and Human Factors

Younho Seong, Assistant Professor, North Carolina A&T State University, 1601 E. Market Street, Greensboro, NC, 27411, United States, yseong@ncat.edu, Eui Park

Triggered by a reporter's death in 1995, research on error in medicine has been extended more than ever. However, there is a plethora of areas that need to be tackled to improve patient safety. In this article, several recommendations from the Institute of Medicine (2000) will be discussed to provide suggestions.

TC10

Rio Mar Salon 10

Optimization in Marketing

Cluster: Optimization in Marketing
Invited Session

Chair: Jeff Camm, University of Cincinnati, ML 0130, Cincinnati, OH, 45221, United States, Jeff.Camm@uc.edu

1 - Product Line Design, Production Technology, and Economies of Scale

Dennis Z. Yu, Assistant Professor of Operations and Information Systems, Clarkson University, School of Business, P.O. Box 5790, Potsdam, NY, 13676, United States, dyu@clarkson.edu, Sergio Chayet, Panos Kouvelis

We study a product line design problem when the production technology allows quality differentiation of the product, with production setup cost and quality dependent variable cost. The manufacturer needs to develop optimal economic production batches for the product line in order to balance the inventory holding and production setups. We show that the efficiency of the production technology plays a crucial role in the manufacturer's product design decisions and provision of product variety.

2 - Optimal Product Design Under Price Competition

Matthew Selove, MIT Sloan School of Management, Room E40-174, Cambridge, MA, 02142, United States, mselove@MIT.EDU

I study the conjoint-based product optimization problem when competing firms can adjust their prices after the entrant selects its new product design. Taking account of the resulting price equilibrium leads the entrant to produce a more differentiated product.

3 - Political Engineering - Optimal Political Platform Design and the 2004 US Presidential Election

James Cochran, Associate Professor, Louisiana Tech University, College of Business, P.O. Box 10318, Ruston, LA, 71272, United States, jcochran@cab.latech.edu

We treat the political platform optimization problem as a share of choices problem. We formulate this as a maximal covering problem with special ordered sets corresponding to positions candidates may assume on issues. We find the optimal platform for a candidate, project the winner, identify key issues, estimate variance and bias of the projected results, assess the sensitivity of a candidate's support to changes in position on various issues, and assess the viability of a 3rd party candidate.

4 - A Branch-and-Price Approach to Optimize the Share-of-Choice Product Line Design Problem

Xinfang Jocelyn Wang, PhD Student, University of Cincinnati, 523 Carl H. Lindner Hall, Cincinnati, OH, 45219, United States, wangfx@email.uc.edu, David Curry, Jeff Camm

This paper focuses on constructing an optimal product line using partworth data obtained from conjoint analysis for the share-of-choice product line design problem. Previous contributions to this NP-Hard problem include a series of heuristics. We propose a branch-and-price algorithm that embeds a column generation procedure within a branch-and-bound process. Computational results demonstrate that the algorithm is capable of identifying provably optimal solutions very quickly.

■ TC11

Caribbean Salon 1

Optimization-Combinatorial II

Contributed Session

Chair: Kevin Li, PhD Assistant Professor, Odette School of Business, University of Windsor, Windsor, ON, N9G2V9, Canada, kwli@uwindsor.ca

1 - The Modified Version of Ant Colony Optimization Algorithm for Multiobjective 0-1 Knapsack Problem

Amir Meimand Kermani, MSc, Tarbiat Modares University, Tarbiat Modares University-Gisha Bridge, Tehran, Iran, amirhosein.meimand@gmail.com, Kamal Charsoghi

The multiobjective allocation problem seeks to find the expected objectives by allocating the limited amount of resource to various activities. In this paper, in order to obtain a set of Pareto solution efficiently, we proposed a modified version of ant colony optimization, in this algorithm we try to increase the efficiency of algorithm by increasing the learning of ants. Effectiveness and efficiency of proposed algorithm was validated by comparing the result of ACO with Hybrid genetic algorithm.

2 - An Ant Colony Heuristic to Minimize Pick Time for Pick-and-Place Machines

Noel Artilles, Professor Department Industrial Engineering, University of Puerto Rico at Mayagüez, Industrial Eng. Department, P.O. Box 9043, Mayagüez, 00681, Puerto Rico, nartilles@uprm.edu, Andres Uribe

Pick-and-place machines position electronic components of different sizes and shapes on a printed circuit board (PCB). Finding an optimal setup that minimizes the pick time and maximizes the number of boards finished is a combinatorial optimization problem. In this work, "Ant Colony" optimization is used to develop a heuristic to solve this problem. A mathematical formulation was also developed to solve this problem optimally and it served as a basis for comparison in small cases.

3 - Heuristics for Loading Homogeneous Boxes Into a Container

Kevin Li, PhD Assistant Professor, Odette School of Business, University of Windsor, Windsor, ON, N9G2V9, Canada, kwli@uwindsor.ca, Zhoujing Wang

Two heuristics are proposed to handle the container loading problem with homogeneous rectangular boxes. Both algorithms adopt the concept of building layers on one face of the container, but the first heuristic determines the layer face once for all, while the second treats the remaining container space as a new container after one layer is placed on the layer face and, hence, selects the layer face dynamically. Numerical studies demonstrate the efficiency of the heuristics.

■ TC12

Caribbean Salon 2

Finance and Stochastics

Sponsor: Financial Engineering
Sponsored Session

Chair: Erhan Bayraktar, Assistant Professor, University of Michigan, Department of Mathematics, 530 Church Street, Ann Arbor, MI, 48109, United States, erhan@umich.edu

1 - Maximizing Portfolio Growth Rate Under Risk Constraints

Traian Pirvu, Postdoctoral Fellow, University of British Columbia, Department of Mathematics, 1984 Mathematics Rd, Vancouver, BC, V6T1Z2, Canada, tpirvu@math.ubc.ca, Steve Shreve, Gordan Zitkovic

This work studies the problem of optimal investment subject to risk constraints: Value-at-Risk, Tail Value-at-Risk and Limited Expected Loss. We get closed-form solutions for this problem, and find that the optimal policy is a projection of the optimal portfolio of an unconstrained log agent (the Merton proportion) onto the constraint set, with respect to the inner product induced by the variance-covariance volatility matrix of the risky assets.

2 - Asymptotic Methods for Commodity Derivatives

Sebastian Jaimungal, Assistant Professor, University of Toronto, 100 St. George Street, Toronto, ON, M5S3G3, Canada, sebastian.jaimungal@utoronto.ca, Samuel Hikspos

It is well known that stochastic volatility is an essential feature of commodity spot prices. By using methods of singular perturbation theory, we obtain closed form pricing equations for forward contracts and options on single-name and two-name forward contracts. The expansions are based on one and two-factor mean-reverting spot-price models with constant volatility. The stochastic volatility corrections are found to be consistent with market data and leads to efficient calibration and pricing.

3 - On the Spanning Property of Risk Bonds Priced by Equilibrium

Ulrich Horst, Assistant Professor, University of British Columbia, Department of Mathematics, Vancouver, BC, Canada, horst@math.ubc.ca

We analyze a financial market where agents are exposed to financial and non-financial risk factors. The agents hedge their financial risk in the stock market and trade a risk bond. We prove that if the bond's payoff function is monotone in the external risk process, it can be priced by an equilibrium approach. The equilibrium market price of risk is characterized as a solution to non-linear backward stochastic differential equation.

4 - A Proof of the Smoothness of the Finite Time Horizon American Put Option for Jump Diffusions

Erhan Bayraktar, Assistant Professor, University of Michigan, Department of Mathematics, 530 Church Street, Ann Arbor, MI, 48109, United States, erhan@umich.edu

We construct an increasing sequence of functions that converge to the value function of the American put uniformly and exponentially fast and use this scheme to prove our results.

■ TC13

Caribbean Salon 3

Aviation Applications

Contributed Session

Chair: Jenny Diaz, PhD Candidate, ITESM Campus Toluca, Eduardo Monroy Cárdenas 2000, San Antonio Buenavista, Toluca, ME, 50110, Mexico, jenny.diaz@invitados.itesm.mx

1 - A Parametric Geometry Computational Fluid Dynamics (CFD) Study Utilizing Design of Experiments (DOE)

Ray Rhew, Engineer, NASA Langley Research Center, MS #435, Hampton, VA, 23681, United States, ray.d.rhew@nasa.gov, Peter Parker

Design of Experiments (DOE) techniques were applied to the Launch Abort System (LAS) of the NASA Crew Exploration Vehicle (CEV) parametric geometry Computational Fluid Dynamics (CFD) study to efficiently identify and rank the primary contributors to the integrated drag over the vehicles ascent trajectory. This paper discusses the methods utilized to develop the experimental design, execution, and data analysis.

2 - Integrated Aircraft and Crew Scheduling Problems

Jenny Diaz, PhD Candidate, ITESM Campus Toluca, Eduardo Monroy Cárdenas 2000, San Antonio Buenavista, Toluca, ME, 50110, Mexico, jenny.diaz@invitados.itesm.mx, Federico Trigos

An approach to solve simultaneously the Aircraft and Crew Scheduling Problems is expected to get better solutions than the sequential approach. An integrated model and a solution algorithm to solve it are presented. Both approaches are compared over real test data from small Latin American airlines.

■ TC14

El Morro 1

Analysis for Nation Building: Afghanistan

Cluster: Analysis for Nation Building
Invited Session

Chair: John Keeter, Lieutenant Colonel, Chief, Joint Analysis Cell, Combined Security Transition Command-Afghanistan, 2202 Morningside Drive, Jonesboro, AR, 72404, United States, john.keeter@us.army.mil

1 - Afghan National Security Force (ANSF) Requirements Analysis

John Keeter, Lieutenant Colonel, Chief, Joint Analysis Cell, Combined Security Transition Command-Afghanistan, 2202 Morningside Drive, Jonesboro, AR, 72404, United States, john.keeter@us.army.mil

An increased threat in 2006 required a re-evaluation of the ANSF requirements. This analysis builds on population ratio techniques for Nation Building developed by the RAND Arroyo Center and the Center for Army Analysis (CAA). Additional factors include scaling the population-to-security force ratios based on provincial and district-level threat estimates and border nation parity goals.

2 - Afghanistan: Application of a Framework for Analysis of an Insurgency

John Scales, PhD, SAIC, 6720 Odyssey Drive, Huntsville, AL, 35806, United States, john.r.scales@saic.com

The insurgency situation in Afghanistan is highly complex with multiple groups pursuing various ends. This paper uses the framework outlined by Bard O'Neill (Professor at the National War College) in his book, *Insurgency and Terrorism*, 1990, to categorize the groups and the Afghan government response to those groups. It also discusses the US strategic and operational approaches being employed and evaluates the overall effectiveness of the effort, identifying certain shortfalls.

3 - Assessing Afghan Perceptions: Security, Governance, and Reconstruction

John Keeter, Lieutenant Colonel, Chief, Joint Analysis Cell, Combined Security Transition Command-Afghanistan, 2202 Morningside Drive, Jonesboro, AR, 72404, United States, john.keeter@us.army.mil

Prior to 2005, there were no assessments to determine Afghan perceptions. A series of quarterly nationwide polls in 2005 and 2006 captured perceptions of security, governance, and reconstruction effectiveness. This presentation addresses findings as well as quantitative research challenges using face-to-face interviews in an austere and high-threat environment.

■ TC15

El Morro 2

Experimental Methods for Characterization and Optimization

Sponsor: Military Applications
Sponsored Session

Chair: James Simpson, Florida State University, 2525 Pottsdamer St, Tallahassee, FL, 32309, United States, simpson@eng.fsu.edu

1 - Development of Tandem Wing MAV Wind Tunnel Test Plan Using Experimental Design Techniques

Teresa English, FSU-AFRL, 1905 Bellevue Way, Tallahassee, FL, 32304, United States, englite@eng.fsu.edu, Drew Landman, James Simpson

A test strategy is developed providing an efficient number of runs in the wind tunnel effectively characterizing aerodynamic behavior of MAVs as a function of changes in attitude, control inputs, and design. Research involves application of second-order split plot designs and completely randomized designs. The outcome demonstrates effectiveness of DOE/RSM techniques coupled with traditional wind tunnel testing techniques, providing a powerful approach to characterizing aerodynamic systems.

2 - A Design of Experiments Approach to Deck Flow Characterization on an Aircraft Carrier Geometry

Yugapriya Wing, Langley Full Scale Wind Tunnel, 224 Hunting Ave, Hampton, Va, United States, priyawing@gmail.com, Drew Landman

A designed experiment was done to obtain turbulence intensity data on a plane intersecting the angled deck of an aircraft carrier. From the data for each experimental combination, regression models were generated for five locations along the glide slope of an aircraft landing on the angled deck. The models generated by the designed experiment were used to give recommendations on what factor settings result in the largest reduction of turbulence intensity along the glide slope.

■ TC16

San Cristobal

Homeland Security and Risk Applications

Cluster: OR on the Edge
Invited Session

Chair: Laura McLay, Assistant Professor, Virginia Commonwealth University, 1001 W. Main Street, P.O. Box 843083, Richmond, VA, 23284, United States, lamclay@vcu.edu

1 - The Optimal Spatial Deployment of Radiation Portal Monitors to Improve Nuclear Detection

Yifan Liu, George Mason University, 10332 Layton Hall Drive, Apt 407, Fairfax, VA, 22030, United States, yliu9@gmu.edu

Radiation monitors are deployed at overseas ports to prevent nuclear weapons from entering the U.S. in a container. Current designs have container trucks passing through one monitor at approximately 10 mph before routed to one of the lanes. We compare the neutron detection limits of the current design and two alternatives, and find out the optimal number and positions of sensors for a fixed budget, and the optimal threshold to set off the alarm.

2 - A Sequential Stochastic Passenger Screening Problem for Aviation Security

Laura McLay, Assistant Professor, Virginia Commonwealth University, 1001 W. Main Street, P.O. Box 843083, Richmond, VA, 23284, United States, lamclay@vcu.edu, Sheldon Jacobson

Passenger screening systems have become an important component in the design and operation of aviation security systems. This presentation introduces the Sequential Stochastic Passenger Screening Problem (SSPSP), which allows passengers to be optimally assigned (in real-time) to aviation security resources. SSPSP is formulated as a Markov Decision Process, and an optimal policy is found using dynamic programming.

3 - A GIS-Based Model of Security Considerations in the Transportation of Hazardous Materials

Irene Casas, Assistant Professor, University at Buffalo, SUNY, 105 Wilkeson Quad, Buffalo, NY, 14261, United States, icasas@buffalo.edu, Mark Karwan, Justin Yates, Rajan Batta

Work on risk assessment and routing of hazardous materials is revisited from the perspective of security considerations against a terrorist attack for hazmat transport using GIS as a development environment. Models are constructed using GIS as an engine, for risk assessment and deployment of security resources (sensors and response units). What-if scenarios based on possible attacks and the simulation of the deployment of available resources to respond to them are created and visualized.

4 - Engineering the Costs of Protecting Commercial Aircraft

Kurt Willstatter, Senior Principal, Summit Engineering Group, 102 Paul Mellon Court, Suite 1, Waldorf, MD, 20602, United States, kwillstatter@summit-group.com, Kirk Hoy

Supporting the Department of Homeland Security (DHS) Counter-MANPADS program, we constructed a Life Cycle Cost (LCC) model to address various deployment alternatives. We leveraged our cost groundrules and assumptions document and other relevant data in constructing the LCC model. This presentation details the systems engineering process utilized in constructing the program costs.

5 - Sensor Placement Learning Automata

Tal Ben-Zvi, Stevens Institute of Technology, Castle Point on Hudson, Hoboken, NJ, 07030, United States, tbenzvi@stevens.edu, Jeffrey Nickerson

Security issues have received an increasing attention in recent years. We use intruders' characteristics information and environmental factors in a learning algorithm called a Learning Automata to optimize sensor placement. The optimization framework is inherently probabilistic due to the uncertainty associated with sensor detections and environmental factors. Experimental results of detecting underwater threats show the merit of our approach.

■ TC17

Egret

Emergency Services and Disaster Relief Applications

Cluster: Measurement, Analysis & Improvement of Service Operations
Invited Session

Chair: Alexandra Medina-Borja, University of Puerto Rico at Mayagüez, Industrial Engineering Building, II-205, Mayagüez, 00680, Puerto Rico, amedina@uprm.edu

1 - Transportation Planning for Emergency Evacuation

Ali Haghani, Professor and Chair, University of Maryland, Dept of Civil & Environmental Engineerin, 1173 Glenn L. Martin Hall, College Park, MD, 20742, United States, haghani@umd.edu, Abbas Afshar, Masoud Hamedi

Evacuation Planning and Emergency Management is aimed to save human lives by safe facility design and optimization of evacuation and rescue operations. In this research, an optimization model for Emergency Evacuation Planning is proposed along with a simulation-optimization framework to solve for the system optimal evacuation plan. The model simultaneously solves for the choice of destination (shelter), evacuation route, and departure time for all evacuees from given origins (endangered zones).

2 - Considering Victims in Resource Allocation: A Dynamic Approach to Understand Disaster Relief

Yesenia Cruz, Research Assistant, UPRM, Industrial Engineering Building, Mayagüez, PR, 00680, Puerto Rico, yesycruz@hotmail.com, Alexandra Medina-Borja

This paper proposes a system dynamics framework to understand the factors influencing service delivery of emergency aid to victims of catastrophic events. This is one of the few times a framework considers victims' satisfaction and outcomes for planning. It is based on a survey collected from the 2005 Katrina and Rita Hurricane victims distributed to the battered Gulf Coast States of Texas, Louisiana, Mississippi, Alabama, and Florida. Survey data was facilitated by the American Red Cross.

3 - Reliability Considerations in Post Disaster Supply Chain Management

Rafael Olarte, Research Assistant, University of Maryland, Dept. of Civil and Environmental Eng., 1173 Glenn L. Martin Hall, Bldg #088, College Park, MD, 20742, United States, olarte@umd.edu, Masoud Hamedi, Abbas Afshar, Ali Haghani

When a region is evacuated due to a severe man-made or natural disaster, the evacuees will be settled in shelters during and after the disaster to ensure their security. Humanitarian supplies should be provided to evacuees in an efficient and timely manner. This study explores the reliability considerations in the post disaster supply chain management. A mathematical model and a heuristic are proposed.

4 - Key Service Features for Disaster Victims' Satisfaction of Immediate Needs: A Data Mining Approach

Alexandra Medina-Borja, University of Puerto Rico at Mayagüez, Industrial Engineering Building, II-205, Mayagüez, 00680, Puerto Rico, amedina@uprm.edu

We studied the attitudes of victims of localized disasters such as household fires, floods, and tornadoes, regarding the key service features that helped them satisfy their immediate needs. Data was collected through a survey and CHAID was used to profile the service and victim characteristics as of the key features that are essential for a planned response. Data was collected all over the United States and territories over 4 years of victims, totaling over 40 thousand respondents.

TC18

Heron

Services Research at IBM

Cluster: Services Research
Invited Session

Chair: Ching-Hua Chen-Ritzo, IBM Research, 1101 Kitchawan Road, Yorktown Heights, NY, 10598, United States, chenritzo@us.ibm.com

1 - OR Models for IBM Global Services

Brenda Dietrich, Director, Mathematical Sciences, IBM Research, 1101 Kitchawan Road, Yorktown Heights, NY, 10598, United States, dietric@us.ibm.com

In addition to providing computer hardware and software, IBM has a number of service-based business, including product support, integration of information technology products, custom application development, managed business services, and business consulting. In this talk I will discuss some current and proposed uses of OR models, algorithms and tools in IBM's services businesses.

2 - Discrete Event Simulation Modeling of Resource-Based Service Business

Young Lee, IBM T.J. Watson Research Center, P. O. Box 218, Route 134, Yorktown Heights, NY, 10598, United States, ymlee@us.ibm.com

We present a discrete-event simulation model that estimates business performance of resource-intensive service business by simulating interactions of demand planning of engagement, supply planning of resources, dynamics of resources and fulfillment of service engagement. The model is also used in evaluating effectiveness of various resource management analytics and policies by estimating profiles of performance metrics such as benched resource, engagement backlog, quality, revenue and profit.

3 - Optimizing Call Center Performance With Respect to Outsourcing Contracts

Ching-Hua Chen-Ritzo, IBM Research, 1101 Kitchawan Road, Yorktown Heights NY 10598, United States, chenritzo@us.ibm.com, Daniel Connors, Laura Wynter

We address the problem of optimizing the allocation of resources in a call/contact center outsourcing engagement comprising multiple call center vendors, a service provider and a client. Our optimization model captures non-linear penalty and bonus functions that may be included in the terms of a contract between the service provider and the client. Our model can be used to guide contract negotiations, and to optimize tactical and operational allocation of call center resources.

4 - Value-Oriented, Model-Driven Business Transformation

Juhnyoung Lee, Research Staff Member, IBM, 19 Skyline Drive, Hawthorne, NY, 10532, United States, jyl@us.ibm.com

In business transformation, technologist emphasizes function and capability, while business people focus on business impact and value. To address this business-IT gap, we propose a novel approach that links IT capabilities to business performance and derived value. This value-oriented, model-driven approach integrates a value driver model with a business component model and a business processes model, and facilitates qualitative and quantitative enterprise analyses for transformation.

TC19

Sea Gull

Social Networks Methodology and Applications II

Cluster: Social Networks
Invited Session

Chair: Mary Helander, IBM Research, Yorktown Heights, NY, helandm@us.ibm.com

1 - The Role of Social Networks in the Success of Open Source Software Systems

Jing Wang, Kent State University, M& IS Department, College of Business, Kent State University, Kent, OH, United States, jwang2@kent.edu, Michael Hu, Murali Shanker

Understanding the elements that affect the success of Open Source Software (OSS) projects has become an essential issue. Nonetheless, little is known on why certain projects succeed whereas others fail. While multiple theoretical lenses may shed light on this issue, we draw on research in the social network theory and investigate the role of social networks in the success of open source software projects.

2 - Knowledge Diffusion Dynamics in an Intra-Firm Social Network and Implications for R&D Management

Markus Günther, University of Vienna, Bruenner Str. 72, Vienna, 1210, Austria, markus.guenther@univie.ac.at, Christian Stummer

The diffusion of knowledge through formal and informal paths in an intra-firm social network plays an empirically documented role in the successful development of new products and services. In our talk we introduce an agent-based computer simulation that can support research and development (R&D) managers in investigating how various organizational measures influence these paths (e.g., by affecting communication patterns of employees) and, thus, promote a firm's innovativeness.

3 - Applying Social Network Analysis to Complex Datasets: An Alternative Approach to Traditional Approach

Joyce D. Williams, Sr. Systems Engineer, IBM, 4660 La Jolla Village Drive, San Diego, CA, 92122, United States, joycedwilliams@us.ibm.com

Applying traditional knowledge discovery approaches to large volumes of multidimensional datasets are not new concepts. Reductionism approaches break a problem into its smallest or simplest parts and attack the problem modularly. With today's complex datasets the whole may be greater than the sum of the parts and reductionism may be unfeasible. Social Network Analysis is being proposed as an alternative to traditional approaches to identify new relationships and patterns in complex datasets.

4 - Cohesive Team Selection for a Communication Task

Ankur Mani, Arizona State University, amanil@asu.edu, Ajita John, Doree D. Seligmann

We present a novel scheme for automatically selecting a maximally cohesive team of employees in an enterprise to perform a task involving communication. We introduce a statistical model for the enterprise social network, learnt from the observations of enterprise communication patterns and use this model to estimate dyadic and team cohesiveness. Experiments performed with an organization of 60 people demonstrated that our scheme for selecting cohesive teams captures the stated preferences of employees for partners in a team.

TC20

Parrot

Optimization- Modeling II

Contributed Session

Chair: Masoud Hamedi, PhD Candidate, University of Maryland, Dept. of Civil & Environmental Engineering, 1173 Glenn L. Martin Hall, College Park, MD, 20742, United States, masoud@umd.edu

1 - Minimax in Multi-Index Transportation Problems

Vladimir Tsurkov, Professor, Computing Center of RAS, 40 Vavilov Str., Moscow, 119991, Russia, tsur@ccas.ru, Anatoly Mironov

We propose an algorithm for finding minimax in multi-indexes transportation problems. The approach generalizes the characteristic equation method which was applied before to two indexes.

2 - How to Optimize a Highway for All

Abbas Afshar, PhD Candidate, University of Maryland, Dept of Civil & Environmental Engineerin, 1173 Glenn L. Martin Hall, College Park, MD, 20742, United States, afshar@umd.edu, Masoud Hamedi, Ali Haghani

Highway alignment design traditionally consists of studying feasible corridors, introducing alternatives, and selecting the final design based on the experience and engineering judgment. In this research, a mathematical model and a solution algorithm are suggested to address this matter. The objective function is a comprehensive cost function considering all stakeholders and the solution algorithm is an iterative gradient-based heuristic supported by a numerical example and sensitivity analysis.

3 - Optimization of Car to Train Assignment for Passenger Rail

Masoud Hamedi, PhD Candidate, University of Maryland, Dept. of Civil & Environmental Engineering, 1173 Glenn L. Martin Hall, College Park, MD, 20742, United States, masoud@umd.edu, Ali Haghani, Abbas Afshar

In this paper we present an optimization framework and a solution algorithm for the assignment of cars to passenger trains. Given a periodic schedule and a fleet of equipment, the model determines the configuration of consists and the trains to minimize the cost such that the travel demand, operational constraints and the yard capacity constraints are satisfied.

■ TC21

Canary

Efficient Simulation Optimization and Applications

Sponsor: INFORMS Simulation Society
Sponsored Session

Chair: Chun-Hung Chen, Professor, George Mason University, 4400 University Dr., MS 4A6, Dept. of Systems Engineering, Fairfax, VA, 22030, United States, cchen9@gmu.edu

Co-Chair: John Shortle, George Mason University, 4400 University Dr., MS 4A6, Fairfax, VA, 22030, United States, jshortle@gmu.edu

1 - Estimating Wake Encounter Probabilities in Aviation Thru Simulation

John Shortle, George Mason University, 4400 University Dr., MS 4A6, Fairfax, VA, 22030, United States, jshortle@gmu.edu, Babak Jeddi

This talk presents a simulation methodology to estimate the probability of a wake encounter in aviation. A landing airplane that encounters a wake may roll, resulting in a fatal crash. The methodology we use is a hybrid approach that combines a direct data feed of flight-track data integrated with simulation of wake-evolution models. We show how wake encounter probabilities depend on atmospheric conditions and that "worst-case" conditions differ from the commonly perceived worst-case conditions.

2 - Generic Indifference-Zone Subset Selection Procedures

Jack Chen, Senior Staff Specialist, BASF Corporation, 333 Mount Hope Avenue, Rockaway, NJ, 07866, United States, e.jack.chen@basf.com

Selection procedures have been widely studied and applied in determining the required sample sizes for selecting the best systems. The Enhanced Two-Stage Selection procedure is a heuristic two-stage selection procedure that takes into account not only the variance of samples, but also the difference of sample means when determining the sample sizes. This paper discusses the use of the same technique to select a subset of size m that contains at least c of the v best of k systems.

3 - Simulating the Performance of Low Latency Queueing for Emergency Telecommunications

Martin Fischer, Senior Fellow, Mitretek Systems, 3150 Fairview Park Drive South, Falls Church, VA, 22042, United States, mfisher@mitretek.org, Denise Masi, Patrick McGregor, David Garbin

Low Latency Queueing is a telecommunications router feature designed to give certain packets performance measures that are better than the routine packets. The purpose of this talk is to report on the development and use of simulation models, both OPNET models and models developed in-house, to conduct analyses to determine the potential benefits of such features.

4 - Efficient Computing Resource Allocation for Simulation Optimization

Chun-Hung Chen, Professor, George Mason University, 4400 University Dr., MS 4A6, Dept. of Systems Engineering, Fairfax, VA, 22030, United States, cchen9@gmu.edu

Optimal Computing Budget Allocation (OCBA) is a technique which can optimally allocate a given simulation budget when a number of alternatives are being simulated for comparison. Combining OCBA with existing search algorithms (such as Genetic Algorithms), we develop effective methods for simulation optimization problems.

■ TC22

Pelican

Health Care- Practice

Contributed Session

Chair: Stefan Creemers, K.U.Leuven, Naamsestraat 69, Leuven, 3000, Belgium, Stefan.Creemers@econ.kuleuven.be

1 - Value Stream Mapping & Simulation Modeling: Integrated Approach to Workflow Analysis in Healthcare

Tayfun Avni, MBA, Lean Sigma Black Belt, IBM / Global Business Services, 1521 Spring Gate, 10104, McLean, VA, 22102, United States, tavni@us.ibm.com

In October of 2006, Physical and Occupational Therapy Department of a major academic medical center retained IBM Global Business Services to conduct a seven week long Safe and Lean diagnostic. As part of the engagement, IBM combined static and dynamic approaches, Value Stream Mapping and Simulation Modeling, to identify operational inefficiencies in Outpatient Physical Therapy primary ambulatory practice site, and evaluate alternatives for process improvement.

2 - Improving Inventory Controls in Materiel Services

Seraphin Tam, Graduate Student, University of Michigan, 3030 Barclay Way, Ann Arbor, MI, 48105, United States, smtam@umich.edu, Richard Coffey, Katie Leikhim

Optimal inventory control in a hospital leads to efficient use of staff time, timely delivery of needed supplies, and ultimately, improved patient care. During this talk, we will discuss a quantitative model used to improve PAR-stocking levels. An extension to this model is considered in which the value of the product is incorporated.

3 - Medicaid Influence in the Drug Market

Franklin Carter, Assistant Professor, Lehigh University, College of Business and Economics, Bethlehem, PA, United States, fcarter@lehigh.edu, Dana Costa

In this paper we study the influence of Medicaid market share of a drug on the price of that drug using a dataset provided by IMS. The dataset contains 398 drugs launched between 1984 and 2003 and each drug is tracked for a maximum of 60 months from the launch date to the final fifth-year month. The results show that as the Medicaid market share for a drug increases, the price of that drug increases, showing that the pharmaceutical companies have a strong incentive to sell to Medicaid patients.

4 - Patient Flow Times in the Presence of Outages: A Case Study in a Belgian Hospital

Stefan Creemers, K.U.Leuven, Naamsestraat 69, Leuven, 3000, Belgium, Stefan.Creemers@econ.kuleuven.be, Marc Lambrecht

Utilization of critical resources and patient flow times are important performance measures in healthcare. We model the orthopaedic department at a Belgian hospital and compare several queueing approaches (decomposition as well as Brownian motion). Simulation is used as a validation tool. We focus on preemptive and nonpreemptive outages and develop new procedures to model their impact. We show the tradeoff between capacity structure, variability and flow times.

Tuesday, 3:30 - 5:00pm

■ TD01

Rio Mar Salon 1

Supply Chain II

Contributed Session

Chair: Pedro Reyes, Assistant Professor, Baylor University, One Bear Place #98006, Waco, TX, 76778, United States, pedro_reyes@baylor.edu

1 - Inventory Models Considering Post-Production Holding Time and Cost

Alex Ruiz-Torres, Assistant Professor, University of Texas at El Paso, 500 W. University Ave., El Paso, TX, 79968, United States, aruiztor@utep.edu

This paper proposes inventory models for an environment where the approval time of the production batches is an important problem variable. The model is motivated by industries, such as the Pharmaceutical, where a batch is produced and then withheld for a certain period pending release and disposition. The paper proposes cost functions that combine the classical EOQ model with a post-production hold time. Optimal batch sizes are derived for various cases of the post-production hold time.

2 - Study on Customer Delivery Time Based Logistics Optimization Models: A Case Study

Xiao-lei Feng, School of Management, Xián Jiaotong University, #1575, Xián Jiaotong University, Xián, 710049, China, fengxl@stu.xjtu.edu.cn, Lin-Yan Sun, Shu-Xia Wang

With the strengthening of customer's position in market, customer response time has been gradually taken into more consideration of Haier company' logistics system. This paper introduces a MIP logistic optimization model with direct-delivery ratio constrained, that can solve logistic problem with customer response time request. And a case study of Haier Company in Yangtze River delta region is also given.

3 - IT Maturity, E-Business Initiatives and Supplier Quality Management: Antecedents of Supply Chain Management System Satisfaction

Toni Somers, Associate Professor of IS, Wayne State University School of Business Administration, 315 Prentiss Bldg, 5201 Cass Ave, Detroit, MI, 48202, United States, toni_somers@wayne.edu

This study contributes to a better understanding of the effectiveness of firms' IT maturity, E-business initiatives and supplier quality management practices in explaining the variance in satisfaction among supply chain managers with the supply chain management system. Supply chain management (SCM) strategies have taken an increasingly important role in strategic planning and overall organizational performance. One major emphasis is the increasing integration of the supply chain with supply chain management systems. An important and overlooked factor to the

increased use of supply chain management systems is supply chain managers and their overall perceived satisfaction. In this paper, we use structural equation modeling to examine the relationship and relative significance of firms' E-business initiatives, supplier quality management, and IT maturity to determine how well they relate to supply chain managers' perception of the SCM system.

4 - RFID: A Two Echelon Experimental Study

Pedro Reyes, Assistant Professor, Baylor University, One Bear Place #98006, Waco, TX, 76778, United States, pedro_reyes@baylor.edu

We examine the impact of RFID data sharing on ordering decisions in a two-echelon supply chain in a controlled simulation experiment. We study this behavior in the content of a simple, RFID supported supply chain that is subject to stochastic demand and information time-lags. Of obvious practical importance; RFID has been the subject of intense discussion and research since the Wal-Mart and U.S. DoD mandates. We discuss the implications of our work and identify future research needs.

■ TD02

Rio Mar Salon 2

Manufacturing and Operations Management

Contributed Session

Chair: Anamika Mishty, Student, UPRM, Mayagüez, United States, mishty98@yahoo.com

1 - A Reconfigurable Framework for Automated Visual Inspection Systems

Hugo Garcia, Graduate Research Associate, Arizona State University, 2414 E. University Dr., Tempe, AZ, 85281, United States, hugo.garcia@asu.edu, Rene Villalobos

The lack of flexibility of the current Automated Visual Inspection (AVI) systems to accommodate new products is one of the main problems faced by users of these systems. This problem is an expensive and time consuming event. In this talk, the authors propose a framework that will facilitate the design of highly reconfigurable AVI systems possible. The presenters will discuss the proposed framework and the research issues that need to be addressed for the attainment of the proposed framework.

2 - Insights Into Factors Affecting POM Journal Evaluations

George Hadjinicola, Associate Professor, University of Cyprus, Department of Public and Business Admini, 75 Kallipoleos Str., Nicosia, 1678, Cyprus, bageorge@ucy.ac.cy, Andreas Soteriou, Vasilis Theoharakis, Chris Voss

We provide peer review evaluations for Production and Operations Management (POM) research outlets, based on a sampling frame that includes POM researchers located worldwide. The paper explores various propositions as to whether the perceived quality and relevance of a journal is affected by such factors as (i) nature of research work (empiricists vs. modelers), (ii) society membership, and (iii) geographical location.

3 - A Review on Machine Failure Prediction

Anamika Mishty, Student, UPRM, Mayagüez, United States, mishty98@yahoo.com, Ahad Ali

This paper presents a comprehensive review on machine failure prediction. Based on the review, a new prediction will be developed to minimize downtime.

4 - The Impact of Process Flexibility on First-Mover Advantages

Bin Shao, University of Illinois, Urbana-Champaign, 1206 S. Sixth St, Champaign, IL, 61820, United States, binshao@uiuc.edu, Dilip Chhajed

We explore the impact of several operational issues such as, change-over flexibility, experience curve, and production cost on first-mover advantages and product-design decisions in duopoly setting with customers making repeat purchases. We decide each firm's design policies and provide the criteria under which the first entrant enjoys the first-mover advantages. We also find that when the first entrant has more flexibility, the competitor may benefit more.

■ TD03

Rio Mar Salon 3

Managing Supply Chain and Service Operations

Cluster: Supply Chain Optimization

Invited Session

Chair: Hari Natarajan, Assistant Professor, University of Miami, 412-D Jenkins Building, University of Miami, Coral Gables, FL, 33124, United States, hnataraj@exchange.sba.miami.edu

1 - On the Benefits of Assortment-Based Cooperation Among Independent Producers

Yalcin Akcay, Asst. Prof., Koc University, Sariyer, Istanbul, Turkey, yakcay@ku.edu.tr, Baris Tan

We consider a competitive market for a set of substitutable products. Depending on the assortment of the firm and the substitution behavior of the customer, either a product is sold to the customer or the sales is lost. We consider the cooperation of independent producers which offer a combined set of products to their customers. We propose an analytical model that enables us to determine the characteristics of firms and their products that would facilitate a beneficial cooperation.

2 - Delivery Fee Design for Logistics Partnerships

Hari Natarajan, Assistant Professor, University of Miami, 412-D Jenkins Building, 5250 University Drive, Coral Gables, FL, 33124, United States, hari@miami.edu, Anant Balakrishnan

Manufacturers and distributors are increasingly developing close partnerships in order to serve their customer needs quickly and efficiently. Compensation schemes play an important role in fostering such collaborations. Motivated by a problem facing a large building-products manufacturer, we propose and solve an optimization model to determine delivery fees, using fee tables, for a manufacturer's distribution partners.

3 - Call Allocation and Agent Scheduling in a Call Center Network

Leon Lasdon, Professor, The University of Texas at Austin, McCombs Business School, University of Texas, Austin, TX, 78731, United States, lasdon@mail.utexas.edu, Anant Balakrishnan

Many organizations have multiple call centers, and must create staffing plans to meet weekly forecasts of total call volume by interval. This requires an allocation of the forecast to the centers, and a staffing plan at each center that handles the allocated calls to meet some service level. We formulate this problem as a large MIP. Using real data from a large computer manufacturer, we solve with GAMS/CPLEX, and discuss solution difficulties and features, and some uses of the model.

■ TD04

Rio Mar Salon 4

Software Seminar: ILOG - CPLEX/OPL

Cluster: Software Seminars

Invited Session

Chair: Carol Tretkoff, ILOG Incorporated 4350 North Fairfax Drive Suite 800, Arlington, VA, 22203, tretkoff@ilog.com

1 - OPL and ODM for Model Development

Carol Tretkoff, ILOG Incorporated 4350 North Fairfax Drive Suite 800, Arlington, VA, 22203, tretkoff@ilog.com

Learn how to harness the full power of the ILOG OPL-CPLEX-ODM Development System to develop optimization models and decision support applications that solve complex problems ranging from near real-time scheduling to long-term strategic planning. We will demonstrate how to use OPL to quickly model problems that are solved by CPLEX, and how to use ODM to gain further insight about the model.

■ TD05

Rio Mar Salon 5

Applications of Decision Analysis

Sponsor: Decision Analysis

Sponsored Session

Chair: Anders V. Jensen, Research Engineer, Centre for Traffic and Transport, Technical University of Denmark, DTU-Building 115, DK-2800 Kgs. Lyngby, Denmark, avj@ctt.dtu.dk

1 - Strategic Planning and Decision Analysis: Presentation of the COSIMA Software System

Anders V. Jensen, Research Engineer, Centre for Traffic and Transport, Technical University of Denmark, DTU-Building 115, DK-2800 Kgs. Lyngby, Denmark, avj@ctt.dtu.dk, Michael B. Barford, Steen Leleur

This paper presents a composite decision support system, COSIMA, programmed in MS Excel. COSIMA provides assistance to the decision maker as concerns complex decisions and strategic planning. The COSIMA software is designed as interconnected modules which make it possible to conduct Cost-Benefit Analysis and Multi-Criteria Analysis (MCA) either in combination or separated. The MCA module is based on the AHP and SMARTER techniques. COSIMA also handles risk analysis using Monte Carlo simulation.

2 - Modeling the Effect of Random Outcomes in Multistage Decision Processes

Ronald Askin, Arizona State University, Dept. of Industrial Engineering, Box 5906, Tempe, AZ, 85287, United States, ron.askin@asu.edu

Human decision makers are known to be affected by factors such as anchoring, certainty preference, approach-avoidance conflicts, and framing. We study the response of human decision makers to random outcomes in multistage decision processes when optimal solutions may require taking short term risks. The impact of outcome sequences is measured in laboratory experiments. Models are proposed for incorporating reactions to random outcomes in sequential decision making.

3 - Investment in a Deteriorating Project With a Random Profit

Dharma Kwon, UCLA, hyok-jon.kwon.2008@anderson.ucla.edu, Steve Lippman

Even in the face of declining and highly volatile demand, firms often invest in aging technologies rather than discard them. We study this phenomenon by modeling the firm's profit rate as a Brownian motion with negative drift. At each point in time, the firm can (1) continue operation, (2) stop the project, or (3) boost the profit rate through one-time investment. The optimal policy is characterized by two thresholds: invest in the project when the profit rate is above one threshold and exit when it is below the other.

4 - Performance Evaluation of the Directors of Districts of NAFTAL (Sonatrach Algeria)

Mustapha Moulai, Dr, USTHB, Faculty of Mathematics, BP32 El-Alia, Alger, 16111, Algeria, mustapha_moulai@yahoo.fr, Abdelhak Mezghiche

The ELECTRE TRI method used for the partition of the directors of districts of categories of performances offers subjective parameters which make it possible to the decision maker to express his choices as for the performance of a director to determine his individual production bonus. Thus, we developed a software tool for outclassing with the base of a multicriteria model of performance evaluation, including some rules aiming at minimizing the arbitrary one in the decision-making.

■ TD06

Rio Mar Salon 6

Tutorial: Modeling and Optimizing Nonlinear Systems in Integrated Computing Environments

Cluster: Tutorials

Invited Session

Chair: Janos Pinter, Pinter Consulting Services Inc., PCS Inc., 129 Glenforest Drive, Halifax, NS, Canada, jdpinter@hfx.eastlink.ca

1 - Tutorial: Modeling and Optimizing Nonlinear Systems in Integrated Computing Environments

Janos Pinter, Pinter Consulting Services Inc., PCS Inc., 129 Glenforest Drive, Halifax, NS, Canada, jdpinter@hfx.eastlink.ca

Nonlinear optimization models are developed and solved across the sciences and engineering. In this tutorial, we place an emphasis on building and solving models in Maple and Mathematica. Both systems include advanced modeling features and nonlinear optimization functionality, enhanced by add-on optimization packages. A brief introduction to global optimization is followed by interesting examples and a review of real-world applications.

■ TD07

Rio Mar Salon 7

Harvey Greenberg and Sandia National Laboratories II: Mathematical Programming

Sponsor: Interface of Computing Science & OR

Sponsored Session

Chair: William Hart, Distinguished Member of Tech Staff, Sandia National Laboratories, Mail Stop 1318, P. O. Box 5800, Albuquerque, NM, 87185, United States, wehart@sandia.gov

1 - A Progressive Hedging Approach to Optimizing an Enterprise-Scale Logistics Support System

Jean-Paul Watson, Senior Member of Tech Staff, Sandia National Laboratories, Mail Stop 1318, P.O. Box 5800, Albuquerque, NM, 87185, United States, jwatson@sandia.gov, David Strip, David Woodruff

We consider the problem of designing low-cost, high-performance inventory and resource allocations across a logistics enterprise dedicated to the support of aircraft fleets. The problem is formulated as a stochastic mixed-integer program, where individual scenarios are solved using a domain-specific heuristic. Scenario solutions are aggregated via Rockafeller and Wets' Progressive Hedging (PH) algorithm. Computational issues involved in the practical deployment of PH are addressed.

2 - Lagrangian Relaxation for Water Security p-Median Problems

Cynthia Phillips, Distinguished Member of Tech Staff, Sandia National Laboratories, Mail Stop 1318, P. O. Box 5800, Albuquerque, NM, 87185, United States, caphill@sandia.gov, Erik Boman, Lee Ann Riesen, Jon Berry

Placing sensors in municipal water networks to protect against a set of contamination events is a classic p-median problem for most objectives. Instances for full-scale networks with large event suites can be so large commercial linear-programming solvers cannot compute lower bounds. We describe our experience computing lower bounds via Lagrangian relaxation. We couple this with Barahona and Anbil's Vol algorithm, previously used for p-median-like problems, to find heuristic solutions.

3 - Enumeration of Near-Optimal Solutions for Peptide Docking Problems

William Hart, Distinguished Member of Tech Staff, Sandia National Laboratories, Mail Stop 1318, P. O. Box 5800, Albuquerque, NM, 87185, United States, wehart@sandia.gov, Diana Roe, Matthew Hart, Richard Forrester, Harvey Greenberg

Many protein-protein interactions are mediated by modular peptide-binding domains that interact with a well-defined backbone structure. Combinatorial search techniques can be used to identify side-chain structures that fit with a backbone when interacting with a target protein. We describe how enumeration techniques can be used to identify consensus patterns of side-chain structures, which provides a more robust binding prediction because of data uncertainties in the interaction potentials.

■ TD08

Rio Mar Salon 8

Using Modeling Languages With COIN-OR

Sponsor: Interface of Computing Science & OR

Sponsored Session

Chair: Robert Fourer, Professor, Northwestern University, Dept. of Industrial Eng & Mgmt Sciences, Evanston, IL, 60208-3119, United States, 4er@iems.northwestern.edu

1 - Quality Assurance, Performance Analysis, and the GAMS/COIN-OR Solvers

Steven Dirkse, GAMS Development Corporation, 1217 Potomac St. NW, Washington, DC, 20007, United States, sdirkse@gams.com

In cooperation with various solver vendors, GAMS has developed many tools for solver QA and benchmarking. As the COIN solvers become more integrated with GAMS, an analysis of these solvers with the QA and benchmarking tools becomes feasible. In this talk, we describe the analysis performed and present the results obtained.

2 - Using the Zinc Modeling Language With COIN-OR

Jakob Puchinger, University of Melbourne, National ICT Australia (NICTA), Dept of Computer Science & Software Eng, Melbourne, Australia, jakobp@csse.unimelb.edu.au, Peter Stuckey, Maria Garcia de la Banda, Reza Rafieh, Nicholas Nethercote, Ralph Becket, Mark Wallace, Kim Marriott

Zinc is a high-level, typed, functional, modeling language. It provides expressive constraints, separation of data from model, extensibility, and solver-independent modelling. Zinc extends OPL and moves closer to CLP languages such as ECLiPSe.

Zinc is part of the G12 constraint programming platform using different solvers such as our own finite domain solver, linear solvers, hybrid solvers, and COIN-OR solvers via the OSI interface.

3 - An Open Interface for Hooking Solvers to Modeling Systems

Robert Fourer, Professor, Northwestern University, Dept. of Industrial Eng & Mgmt Sciences, Evanston, IL, 60208-3119, United States, 4er@iems.northwestern.edu

We describe a new open standard for representing optimization problem instances. At the heart of our proposal are OSiL, an XML-based representation for instances, and OSInstance, a corresponding in-memory representation. An open-source library, maintained as a COIN-OR project, provides application programming interfaces for reading and writing OSiL and OSInstance and for converting between them. Related representations handle the passing of options to solvers and the retrieval of results.

■ TD09

Rio Mar Salon 9

Emerging Research Opportunities in Supply Chain Management

Cluster: Industry-Research Interface
Invited Session

Chair: Jack Chen, Senior Staff Specialist, BASF Corporation, 333 Mount Hope Avenue, Rockaway, NJ, 07866, United States, e.jack.chen@basf.com

1 - Optimization and Simulation of Demand Shaping Process in a Supply Chain with Configurable Products

Young Lee, IBM T.J. Watson Research Center, P. O. Box 218, Route 134, Yorktown Heights, NY, 10598, United States, ymlee@us.ibm.com, Markus Ettl, Tom Ervolina

We describe a demand shaping process that promotes marketable product alternatives to better manage inventory and product portfolio. The process is aided by an optimization tool that enables on demand up-selling, alternative-selling and down-selling to better integrate the supply chain, connecting the interaction of customers and sales teams to procurement and manufacturing capabilities of a firm. The effectiveness of the process is highlighted by simulating sales execution of the business.

2 - Supply Chain Optimization and Simulation Domain Mapping: A Key Area for New Research

Donald Hicks, President and CEO, LLamasoft, Inc., 204 East Washington Street, Ann Arbor, MI, 48104, United States, don@llamasoft.com

Many advances in supply chain and manufacturing software technology are being driven by private companies, not academia. This is the opposite of the normal situation observed in life and physical sciences. Although numerous research topics exist for optimization and simulation applications in logistics and manufacturing, the area needing the most immediate help is in the integration of different algorithms in the service of solving more complicated real problems.

3 - Large Scale Transportation Network Planning and Optimization

Hong Wei Ding, Researcher, IBM China Research Lab, Diamond Building A Tower, Haidian District, Beijing, BJ, 100094, China, dinghw@cn.ibm.com, Min Min Qiu, Wei Wang, Jin Dong, Chang Rui Ren

Transportation planners face various challenging problems: when to deliver a shipment, how to select routes, where to consolidate shipments, etc. We consider a general transportation network with terminals and hubs. Transportation tariff for each carrier is non-linear. A hybrid heuristic algorithm which integrates neighbor search and reinforcement learning is developed to solve this optimization problem. Numerical examples show the high efficiency and performance of the algorithm.

■ TD10

Rio Mar Salon 10

Marketing I

Contributed Session

Chair: Syed Shahabuddin, Professor, Central Michigan University, 1306 E Preston, Mt Pleasant, MI, 48858, United States, shaha1s@cmich.edu

1 - Forecasting Count Data in Sales

Nobuhiko Terui, Professor, Tohoku University, Graduate School of Economics, Kawauchi, Aoba-ku, Sendai, 980-8576, Japan, terui@econ.tohoku.ac.jp

We propose a sales forecasting model for multinomial distributed variables in terms of conditionally Gaussian modeling. Our proposed model forecast the numbers of product sales not only in a maker but also across competitive makers. A generalized linear model for count data is extended to dynamic model by incorporating state space modeling.

2 - What Motivate Indian & Nepalese Sales Managers in Post Liberalized Era?

Rajesh Srivastava, Emeritus Professor, SIMSR, 2/9/12, Bluemont, Bhawaninagar, Marol, Mumbai, 400059, India, srivastava@vsnl.net

The study was conducted in India & Nepal in Mumbai & Kathmandu being economical center for their respective country. The objective of the study was to investigate the motivational factors which motivate Indian & Nepalese sales managers and also understand if there is any difference due to cultural difference and distance. The top three motivational factors emerged from the study were good environment, money and challenging job.

3 - Time Series Forecasting Techniques

Syed Shahabuddin, Professor, Central Michigan University, 1306 E Preston, Mt Pleasant, MI, 48858, United States, shaha1s@cmich.edu

There are many forecasting methods. Some are for determining causal relationships among variables and others are for projecting time history, called time series. Time series methods are moving average, a variety of exponential methods, Box-Jenkins and classical time series methods. The purpose of my paper is to evaluate these time series methods and determine which method performs best under what conditions.

4 - Purchase Cycles in Customer Databases:

A Gamma -Poisson Approach

Qin Zhang, Assistant Professor of Marketing, Univ. of Texas at Dallas, 2601 N. Floyd, Richardson, TX, 75080, United States, zhangq@utdallas.edu, P.B. (Seethu) Seetharaman

We propose a Gamma-Poisson (GP) model to model customers' buying behavior characterized by purchase cycles. We show how to use the GP model to score a firm's customers in terms of their expected profitability. We illustrate our proposed technique using individual-level purchasing data from a catalog firm. We demonstrate the substantive benefits of employing our GP model in terms of segmenting customers based on their predicted profitability scores.

5 - Determinants of Marketing Strategy Used by McDonalds Around the World

Lalita Manrai, University of Delaware, 800 Baylor Drive, Newark, DE, 19711, United States, manrail@udel.edu, Ajay Manrai, Padmini Manrai

We analyze the 4Ps of marketing strategy used by McDonalds (Product, Price, Place, and Promotion) to understand how economic, political, social, and cultural considerations affect these decisions. In particular, the issue of globalization versus adaptation of marketing strategies will be discussed. Several examples will be provided for developing as well as developed countries to evaluate the efficacy of marketing strategies under a wide range of international marketing environments.

■ TD11

Caribbean Salon 1

Discrete Geometry Methods

Cluster: Honoring the Legacy of Peter Hammer
Invited Session

Chair: Peter Gritzmann, Professor, TU Munich, Dept. of Mathematics, Munich, D-80290, Germany, gritzman@ma.tum.de

1 - Geometric Clustering (and its application to the consolidation of farmland)

Peter Gritzmann, Professor, TU Munich, Dept. of Mathematics, Munich, D-80290, Germany, gritzman@ma.tum.de

With a view towards an application to the consolidation of farmland we present a new norm maximization model for geometric clustering where in effect the centers of gravity of the clusters are pushed apart. The model facilitates appropriate separation, leads to a polynomial-time approximation algorithm for the underlying large size convex maximization problem and allows a tight worst case analysis. (Jointly with A. Brieden and, in part, with C. Metzger)

2 - Rotating Hyperplanes and a Geometric Connection to Threshold Logic

M. Reza Emamy-K., Professor, Department of Mathematics, UPR Rio Piedras, San Juan, PR, 00931, United States of America, sanjuancube@yahoo.com

A rotating hyperplane method is used to construct an interaction between polytopes and threshold logic. This approach has been used to prove some of the basic facts in convex polytopes. For instance, we present a new proof for the fact that every compact convex set in the Euclidean space has a supporting hyperplane at a given relative boundary point. Then, the rotating hyperplanes will be the main tool to obtain the basic combinatorial properties of simple polytopes. Cut-complexes are defined to be the geometric presentations of the threshold Boolean functions. Here, we characterize all the cut-complexes with 2 or 3 maximal faces for any $n > 2$.

3 - Cut-Complexes: Geometric Approaches to Threshold Boolean and Pseudo-Boolean Functions

Carmen Caiseda, Inter American University of Puerto Rico,
P.O. Box 10499 Caparra Station, San Juan, PR, 00922, Puerto Rico,
ccaiseda@bc.inter.edu

The main goal is to introduce ramifications of a land-mark article by Hammer, Simone, Liebings and De Werra, From Linear Separability to Unimodality: A Hierarchy of Pseudo-Boolean Functions. In this paper the authors introduce the concept of threshold pseudo-Boolean functions that are the smallest class in a hierarchy of pseudo-Boolean functions. We talk about characterization of threshold pseudo-Boolean functions for the 5-6 cubes and polytopal sections of the 5-cube.

■ TD12

Caribbean Salon 2

Integrated Corporate - Wide Risk/Return Management

Cluster: Risk Management

Invited Session

Chair: Hans Ulrich Buhl, Prof. Dr., University of Augsburg,
Universit, Tsstraße 16, Augsburg, 86135, Germany,
hans-ulrich.buhl@wiwi.uni-augsburg.de

1 - Quantitative IT-Sourcing- Portfolio- Management

Steffen Zimmermann, University of Augsburg, Universitaetsstrasse 16,
Augsburg, BV, 86135, Germany, steffen.zimmermann@wiwi.uni-
augsburg.de, Arne Katzmarzik

Global IT sourcing strategies bear enormous growth potential. With the main focus on cost reduction in valuation of sourcing alternatives, risks and diversification effects are often inadequately considered leading to false estimation. Hence the authors have developed a model for site valuation where sourcing risks are quantified and a risk-return-optimized site allocation can be achieved by using portfolio theory. The practicability was proven in cooperation with an ITO provider.

2 - Customer Portfolio Management in E-Commerce - A Risk Management Perspective

Dennis Kundisch, Dr., Department of Information Systems, University
of Freiburg, Platz der Alten Synagoge, Freiburg, BW, 79085, Germany,
dennis.kundisch@vwl.uni-freiburg.de, Markus Ruch,
Stefan Sackmann

Investing in existing customers is widely accepted as a promising strategy. Recent research provides indications that focusing on transaction-related customers may also be viable. The mix between long-life and transaction-related customers is subject to optimization. Portfolio theory is applied to determine the optimal share of the different customer types from a value-based risk management perspective. An evaluation is realized with a set of data from an online-retailer.

3 - Integrated Enterprise Balancing

Bjoern Haeckel, University of Augsburg, Alter Postweg 101,
Augsburg, BV, Germany, bjoern.haeckel@wiwi.uni-augsburg.de

To support decision making in value based management satisfying both transparency requirements and reporting obligations, companies require a corporate-wide consistent database with return and risk information. The concept of "Integrated Enterprise Balancing" developed in this paper enables companies to control their business activities with corporate-wide consistent return and risk measures and to set up a multipurpose database.

■ TD13

Caribbean Salon 3

Logistics

Contributed Session

Chair: Jong-hyuck Park, Korea University, JunpaGwan 101, Korea
University, Anam dong, Sungbuk Gu, Seoul, 136-713, South Korea,
nrevival@gmail.com

1 - Getting Closer to Metaheuristics: New Improvements on the ALADIN Algorithm for the VRPTW

Eduardo Guillen, Mr., University of la Coruna, E.U. Diseno Industrial,
Campus Esteiro, Ferrol, 15403, Spain, edugs@udc.es, Manuel
Martinez, Susana Barbeito

In this paper we present the new techniques implemented in the ALADIN algorithm for VRPTW. This algorithm was developed by integrating a series of heuristic techniques to solve the VRPTW. It was based on simple addition and insertion procedures that provided good results. We are presenting now the improvements achieved by introducing some modifications to the original code. These changes provide much better results when applied to the benchmark problems provided by Solomon.

2 - Optimization of Library Processes

Iris Vis, Vrije University Amsterdam, Faculty of Economics and
Business Administration, Department of Information Systems and
Logistics, De Boelelaan 1105, Amsterdam, 1081 HV, Netherlands,
ivis@feweb.vu.nl

Libraries play an important part in promoting and sustaining culture life. Similar to companies, libraries need to go along with the trend of providing better customer's services. Many decision problems arise varying from collection management to warehouse design. We present several solution techniques to efficiently plan and control library processes.

3 - Spanning Trees With Node Degree Dependent Costs

Luis Gouveia, University of Lisbon, Operations Research Center,
Lisbon, Portugal, legouveia@fc.ul.pt, Pedro Moura,
Mauricio de Souza, Christophe Duhamel

We describe several models for determining minimum cost spanning trees with node degree dependent costs. In order to model the new cost term we consider a model using discretized by degree variables. Valid inequalities and an enhanced model will also be considered based on decomposing (and strengthening) the original formulation). Computational results for instances with up to 50 nodes will be considered.

4 - Algorithms for the Vehicle Routing Problem With Time Windows Based on Parallel Machine Dispatching

Jong-hyuck Park, Korea University, JunpaGwan 101, Korea
University, Anam dong, Sungbuk Gu, Seoul, 136-713, South Korea,
nrevival@gmail.com

The main idea of this study is solving vehicle routing problem with Time Windows (VRPTW) using parallel machine dispatching algorithms. There are similarities between VRPTW and parallel machine scheduling. Using these similarities, this paper applies dispatching algorithms to solve VRPTW. The tests were produced using Solomon's benchmark problems.

■ TD14

El Morro 1

Main Session: Applying OR to Deliver Development in Africa

Cluster: Applying OR to Deliver Development in Africa
Invited Session

Chair: Eric Soubeiga, Manager, Fortis Bank, 23 Camomile Street, London,
Lo, United Kingdom, eric.soubeiga@orpagroup.net

1 - Citizen Empowerment in Village Land Management in Tanzania

Montanus Milanzi, Dean, Faculty of Public Administration and
Management, Mzumbe University, P.O.Box 2, Mzumbe, Morogoro,
Tanzania, mcmilanzi@hotmail.com

This paper dwells on the efforts made by the Government of the United Republic of Tanzania to decentralise by devolution in four major areas namely political, administrative, and financial decentralisation and improved central - local government relationships. The area of land management and administration in rural Tanzania will be discussed in terms of methods used by the village land council and the village assembly to empower citizens in their respective localities.

■ TD15

El Morro 2

Military OR I

Contributed Session

Chair: Teeranan Nandhakwang, Instructor, Graduate School, National
Defence Studies Institute, 124-126 Vipawadeerangsit Rd., Dindaeng,
Bangkok, 10400, Thailand, teeranan.n@schq.mi.th

1 - A Stochastic Differential Game Model With an LP Subroutine for Mixed and Pure Strategy Optimization

Peter Lohmander, Professor, SLU, Faculty of Forest Sciences,
Umeå, SE-901 83, Sweden, peter.lohmander@sekon.slu.se

Differential games handle optimal dynamic decisions with more than one decision maker. This paper presents a stochastic two person differential game model with a linear programming subroutine that is used to optimize pure and/or mixed strategies as a function of state and time. Stochastic exogenous disturbances may be included. The model is programmed for the internet as web software. Problems from enterprise competition and military strategy are used as illustrations.

2 - Distributed Optimization Algorithms for Multi-Target and Multi-Sensor Allocation and Scheduling

Yosef Tirat-Gefen, Lead Scientist, Aerospace Division, Castel Research Inc., 3940 Bradwater Street, Fairfax, VA, 22031, United States, yosefgavriel@computer.org

This work studies distributed optimization algorithms for collaborative sensor and target allocation subject to different constraints in risk and cost. We assume an enemy force deploying missiles of several ranges and unmanned air vehicles (UAVs) against an inhabited area with a non-uniform distribution of population and strategic assets, protected by a distributed network of sensors and defense systems, using collaborative real-time allocation and scheduling algorithms.

3 - Planning of Air Defense Strategy for a Group of Air Defense Weapons With Varying Hit Probabilities

Taner Gülez, Ind. Eng., Aselsan Inc., P.K. 101 Macunköy, Yenimalle, Ankara, 06172, Turkey, tgulez@aselsan.com.tr, Levent Kandiller, Nur Evin Ozdemirel

We investigate defense strategy of a group of air defense weapons with varying Single Shot Hit Probabilities (SSHP) against air threats aiming at high-valued assets. SSHPs are derived from Error Analysis of Fire Control Systems. A mixed nonlinear integer mathematical model is constructed by using SSHPs. Linearization techniques are developed for three nonlinearities present in this mathematical model. The final model formulation is verified in terms of both solution and time performance.

4 - Area of Operations Zoning and Ranking in Thailand's Southern Bordered

Teeranan Nandhakwang, Instructor, Graduate School, National Defense Studies Institute, 124-126 Vipawadeerangsit Rd., Dindaeng, Bangkok, 10400, Thailand, teeranan.n@schq.mi.th, Wuttinun Leelayudth

This paper proposes a new segmentation model. K-mean algorithm is selected to cluster area of operations (AO) into segment by using all of factors such as the number of incident of the insurgency, ratio of religions in each AO, level of violence, etc. Then, the ranking are provided for each AO in an appropriate segment. An AO ranking model is based on scoring, which called un-weighted factor scoring.

TD16

San Cristobal

Optimization and Equilibrium Problems in Networked Systems and Markets

Cluster: OR on the Edge
Invited Session

Chair: Uday Shanbhag, Assistant Professor, Dept of IESE, UIUC, 117 Transportation Building MC-238, 104 S. Mathews Ave, Urbana, IL, 61801, United States, udaybag@uiuc.edu

1 - Distributed Algorithms for Proportional Fairness in Wireless Networks

Ramavarapu Sreenivas, Associate Professor, IESE & CSL, University of Illinois at Urbana-Champaign, Urbana, IL, 61801, United States, rsree@uiuc.edu, Nikhil Singh

We consider an Adhoc Wireless Network that carries several flows between source-destination pairs under a slotted-time MAC protocol. Each flow has a utility function of $\log x$, where x denotes the probability of successful delivery of a packet to its final destination. We present a distributed scheme for the assignment of network resources among flows that maximizes the sum of the utilities of the flows using local, 2-hop information. Our claims will be confirmed using ns2 simulations.

2 - Multi-Period Equilibrium Problems in Electricity Markets

Uday Shanbhag, Assistant Professor, Dept of IESE, UIUC, 117 Transportation Building MC-238, 104 S. Mathews Ave, Urbana, IL, 61801, United States, udaybag@uiuc.edu, George Gross, Ankur Kulkarni

The multiple settlement structure in electricity markets results in complicated, and often ill-posed, optimization problems. The presence of uncertainty adds further difficulties from the standpoint of obtaining a sub-game perfect equilibrium. We discuss some recent advances using decomposition methods to solve such stochastic equilibrium problems efficiently. The performance of the algorithm is demonstrated on a sample electricity network.

3 - Addressing Competition in Stochastic Systems

Achal Bassamboo, Assistant Professor, Kellogg School of Management, Northwestern University, Chicago, a-bassamboo@northwestern.edu, Uday Shanbhag

In a variety of stochastic systems, optimizing in the presence of competition is often a challenging task. We consider some extensions of well-known systems to the competitive domain and articulate the notion of a Nash equilibrium in policies. Some computational results are also provided.

4 - Complementarity Models for Dynamic Games in Communication Networks

Huiping Yin, Mechanical Science and Engineering, UIUC, Urbana, IL, 61801, yin3@uiuc.edu, Prashant Mehta, Uday Shanbhag

We present a congestion control and queue management framework in a communication network setting. Users maximize their utility and pay a price, based on some specified dynamics. This prices are shown to converge to the optimal Lagrange multiplier. Stability of the system and fairness of the flows are proven and some preliminary numerical results are provided.

TD17

Egret

Statistics

Contributed Session

Chair: Beatriz Mendes, Professor, Federal University at Rio De Janeiro, Rua Marquesa De Santos 22 Apto 1204, Rio De Janeiro, 22221080, Brazil, bmendes@visualnet.com.br

1 - Applying Some Exploratory Data Analysis Measures on Seasonally Adjusted Percent of Manufacturing Employment Data

Elliot Levy, Economist, U.S. Department of Commerce, 11011 Saffold Way, Reston, VA, 20190, United States, Elliot_Levy@ita.doc.gov

Recent falling rates of manufacturing employment show harmony in their annual monthly distribution as another method of correlation. Exploratory analysis provides more information through its various components when compared to conventional Pearson r . These monthly percents are serially correlated from year to year.

2 - Design of Experiments for Stochastic Constrained Regions

Szu Hui Ng, Assistant Professor, National University of Singapore, 10 Kent Ridge Crescent, 119260, Singapore, isensh@nus.edu.sg

In many practical design of experiment situations, secondary response constraints may exist, causing interdependencies among factors and resulting in an irregular operability region. The region imposed by the constraints is often unknown a priori, rendering standard experimental designs inappropriate. We propose a two-stage approach to study such problems and look into three different types of designs. We further study the characteristics of these designs through Monte Carlo simulations.

3 - Robust Variable Selection Algorithm Based on Least Angle Regression

Hwang Jibin, a Department of Industrial Systems and Information Engineering, Korea University, Korea University, 1, 5-ka, Anam-dong, Seoul, South Korea, ji_bin_@hanmail.net

Variable selection with multi-collinearity, known as NP-hard classes' problem, is a critical issue on linear regression. A heuristic algorithm based on geometric interpretation of variable spaces is proposed. Time complexity is performed and variable selection result are shown through Monte Carlo simulations.

4 - Analysis of Field Data for Repairable Systems

David Trindade, Distinguished Engineer, Sun Microsystems, 6005 Assisi Court, San Jose, CA, 95138, United States, david.trindade@sun.com

Analysis of field data for repairable systems typically involves estimating the mean time between failures (MTBF). Significant assumptions and shortfalls surround MTBF usage. This talk presents simple but robust alternative graphical methods for analyzing and monitoring the reliability of repairable systems. These techniques have been successfully used within Sun Microsystems to transform the way the repairable system reliability is analyzed and communicated to management and customers.

5 - Multivariate Extreme Value Modeling With Applications to Flooding in Puerto Rico

Beatriz Mendes, Professor, Federal University at Rio De Janeiro, Rua Marquesa De Santos 22 Apto 1204, Rio De Janeiro, 22221080, Brazil, bmendes@visualnet.com.br, Luis Pericchi

Environmental Risk Analysis involves multivariate analysis of Extreme Values: "What is the probability that K rivers will flood together?" We explore the adequacy of a multivariate modeling of extremes strategy analyzing a group of rivers flow data from Puerto Rico Island. This strategy is quite flexible since not all the variables have to be extremes, but only assumes that at least one of them is extreme.

■ TD18

Heron

Strategic Planning and Forecasting: The Future of Services

Cluster: Services Research
Invited Session

Chair: Ruoyi Zhou, IBM, 650 Harry Road, San Jose, CA, 95120, United States, ruoyi@us.ibm.com

1 - Future Ecosystems Keystone Service Models

Ray Strong, Research Staff Member, IBM Research, 650 Harry Road, San Jose, CA, 95120, United States, strong@almaden.ibm.com,
Colin Harrison, Ruoyi Zhou, Sudhir Desai

We explore two potential ways to provide keystone services in a dynamic ecosystem: (1) signpost based prediction markets (signposts are potential future events that are recognizable and actionable); (2) computational wikis for predictive analytics (a computational wiki allows a community of contributors to share and blend their knowledge represented as executable components of models). Both ways could be facilitated by emerging service community middleware.

2 - Strategic Planning and Forecasting: The Future of Services

Peter Bishop, Associate Professor, University of Houston,
5426 Jason, Houston, TX, 77096, United States, pbishop@UH.EDU

Manufacturing peaked in the industrial societies in the mid-twentieth century as employment shifted to services. Now information tools are taking the place of many service occupations, like secretary, bookkeeper, and even computer programmer. If opportunities in service employment decline, where will people work in the future? That is the question for this session on the Future of Services.

3 - The Interplay of Context and Strategy in Co-Creating Service Innovations

Bill Hefley, Associate Teaching Professor & Associate Director,
Carnegie Mellon University, ITSq, 5000 Forbes Ave, Pittsburgh, PA,
15213, United States, hefley@cmu.edu, Ethel Loesche

Services Science has been defined as "the study of coevolving compositions of technology tools, business methods, and organizational culture and their impact on human effectiveness and efficiency in the performance of services work." Grounded in our work in understanding best practices in global sourcing of IT services, this paper explores the essential interplay of context and organizational strategy in shaping services work and services innovations using selected illustrative cases.

4 - Applying SW and Requirement Engineering Methods to Business Modeling

Yuriko Sawatani, Tokyo Research Lab, IBM, 2-17-8 Tukushino,
Machida, Tokyo, 194-0001, Japan, YURIKO@jp.ibm.com

In general, there is no formal way to describe business modeling. We introduce goal modeling from requirement engineering and use case maps for high level scenarios to describe business use cases. Those methods help to describe business goals clearly and as formal way, so that we could analyze those goals from various perspectives. We applied the proposed method to a case study, and discuss future issues.

5 - Effective Business Idea Creation Using a Signpost Generation Approach

Fusashi Nakamura, Tokyo Research Laboratory, IBM Japan, 1623-14,
Shimotsuruma, Yamato-shi, Kanagawa-ken 242-8502, Japan,
NAKAMUF@jp.ibm.com, Yuriko Sawatani, Ray Strong, Ruoyi Zhou

Consultants are often asked to create many example high level business cases quickly to illustrate how a client can utilize state-of-the-art technology to establish a differentiated market position. In place of a highly focused technology based approach not suited for a services business, we propose a new approach that interpolates between the present and possible future states to identify near-future signposts from which the requested business cases can be generated in a straightforward manner.

■ TD19

Sea Gull

Economics, Societies and Transition I

Contributed Session

Chair: Tibor Kis, Professor, Faculty of Economics, 9-11 Segedinski put,
Subotica, Se, 24000, Serbia-Montenegro, tbkis@yahoo.com

1 - Relevant Issues When Deciding on the Next Candidate to Deal With the Management of the Family Firm

Susana Barbeito, Ms., University of La Coruna, E. Politecnica
Superior, Campus Esteiro, Ferrol, 15403, Spain, sbar@cdf.udc.es,
Eduardo Guillen, Manuel Martinez

In this paper we present an analysis of the main characteristics of the second generation that must deal with the management of a family firm. Whereas other

similar studies focus on the sex of the candidate, ranking in the succession line, belonging to the family or not as important issues, we highlight other relevant aspects such as the background of the candidate, previous experience, management studies, and some others. We deployed an analysis of 57 family businesses from North West Spain.

2 - Demographic Transitions and Social Security - The Case of Italy

Farinaz Wigmans, Visiting Assistant Professor, Texas Tech University,
Rawls College of Business, Dept. of Finance, Box 42101, Lubbock,
79409-2101, United States, farinaz.wigmans@ttu.edu

Many countries face major challenges to the sustainability of their public pension system. In Italy, effects of increased life expectancy are exacerbated by very low birth rates, little immigration and historically generous system. We have systematically analyzed the factors affecting future sustainability of this system. Population development until 2080 was studied stochastically, with a custom-made computer program. A second program calculates the consequences. We evaluated and recommended remedies.

3 - Impact of Colonization and Globalization on Economy, Culture, and Society

Padmini Manrai, University of Delaware, 800 Baylor Drive, Newark,
DE, 19711, United States, minimanrai@gmail.com

Researchers argue that modern day colonization exists in the form of economic dominance and human rights violations. Similarly, globalization has been blamed to cause cultural erosion. However, advantages of colonization and globalization, such as economic development and cultural enrichment, have also been well acknowledged. This research presents a conceptual model capturing the processes leading to societal problems versus societal benefits. Implications for policy makers are discussed.

4 - Long Range Relationships Between Economic Aggregates of Transitional Economies- Case of Serbia

Tibor Kis, Professor, Faculty of Economics, 9-11 Segedinski put,
Subotica, Se, 24000, Serbia-Montenegro, tbkis@yahoo.com,
Maria Cileg, Otilia Sedlak

The objective of this paper is to analyze long range development of Serbia and its regional units, whereas they are subject to transition, going through social and economic transformation as a lasting process. Basic aggregates like GDP, employment and unemployment, inflation rate, investment etc. are analyzed, trying to find out long range interdependences of variables given by time series data and to identify structural brakes. International comparisons are also performed.

■ TD20

Parrot

Optimization- Modeling III

Contributed Session

Chair: Derek Armstrong, Technical Staff Member, Los Alamos National
Laboratory, P.O. Box 1663, Los Alamos, NM, 87545, United States,
dearmstr@lanl.gov

1 - Improving Furnace Loading Using Optimization Models

Mojahid Saeed Osman, PhD student, North Carolina A&T State
University, Department of Industrial and Systems Engineering, 1601
E. Market St., Greensboro, 27411, United States, mfsaeedo@ncat.edu,
Bala Ram, Funda Samanlioglu, Lauren Davis

We address furnace-loading for heat treatment operation of cylindrical parts. Furnace-loading, where parts are loaded into baskets, is complex and involves issues relating to geometry, and heterogeneity. Currently basket loading is accomplished by operator ingenuity; so furnace capacity is not used adequately. It can be inferred that improving furnace throughput can be achieved by improving basket utilization. We describe two mixed integer programming formulations for the basket-loading problem.

2 - Mixed Duopoly: Comparative Statics

Vitaly Kalashnikov, DIW (German Economics Institute), Koenigin-
Luise-Strasse 5, Berlin, Germany, kalashnikov_de@mail.ru,
Vyacheslav Kalashnikov

We investigate Stackelberg mixed duopoly models where a state-owned public firm maximizing domestic social surplus, and a foreign firm compete. A desirable role (either leader or follower) for each firm is examined. Under certain conditions, the firms may have two different types of optimal reaction at the Cournot equilibrium: weak or strong. We compare the profits and domestic social surplus, and volumes of produced commodities for various combinations of weak and strong leaders and followers.

3 - Noise and Blur Removal From Proton Radiographs With Total Variation Regularization

Derek Armstrong, Technical Staff Member, Los Alamos National
Laboratory, P.O. Box 1663, Los Alamos, NM, 87545, United States,
dearmstr@lanl.gov, Diane Vaughan

Proton radiography is an imaging technique that consists of measuring the attenuation of a proton beam that passes through an object of interest. Aberrations of the lens system and multiple Coulomb scattering of the protons blur the final image. Total variation regularization is applied to remove noise and blur from proton radiographs. The blur on proton radiographs is modeled with a non-stationary projection operator.

■ TD21

Canary

Simulation I

Contributed Session

Chair: Lolke Schakel, MSc., University of Groningen, Postbus 800, Groningen, 9700 AV, Netherlands, L.P.Schakel@rug.nl

1 - Modelling the Dynamics of Poverty Reduction Value Networks (PR-VNets)

S. Claudina Vargas, Director, Complex Systems Optimization Lab, P.O. Box 1087, Northampton, MA, 01061, United States, scvargas@cosola.org

We consider a complexity-based modelling framework to increase understanding of PR-VNets and to find feasible solutions that optimize stakeholders' value. PR-VNets are complex systems that address large-scale poverty reduction problems. Value is optimized when the system achieves increasing and sustainable returns on poverty investments over time, increasing access to markets. We use simulation to model the dynamics and to find suitable value functions.

2 - Modeling and Simulation of a Chassis Painting Operation

María Guadalupe Villarreal Marroquín, Student, Universidad Autónoma de Nuevo León, Posgrado FIME, Av. Universidad S/N, San Nicolás de los Garza, NL, 66450, Mexico, lupita.villarreal@gmail.com, Mauricio Cabrera-Ríos

Modeling and Simulation are used in this case study to provide insight into the future installation of a painting line. Key issues in terms of keeping the models realistic are emphasized and the final decision analyses are provided along with a series of potential research extensions.

3 - Implementation of Discrete Event Simulation for Passenger Evacuation in Large Passenger Vessel

Trika Pitana, Mr, Graduate School of Science and Technology, Kobe University, 5-1-1 Fukaeminami-Machi Higashinadaku, Hyogo Prefecture, Kobe, 658-0022, Japan, 049d984n@stu.kobe-u.ac.jp, Eiichi Kobayashi

During accident, passengers have to evacuate from ship to save their life. This paper describes the impact of marine accident in evacuation passenger process considering familiarity of passenger; and effect of individual obstacle on crowd. Assessments of evacuation are evaluated by simulation, based on discrete event simulation. The outputs of analysis are prediction of time evacuation, and assessment of risks, which are existed in evacuation process.

4 - Customer and Observer-Oriented Transient Measures in a Single Queue with Continuous-Time Departures

Avi Herbon, Lecturer, Dept. of Interdisciplinary Studies - Logistics, Bar-Ilan University, Ramat-Gan, Israel, Dept. of Management and Industrial Engineering, College of Judea and Samaria, Ariel, 44837, Israel, avher@bezeqint.net

An entering customer to a service system has different utilities compared to an observer of that system. An entering customer never observes an empty system, while bases inquired costs on its transient waiting duration in the system. An observer on the other hand is interested in steady state queuing length as a design parameter of the system capacity, while bases inquired costs on the steady state accumulated inventory over time. We introduce a transient approach for both viewpoints.

5 - Using Operations Research to Design Large Scale Radio Telescopes

Lolke Schakel, MSc., University of Groningen, Postbus 800, Groningen, 9700 AV, Netherlands, L.P.Schakel@rug.nl, Diptesh Ghosh, Gerard Sierksma

Modern large scale radio telescopes usually consist of many antenna systems spread over a large geographical region, linked using high speed cables. The relative location of these antenna systems is critical for the imaging performance of the telescope. We present an algorithm that determines the relative location of antenna systems to achieve a given imaging reliability, and present our experiences in designing the LOFAR radio telescope, which contains 132 antenna systems.

Wednesday, 8:00 - 9:30am

■ WA01

Rio Mar Salon 1

Supply Chain III

Contributed Session

Chair: Namit Mehta, Consultant, Infosys Technologies Limited, 36 S 9th Street # 609, Minneapolis, MN, 55402, United States, namitmehta@gmail.com

- 1 - Efficient Optimal Buy-Back Contracts Under Asymmetric Information**
Chester Chambers, Asst. Professor, Southern Methodist University, Box 750333, Dallas, TX, 75275, United States, cchamber@cox.smu.edu, Eli Snir

We consider the use of buy-back contracts in a single supplier, multi-buyer supply chain in which the buyers have private information concerning the distribution of demand. We explain why screening is impossible for a large class of problems when the asymmetry deals with parameters of the demand distribution. We describe the terms of the optimal contract and explain what portion of the market the supplier should choose to serve.

- 2 - Challenges in Managing Supply Chains for Financial Sector Products (Pre-Paid Plastics)**

Namit Mehta, Consultant, Infosys Technologies Limited, 36 S 9th Street # 609, Minneapolis, MN, 55402, United States, namitmehta@gmail.com

Gift card is not only a new product for financial transactions but is redefining gifts. With innovative gift cards being launched, tremendous pressure is on its supply chain as they are perishable products and need to be sold before a certain expiry date (regulatory compliance). We discuss the challenges being faced in managing the supply chain of gift cards and list some effective techniques that can be used to improve the supply chain performance (minimizing the cost of product obsolescence).

■ WA02

Rio Mar Salon 2

Inventory Management

Contributed Session

Chair: Shao-ju Lee, Professor, National Dong-Hwa University, No. 1, Sect. 2 Da-Hsueh Rd., ShouFang, Hualien, 974, Taiwan, slee@mail.ndhu.edu.tw

- 1 - Heuristics for Inventory Optimization at Item-Family Level in a Multi-Echelon Arborescent Network**

Deepak Bhatia, Manager, Service Parts Planning, Applied Materials, 2821 Scott Blvd, MS1785, Santa Clara, CA, 95050, United States, deepak_bhatia@amat.com, Ted Noble, Arjun Subramaniam

We present heuristics for optimizing inventory at item-family level instead of item level in a multi-item, multi-echelon inventory optimization problem. Demand prediction techniques and commercial software for network optimization already utilize item-family level aggregation. Further motivation is provided by reduction in problem size which enables the integration of inventory and network optimization. We also analyze the sub-optimum penalty of this approach relative to the item level heuristic

- 2 - Rationalizing Safety Stock Management for Multiple High-Valued Items**

Shao-ju Lee, Professor, National Dong-Hwa University, No. 1, Sect. 2 Da-Hsueh Rd., ShouFang, Hualien, 974, Taiwan, slee@mail.ndhu.edu.tw

This study employs a simulation approach to examine the safety stock management of multiple high-valued items with different life-cycle patterns and demand volatilities. The study considers inventory models with various parameters, and seeks to dynamically allocate production capacity and joint safety stock constraints to achieve overall cost efficiency.

■ WA05

Rio Mar Salon 5

Decision Theory and Analysis

Contributed Session

Chair: Eric Smith, University of Missouri - Rolla, 1870 Miner Circle, 205 Engineering Management, Rolla, MO, 65409-0370, United States, erics@umr.edu

- 1 - Separate Criteria Weights From Outlier Cases in MCDM**

Eng Choo, Professor, Simon Fraser University, Faculty of Business Administration, Burnaby, BC, V5A1S6, Canada, choo@sfu.ca

Evaluating competing alternatives under conflicting criteria typically starts with a matrix with each alternative represented by a row of performance scores, the bigger the better. Criteria weights are derived to maximize the consistency between the overall scores of the alternatives, represented by weighted sums of the rows, and some predetermined rankings of the alternatives. In this paper, consistency is improved by eliminating "outliers" recursively to generate better criteria weights.

- 2 - Updating Claims in Bankruptcy Problems**

José M. Zarzuelo, UPV-EHU, F. CC. Económicas y Empresariales, Lehendakari Aguirre,83, Bilbao, 48015, Spain, josemanuel.zarzuelo@ehu.es, Justin Leroux, M. Josune Albizuri

In bankruptcy problems consistency has been helpful in characterizing some rules. Customarily, in the reduced problem the residual estate is defined as the difference between the original one and the sum of the rewards paid to the leaving agents, while the claims remain the same. We propose an alternative definition in which the claims are also updated in a natural way to characterize the "Random arrival" rule. In addition, we propose an extension of this rule to the NTU case.

- 3 - Multi-Attribute Trees From Different Perspectives**

Eric Smith, University of Missouri - Rolla, 1870 Miner Circle, 205 Engineering Management, Rolla, MO, 65409-0370, United States, erics@umr.edu

Multi-attribute trees are discussed from new perspectives. The uniqueness of attribute sets, as well as the hierarchical tree structures into which they are arranged, are described as being dependent on the attributes first chosen. Cognitive biases, such as packing and unpacking, and properties such as abstractness and concreteness, can affect the relative influence of adjacent levels in multi-attribute trees. Applications of multi-attribute trees are discussed.

■ WA06

Rio Mar Salon 6

Tutorial: Perl in an Hour

Cluster: Tutorials

Invited Session

Chair: Vernon Austel, Programmer, IBM, P.O. Box 218, Yorktown Heights, NY, 10567, United States, austel@us.ibm.com

- 1 - Tutorial: Perl in an Hour**

Vernon Austel, Programmer, IBM, P.O. Box 218, Yorktown Heights, NY, 10567, United States, austel@us.ibm.com

Perl is popular scripting language that makes it easy to change the format of a text file or extract information from it. One can accomplish a great deal using less than a page of code. This tutorial will introduce perl with simple but useful examples. Only a basic knowledge of regular expressions will be assumed.

■ WA07

Rio Mar Salon 7

Critical HP Resource Allocation Problems. HP Labs Reserchers will Present Computing, Workforce, and Spare Parts Resource Allocation Problems Tackled With Operations Research TechniquesSponsor: Interface of Computing Science & OR
Sponsored SessionChair: Pano Santos, Principal Scientist, HP Laboratories,
1501 Page Mill Rd, MS 1140, Palo Alto, CA, 94304, United States,
cipriano.santos@hp.com**1 - A Comparison Between Mechanisms for Sequential Compute Resource Auctions**Andrew Byde, HP Labs, Filton Road, Stoke Gifford, Bristol, BS348QZ,
United Kingdom, andrew.byde@hp.com

We describe simulations to test the relative efficiency of two different sequential auction mechanisms for allocating compute resources between users in a shared datacenter dedicated to CGI rendering, in which animators delegate responsibility for acquiring adequate compute resources to bidding agents that autonomously bid on their behalf. We apply a GA to a class of bidding strategies and use the performance of the evolved strategies to determine the most suitable auction type for this domain.

2 - High Dimensional Bin Packing for Resource ConsolidationAlex Zhang, HP, 1501 Page Mill Road, MS 1140, Palo Alto, CA,
94304, United States, alex.zhang@hp.com, Fereydoon Safai,
Marie-Jo Fremont

We apply several bin packing algorithms for determining the placements of a set of the workloads on target servers. Each workload is described by a time series on CPU utilization, disk I/O, network and other metrics, and a capacity constraint is placed for resource consumption at each interval in the time series. We will describe a new "least capacity increment" heuristic for bin packing, and present several variants of the problem and other practical issues in IT consolidation.

3 - Capacity and Capability Planning (CCP) for Consulting ServicesPano Santos, Principal Scientist, HP Laboratories, 1501 Page Mill Rd,
MS 1140, Palo Alto, CA, 94304, United States,
cipriano.santos@hp.com, Maria Teresa Gonzalez, Shailendra K. Jain,
Haitao Li

The CCP process defines a sourcing plan that maximizes gross margins and workforce utilization while considering internal and external workforce capacity and capabilities. We will present an LP based tool developed for the Consulting & Integration organization of HP Services. We will discuss the IT challenges to transfer OR methodology.

■ WA08

Rio Mar Salon 8

Tutorial: Healthcare Facility Evacuation – Plans, Requirements, and EffectivenessCluster: Tutorials
Invited SessionChair: Kevin Taaffe, Assistant Professor, Clemson University, 110 Freeman
Hall, Clemson, SC, 29634, United States, taaffe@CLEMSON.EDU**1 - Tutorials: Healthcare Facility Evacuation - Plans, Requirements, and Effectiveness**Kevin Taaffe, Assistant Professor, Clemson University, 110 Freeman
Hall, Clemson, SC, 29634, United States, taaffe@CLEMSON.EDU

All health care facilities are required to have evacuation plans in place. While there are many tools for hurricane or transportation modeling, none of these tools address the complications in carrying out the tasks in a health care facility evacuation. In this tutorial, we will discuss three key elements of the health care facility evacuation problem (staffing, transportation, and sheltering), and we will offer a quantitative-based methodology for measuring a plan's effectiveness.

■ WA09

Rio Mar Salon 9

Translating Academic Knowledge Into Practical Approaches for the IndustryCluster: Industry-Research Interface
Invited SessionChair: Christophe Oggier, Nestle Venezuela S.A., Edificio Polar, Plaza
Venezuela, Los Caobos, Apartado 3367, Caracas, A, 1010, Venezuela,
Christophe.Oggier@ve.nestle.com**1 - A Unified Network Efficiency/Performance Measure**Anna Nagurny, John F. Smith Memorial Professor, University of
Massachusetts at Amherst, Isenberg School of Management, Amherst,
MA, 01003, United States, nagurny@gbfin.umass.edu,
Qiang "Patrick"

In this paper, we propose the first network efficiency/performance measure that can be used to assess the efficiency of either fixed or elastic demand networks. The measure captures demands, flows, costs, and behavior of the network users and allows one to determine the criticality of the nodes and links and their importance and ranking. Applications of the new measure to transportation networks, supply chains, financial networks, electric power networks, and the Internet are given.

2 - Decision Analysis Tools for NestléChristophe Oggier, Nestle Venezuela S.A., Edificio Polar, Plaza
Venezuela, Los Caobos, Apartado 3367, Caracas, A, 1010, Venezuela,
Christophe.Oggier@ve.nestle.com, Emmanuel Fragniere

Nestlé has a long tradition in integrating Management Science Approaches in its day-to-day operations. However, some "translation" has been necessary to apply them in a business context. We will present through different real case studies how OR techniques have been successfully employed at Nestlé.

■ WA10

Rio Mar Salon 10

Marketing II

Contributed Session

Chair: Kambiz Heidarzadeh Hanzae, Assistant Professor of Marketing and
Head of Business Management Department, I.AU. (Science and Research
Branch) University, Ashrafee Esfahani Highway, Hesarak Road, Tehran,
Iran, heydarzadeh@iaucss.org**1 - Negative Political Advertising on Vote Outcome: An Investigation of 2000 Election**Hai Che, University of California at Berkeley, 545 Student Services
Building, #1900, Haas School of Business, Berkeley, 94720-1900,
United States, cheh@haas.berkeley.edu, Ganesh Iyer,
Ravi Shanmugam

Negative advertising in political campaigns has been especially timely. Using data sets from both voter surveys and advertising, we model voter choices in 2000 election. Our model contains both a voter choice and a political candidate campaign advertising model. We find evidence for a negative effect for negative ads in House races, which changes to a positive effect in Senate and Presidential races. We also model the campaign's choice of relative balances of negative and positive ads.

2 - Mathematical Models of Proximity Judgments and MDSAjay Manrai, Professor, University of Delaware, 217 Alfred Lerner
Hall, Department of Business Administration, Newark, DE, 19716,
United States, manraia@lerner.udel.edu, Lalita Manrai, Arjun Manrai

The inter brand proximity (similarity or dissimilarity) judgments made by consumers have played a critical role in obtaining perceptual maps in the marketing literature. Such maps are used in product positioning and market opportunity analysis. The paper reviews literature on major mathematical models of proximity judgments leading to various methodologies for multidimensional scaling. A new model of proximity judgment is presented and its properties and potential for MDS is discussed.

3 - Perception of Children's Influence Over Purchases: The Role of Parental Communication PatternsKambiz Heidarzadeh Hanzae, Assistant Professor of Marketing and
Head of Business Management Department, I.AU. (Science and
Research Branch) University, Ashrafee Esfahani Highway,
Hesarak Road, Tehran, Iran, heydarzadeh@iaucss.org

Socialization by children is seen as taking place within a socio-cultural environment where family patterns of communication play a pivotal role. The socio- and concept-orientation are two predominant parental communication styles that are likely to affect the perceived influence that children believe they hold. This study focuses on the perceived influence of children resulting from the communication pattern adopted by parents in I.R.Iran.

■ **WA11**

Caribbean Salon 1

Advances in Combinatorial and Integer ProgrammingCluster: Honoring the Legacy of Peter Hammer
Invited Session

Chair: Warren Adams, Professor, Clemson University, O-327 Martin Hall, Clemson, SC, 29634, United States, wadams@clemson.edu

1 - Recent Advances and Challenges in the Quadratic Assignment and Related Problems

Yi-Rong Zhu, University of Pennsylvania, 220 South 33rd Street, 270 Towne Building, Philadelphia, PA, 19104, United States, yrzhu@seas.upenn.edu

We present the inherent relationships of the (axial) three-dimensional assignment problem (3AP), the quadratic assignment problem (QAP) and the quadratic 3-dimensional assignment problem (Q3AP). The crucial link involves solving the 3AP as a QAP. We also report a new algorithm for a related problem, the generalized quadratic assignment problem (GQAP).

2 - Perfect Dominating Sets in Grid Graphs

Italo Dejter, Professor, University of Puerto Rico, Box 23355, San Juan, PR, 00931, Puerto Rico, ijdejter@uprrp.edu

A dominating set S in a graph G is said to be perfect if every vertex of G not in S is adjacent to exactly one vertex of S . Given a vertex subset S' of a side or maximum lateral path P_m of a grid graph G of side lengths m and n , the perfect dominating sets S of G with S' equal to the intersection of S and the vertex set of P_m can be determined via an exhaustive algorithm whose running time is $O(2^{m+n})$. This leads to a classification of such sets.

3 - Extensions to the Reformulation-Linearization-Technique (RLT)

Warren Adams, Professor, Clemson University, O-327 Martin Hall, Clemson, SC, 29634, United States, wadams@clemson.edu, Hanif Sherali

The RLT reformulates mixed 0-1 polynomial programs as mixed 0-1 linear problems with tight relaxations. It relies on the square of a binary variable equaling the variable. We extend the RLT to the integer case via Lagrange interpolating polynomials. Emphasis is given to new, simple algebraic proofs of the convex hull results.

■ **WA12**

Caribbean Salon 2

Facility Location and Production and Inventory Systems

Contributed Session

Chair: S. Ali Torabi, Tehran University of Tech., Engineering Dept., Tehran, Iran, satorabi@ut.ac.ir

1 - The Maximal Covering Problem with Some Negative Weights

Oded Berman, Professor, University of Toronto, 105 St. George Street, Toronto, ON, L4J 3B7, Canada, berman@rotman.utoronto.ca, George Wesolowsky, Zvi Drezner

In this paper we propose the maximal covering problem on a network when some of the weights can be negative. Integer programming formulations are proposed and tested on CPLEX. Heuristic algorithms: an ascent algorithm, simulated annealing are proposed and tested.

2 - A Dynamic Lot-Sizing Model With Substitution Options and Initial Inventory

Jan Christian Lang, Dipl.-Wirtsch.-Inform., Darmstadt University of Technology, Hochschulstr. 1, FB 1, FG BWL3, Darmstadt, 64289, Germany, jclang@bwl.tu-darmstadt.de

We consider a multi-period lot-sizing model that includes product substitution options. In contrast to existing models, both initial inventories and general substitution structures are incorporated. We show how to transform the model into a warehouse location problem. Based on this transformation, we develop a reformulation of the original model that can be solved efficiently using standard MIP solvers. Computational results are reported.

3 - An Analytical Model for Procurement-Production-Delivery Policy in a Three-Stage Supply Chain System

Naser Nikandish, Sharif University of Technology, No.17, Khodrokovir Building, Ketabi Sq., Golnabi St., Shariati Ave., Hemmat Junc., Tehran, Iran, n.nikandish@gmail.com, Kourosh Eshghi, S. Ali Torabi

This paper presents a mathematical model and its solution to integrate the procurement, production and delivery activities in a three-stage, multi-customer, multi-product supply chain. This chain consists of a single raw-material supplier, multiple manufacturers, and multiple retailers. The objective is to find the production sequences of multiple items in each manufacturer, the common production cycle length and the delivery frequencies and quantities of final products that minimize the total cost.

■ **WA13**

Caribbean Salon 3

Warehouse Design, Planning, and Control

Contributed Session

Chair: Sergio Maturana, Professor, Pontificia Universidad Catolica de Chile, Casilla 306 Correo 22, Depto. Ingenieria Industrial y de Sistem, Santiago, RM, Chile, smaturan@ing.puc.cl

1 - Optimal Zone Boundaries for Two-Class-Based Compact 3D AS/RS

Yugang Yu, Dr., RSM, Erasmus University Rotterdam, Room: T10-38, P.O. Box 1738, 3000 DR, Rotterdam, Netherlands, ygyums@gmail.com

The paper studies the optimal zone boundaries problem for a new 3D AS/RS (Automated Storage/Retrieval System) containing two storage zones: high turnover and low turnover by minimizing the travel time. A mix-integer nonlinear programming model is proposed to determine the boundaries, which then be solved a decomposition algorithm and one dimension-search. The optimal result is obtained in closed-form. The results are compared with random storage, and show its significant travel time reduction.

2 - Layout Evaluation of Large Capacity Warehouses

Jose Ignacio Huertas, Professor, ITESM Campus Toluca, Eduardo Monroy Cárdenas 2000, San Antonio Buenavista, Toluca, ME, 50110, Mexico, jhuertas@itesm.mx, Jenny Diaz, Federico Trigos

We present a model to estimate and evaluate the operational costs of alternative layouts for large capacity warehouses with large variety of goods. The proposed model is based on time and resources studies per each of the basic activities on a warehouse operation. For validation purposes, it was applied on a perishable goods warehouse in Mexico. Performance measures were operational costs and average picking time.

3 - Simple Procedures for Warehouse Layout Optimization

Kees Jan Roodbergen, RSM Erasmus University, P.O. Box 1738, Rotterdam, 3000 DR, Netherlands, kroodbergen@rsm.nl

We propose a spreadsheet-based approach to determine travel distances for the order picking problem in warehouses. By combining aspects from simulation and statistical estimates, layout optimizations can be performed with a general purpose spreadsheet program. Furthermore, travel times can be estimated for situations for which no suitable estimate was available.

4 - The Impact of Order Batching and Zoning on Order Picking System Performance

Mengfei Yu, RSM, Erasmus University, Room T10-46, Burg.Oudlaan 50, P.O. Box 1738, Rotterdam, 3000 DR, Netherlands, myu@rsm.nl, René de Koster

We propose an approximation model based on queueing theories to analyze the impact of order batching and picking area zoning on the mean order throughput time in an order picking system. We derive the first and second moment of service times at zones and the visit probability of a batch of orders to a zone. We obtain the mean throughput time of an order in the order-picking system. Results from simulation show that this approximation model provides acceptable accuracy for practical purposes.

5 - A Dimensioning Method for Supporting Distribution Center Design

Sergio Maturana, Professor, Pontificia Universidad Catolica de Chile, Casilla 306 Correo 22, Depto. Ingenieria Industrial y de Sistem, Santiago, RM, Chile, smaturan@ing.puc.cl, Mauricio Tapia

Designing distribution centers and warehouses is a complex task that has to take into account many different aspects. We propose a dimensioning method that helps determine the type and quantity of handling equipment that will be required by a distribution center to meet the projected requirements and material flows. The ABC classification method is used to estimate the fast pick area. We illustrate using a real case how this method is integrated into the distribution center design process.

■ **WA15**

El Morro 2

Military OR II

Contributed Session

Chair: Leticia J. Pacheco, PhD, Operations Research Analyst, Operational Technologies Corp., 4100 NW Loop 410, Ste 230, San Antonio, TX, 78245, United States, leticia.pacheco@otcorp.com

1 - The Defense Offset Technology Valuation(DOV) Model of DTAQ in ROK

Won Joon Jang, Ph.D in Economics, Offset Program Manager, DTAQ(Defense Technology and Quality), 101-708 Greenpark Apt., Seobinggo-dong, Yongsan-gu, Seoul, 140-240, South Korea, wjjang47@snu.ac.kr, Tae Yun Joung

It is important to develop an objective and credible valuation model in defense trade world today. By undertaking various technology valuation approaches, The offset technology valuation (DOV) model in DTAQ is presented as an effective valuation approaches in defense trade fields. The contribution of the paper is in applying various valuation approaches to the offset valuation fields with empirical applications between ROK and other countries in 2006.

2 - Co-Assignment of Occupational Specialties Across Air Force Bases

Leticia J. Pacheco, PhD, Operations Research Analyst, Operational Technologies Corp., 4100 NW Loop 410, Ste 230, San Antonio, TX, 78245, United States, leticia.pacheco@otcorp.com,
William E. Alley, PhD, C. Wayne Shore, PhD, Randy Agee

As part of an initiative to more effectively utilize Air Force resources, a consolidation effort to revise Air Force Specialty Codes is being reviewed. The objective is to optimize resource allocation through restructuring while considering the logistical and financial implications of doing so. The authors develop a methodology to facilitate the selection of merger candidates by employing a quantitative approach using empirical data on AF enlisted personnel assigned to specific locations.

■ WA16

San Cristobal

Auctions

Cluster: Auctions
Invited Session

Chair: S. Raghavan, Associate Professor, The Robert H. Smith School of Business, University of Maryland, University of Maryland, College Park, MD, 20742, United States, raghavan@umd.edu

1 - Preemption and Jump Bidding - The Case Against Information Aggregation

Vlad Mares, Assistant Professor, Olin School of Business, One Brookings Drive, Campus Box 1133, St. Louis, MO, 63120, United States, mares@olin.wustl.edu

This paper constructs an integrated model of preemption and joint bidding in open auctions. Bidder's differentiated sensitivities to the information revealed in the auction process provides incentives to manipulate and censor the price formation process in their favor by using simple devices like opening bids or discrete jumps. In doing so, they affect both the expected price and the allocation of the asset. Increased competition can actually strengthen these incentives.

2 - Non-linear Effect of Reserve Prices on Selling Prices in Online Auctions

Peter Popkowski Leszczyc, Associate Professor of Marketing, University of Alberta, 4-20 F School of Business, Edmonton, AB, T6G 2R6, Canada, ppopkows@ualberta.ca, Dawit Zerom

We propose a partially linear model (PLM) that allows explicitly for a possible non-linear effect of the reserve price on the selling price in internet auctions. The PLM simultaneously incorporates a non-linear effect of reserve prices, endogeneity of number of bidders, and the censoring of the selling price.

3 - Charitable Intent and Bidding in Charity Auctions

Peter Popkowski Leszczyc, Associate Professor of Marketing, University of Alberta, 4-20 F School of Business, Edmonton, AB, T6G 2R6, Canada, ppopkows@ualberta.ca, Michael Rothkopf

We modeled charity auctions and conducted controlled and uncontrolled online field studies of them. In controlled experiments, charity auctions had fewer bidders but higher revenue than non-charity auctions. Bidders in them acted like volunteer skills, increasing prices. Bidders paid relatively higher prices for frivolous items and for "common value" items. Auctions with 25% of revenue donated to charity had higher net revenue than non-charity auctions, suggesting that doing good while doing well is possible.

4 - Bid Optimization in Sponsored Search Auctions

S. Raghavan, Associate Professor, The Robert H. Smith School of Business, University of Maryland, University of Maryland, College Park, MD, 20742, United States, raghavan@umd.edu, Abhishek Pani

In the last five years, internet search based ads have been the fastest growing segment in the entire advertising domain. Potential advertisers provide their valuations for various keywords and also, specify overall budget for a period of time. The search operator, then, solves a multi-unit allocation problem with the specified bidder values and budgets, and determines two things - the order to place the ads and the amount to charge the respective bidders. The advertisers, on the other hand, regularly solve a bid determination problem for the various keywords, given budget and other constraints. The advertiser's problem can be viewed as a large-scale multiple choice knapsack problem. We first discuss the properties of the optimal solution to the linear relaxation. We then develop a branch and price approach that is computationally viable for a large scale multiple choice knapsack problem.

■ WA17

Egret

Programming, Linear and Integer

Contributed Session

Chair: Arnav Sheth, Doctoral Student, Rutgers Business School, 94 Rockefeller Rd, Piscataway, NJ, 08854, United States, shetha@andromeda.rutgers.edu

1 - Financial Distress, Competition and Free Cash Flow: Optimal Operating Strategies

Arnav Sheth, Doctoral Student, Rutgers Business School, 94 Rockefeller Rd, Piscataway, NJ, 08854, United States, shetha@andromeda.rutgers.edu

We solve a series of stochastic control problems for a firm whose cash flows are a diffusion process (X_t) using a combination of martingale theory, Itô calculus and linear programming. Our methodology provides for a quick and easy way by which this class of stochastic control problems can be solved. Although we do not have explicit solutions in all the cases, we provide them where possible.

■ WA18

Heron

Enterprise Mobility and Interoperability

Cluster: Services Research
Invited Session

Chair: Jeffrey Tew, General Motors, 30500 Mound Rd, MC 480-106-359, Warren, MI, 48090, United States, jeffrey.tew@gm.com

1 - Locating Hospital Equipment Using RFID

Gary Gaukler, Assistant Professor, Texas A&M University, Zachry Engineering Center 239A, College Station, TX, United States, gaukler@tamu.edu

Immediate access to medical equipment such as IV pumps and defibrillators is essential in any hospital environment. However, experience has shown that during high-stress emergency situations, this kind of equipment frequently gets misplaced. RFID is one technology that can allow hospital personnel to quickly locate equipment and thus increase service level. This talk presents an analysis of the use of RFID in such an environment.

■ WA19

Sea Gull

Economics, Societies and Transition II

Contributed Session

Chair: Godwin Udo, Professor of CIS, University of Texas at El Paso, 500 W University Avenue, IDS Department, El Paso, TX, 79968, United States, gudo@utep.edu

1 - Thermodynamic Modelling for Social Science Problems

Dennis Collins, Professor, Dept. of Math, Box 9018, UPR-Mayagüez, Mayagüez, PR, 00681-9018, Puerto Rico, d_collins_pr@hotmail.com

The presentation discusses some of the author's thermodynamic models for social science problems, such as mergers and war vs. peace, unemployment vs. employment, and moral codes.

2 - Evolutionary Economics of Incumbent's Defense Strategies

Eugen Scheinker, University of Muenster, Leonardo Campus 18, 48149, Germany, scheinker@ism.uni-muenster.de, Thomas Ehrmann

A significant stream of IO and strategic management research is related to incumbents' defense strategies against new competitors. However, discrepancies between game-theoretic models and empirical insights emerge. Our paper provides an innovative analytical framework for analysis of retaliatory behaviour of firms. We draw upon an epidemic model from biology that uses evolutionary techniques and apply the model to a multi-phase entry process.

3 - An Overview of the State-of-the-Art of Pervasive Computing

Godwin Udo, Professor of CIS, University of Texas at El Paso, 500 W University Avenue, IDS Department, El Paso, TX, 79968, United States, gudo@utep.edu

The Internet era caused computers to appear in almost everywhere humans exist. The era of pervasive computing is now causing computers to disappear and to be integrated into human lives and the environment. Smart dusts, wearable processors, smart everyday items, RFID, etc. are few evidences of the new era. The state-of-the-art of pervasive computing and the ensuing security, privacy, trust and other social issues will be discussed.

■ WA20

Parrot

Graphs and Networks I

Contributed Session

Chair: Robert Taft, Mathematician, Naval Surface Warfare Center, Code K61, 17320 Dahlgren Road, Dahlgren, VA, 22448, United States, robert.l.taft@navy.mil

1 - Some Topological Indices in Hypercube

Behzad Manoochehrian, Academic Center for Education, Culture, and Research, Kordestan Highway, 26th Ave., #6, Tehran, Iran, behzad@khayam.ut.ac.ir

From the graph-theoretical point of view, a hypercube, Q_n , has vertices and edges. On the other hand, topological indices are graph invariants which are all related to the concept of distance in graphs. Although, topological indices have mostly been introduced because of their applications in Chemistry, Material Science, and other related fields; but we study some of them in hypercube theoretically.

2 - Aggregating Performance Measures of a Multi-Echelon Supply Chain With the Analytical Network Process

Julie Drzymalski, PhD Candidate, Lehigh University, 200 W. Packer Ave, Bethlehem, PA, 18015, United States, jud204@lehigh.edu, N.G. Odrey

Performance measures (PMs) of a multi-echelon supply chain (SC) assist SC Managers in making strategic decisions and are an aggregation of the PMs of the SC members. Traditional hierarchical techniques are inaccurate as they do not account for dependencies within the SC. A two-dimensional approach is taken using the Analytical Hierarchy Process with the Analytical Network Process to overcome this. Intra-dependency of each member and interdependency between echelons are considered.

3 - A Simple Model of Disease Propagation Using Graphs (for H.I.V.)

Jorge Diaz-Castro, student, University of Puerto Rico at Rio Piedras, Calle Reverendo Francisco Colon #60, Rio Piedras, PR, 00925, United States of America, jdiaz_castro@hotmail.com

It can be shown that every planar map can be converted to a graph, that is unique (a surjective function). We should consider a disease with high incidence and prevalence rates, and trustworthy statistics. We consider six variables: the mortality rate, the birth rate, the immigration rate, the emigration rate, and the incidence and prevalence of the disease we want to model (H.I.V.). H.I.V. infection and control is one of the paramount health problems we will be facing in the 21st century.

4 - Using Network Actor's Prestige Measure as a Predictor of Finish in Soccer Leagues

Robert Taft, Mathematician, Naval Surface Warfare Center, Code K61, 17320 Dahlgren Road, Dahlgren, VA, 22448, United States, robert.l.taft@navy.mil

Within a division of a youth soccer league the teams are considered as nodes in a network. The game scores are used to produce a prestige score for the link connecting the teams that played. After each play date, once the network is connected, these arc weights are used to produce prestige centrality measures for all teams. We then measure the power of these interim rankings as predictors of the final rankings. Scores from two divisions of youth soccer teams are analyzed.

■ WA21

Canary

Simulation II

Contributed Session

Chair: Vivek Gupta, Georgia Institute of Technology, 6640 Akers Mill Road, Apt #3526, Atlanta, GA, 30339, United States, vkg378@gmail.com

1 - An Approach to Modelling Domain-Wide Information Based on Limited Points' Data

Chris Smith, Student, University of the West Indies, Cave Hill Campus, Bridgetown, BB, BB11000, Barbados, csvideo@hotmail.com, John Charley

Predicting unknown data points in a region with only a few known ones is an intriguing problem. Although interpolation methods used today are widespread, none of them considers historical data. This work presents an approach which relies on the historical relationships existing among the data points in a region of interest. From these linkages, the proposed algorithm seeks to determine the unknown values of all the data stations when as few as only one value within the domain area is known.

2 - Modeling of Maintenance Within Discrete Event Simulation

Sheo Misra, Consultant, Misra Associates, 5 Catalpa Street, Morgantown, WV, 26505-3677, United States, misra@icdi.wvu.edu

This paper presents an approach to modeling maintenance activity within discrete event simulation that uniquely achieves fidelity required to investigate Maintenance Free Operating Period (MFOP) concepts, yet its use is not restricted to MFOP applications. The paper describes MFOP and identifies key factors determining its achievements. Maintenance factors are then expanded, particularly with regard to managerial and technical challenges affecting diagnosis, anticipation, and control of maintenance activity.

3 - A Simulation Based Analysis of Information Sharing in a Multi-Product Environment

David Claudio, PhD Student, The Pennsylvania State University, 102 Ray Hall, White Course Apartments, University Park, PA, 16802, United States, dave.claudio@psu.edu, Ananth Krishnamurthy

This paper investigates the benefits of asymmetries in sharing advance demand information in a multi-product setting. Simulation experiments are used to identify the impact of such asymmetries on performance metrics of interest. Comparisons are also made with systems where information sharing is symmetric.

4 - Linear Regression and Other Linear Combination Techniques for Spectral Estimators

Vivek Gupta, Georgia Institute of Technology, 6640 Akers Mill Road, Apt #3526, Atlanta, GA, 30339, United States, vkg378@gmail.com, Sigrún Andradóttir, David Goldsman

In this paper, we obtain spectral estimators with reduced variance by linearly combining estimators at different window sizes. We also present a linear regression based approach to obtain a good value for window parameter.

■ WA22

Pelican

E-Business/Commerce

Contributed Session

Chair: Yuu Hi Sai, The Kyoto College of Graduate Studies for Informatics, 7 Monzen-cho, Tanaka, Sakyo-ku, Kyoto-city, Japan, m06w0005@m1.kcg.edu

1 - Proxy Server for Protecting Privacy by Distributing Information and its Evaluation

Shozo Naito, The Kyoto College of Graduate Studies for Informatics, 7 Monzen-cho Tanaka Sakyo-ku, Kyoto, 606-8225, Japan, s_naito@keg.ac.jp, Makoto Miyamoto, Makoto Hirose, Hong Seung Ko, Yasuyoshi Yamashita, Tomokazu Kamigaki

Protecting privacy and personal information in the Internet comes to be an important issue in the field of information security. We propose a new solution through the way where information necessary for each server in completing the whole service is encrypted using the individual public key of the server and distributed by the proxy server. Details of the implementation and its performance evaluation are presented. Problems to be remained for real use are also discussed.

2 - Information Technology Diffusion Patterns in Sub-Saharan Africa: The Case of Ghana

Kweku Ewusi-Mensah, Professor, Loyola Marymount University, College of Business Admin, One LMU Dr, MS 8385, Los Angeles, CA, 90045, United States, kewusi@lmu.edu

Information technology is credited with the significant increase in the level of economic development experienced in many countries and regions of the world in the modern information economy except, perhaps, sub-Saharan Africa (SSA). The paper examines the diffusion patterns for IT in the public and private sectors of the Ghanaian economy. The paper discusses diffusion and adoption trends in hardware, software, and data communications. The problems associated with IT diffusion in the country are discussed. Some prescriptive suggestions are offered to help address those problems.

3 - Viewing the Discontents of Globalization from the Other Side: A Question of Parity

Pracheta Mukherjee, Mukherjee Associates, 20 West Cooper Street, Slippery Rock, PA, 16057, United States, pracheta@aol.com

Recent critiques of globalization by Stiglitz, Sassen and others have taken a Western stance. Here, a view from India is presented which is rooted in the idea of parity/disparity and highlights the basic asymmetries in the North-South commercial relationship and how it might play out in the medium term.

4 - A Strategic Customer Relationship Marketing Model for Retaining Customers on e-business

Yuu Hi Sai, The Kyoto College of Graduate Studies for Informatics, 7 Monzen-cho, Tanaka, Sakyo-ku, Kyoto-city, Japan, m06w0005@m1.kcg.edu, Ken Niho, Hong Seung Ko, Tomoko Shikama, Kazu Iwasaki

Retaining customers than acquiring them on the website is the critical issue for e-business. This is the reason why we propose our Strategic Customer Relationship Marketing Model using email as the most cost-effective and strong tool for customer retention on e-business. In our paper we also shed light on the field of relationship and communication, because only through favorable communication, we can establish long-term relationship with royal customers for retaining customers.

Wednesday, 10:00 - 11:30am

■ WB02

Rio Mar Salon 2

Accounting

Contributed Session

Chair: Tzu-Ching Ou, National Sun Yat-Sen University, No.70, Lianhai Rd., Gushan District., Kaohsiung City, Taiwan, o_paper@yahoo.com.tw

- 1 - Optimization Models for Use of Aircraft Deicing and Anti-Icing Fluids**
Evangelos Kaisar, Florida Atlantic University, 777 Glades Rd., Boca Raton, FL, 33486, United States, ekaisar@fau.edu, Ramesh Teegavarapu

Use of aircraft deicing and anti-icing fluids for removal of ice and limiting the ice-formation respectively on aircrafts at airports is common practice. Mathematical programming models are developed for optimal use of aircraft-de-icing and anti-icing fluids. Mixed integer non-linear programming considering a variety of objectives with exhaustive sets of system constraints are developed. A real-life case study system will be used for testing the optimization formulations.

- 2 - Policy in the Technology Innovation Diffusion Process: A Study on the Early RFID Adopters in Taiwan**

Tzu-Ching Ou, National Sun Yat-Sen University, No.70, Lianhai Rd., Gushan District., Kaohsiung City, Taiwan, o_paper@yahoo.com.tw, Ping-Yu Chu

RFID has been highly appreciated in various industries, one of the most significant automation technologies. Taiwan launched government-sponsored RFID development program and has helped "how many" companies to adopt RFID since 2001. This study surveyed 30 government-sponsored companies to analyze factors affecting these early RFID adopters' decisions such as OC, CE, and TB. We also discussed the impacts of policy design and intervention on the RFID innovation diffusion process in Taiwan.

■ WB03

Rio Mar Salon 3

Supply Chains and the Environment

Cluster: Supply Chain Optimization

Invited Session

Chair: Anna Nagurney, John F. Smith Memorial Professor, University of Massachusetts at Amherst, Isenberg School of Management, Amherst, MA, 01003, United States, nagurney@gbfin.umass.edu

- 1 - Spatially Differentiated Trade of Permits for Multipollutant Electric Power Supply Chains**
Trisha Woolley, Doctoral Student, Isenberg School of Management, University of Massachusetts at Amherst, Amherst, MA, 01003, United States, twoolley@som.umass.edu, John Stranlund, Anna Nagurney

We consider electric power supply chain networks with a tradable pollution permit system in the case of multiple pollutants and spatially distinct receptor points. We formulate the equilibrium conditions as a finite-dimensional variational inequality. We describe a computational procedure that exploits the structure of the problem and present numerical examples.

- 2 - Closed-Loop Supply Chain Network Equilibrium Under EU Recycling Legislation**

David Hammond, Portsmouth University, Department of Mathematics, Portsmouth, United Kingdom, David.Hammond@port.ac.uk, Patrick Beullens

European Union legislation on 'Waste of Electric and Electronic Equipment' (WEEE) aims at reducing "the quantity of waste from electrical and electronic equipment and increase its re-use, recovery and recycling". Through investigation of closed-loop supply chain network equilibria, this presentation questions the robustness of the current guise of the WEEE.

- 3 - Dynamics of Supply Chain Networks With Corporate Social Responsibility**

Jose Cruz, Assistant Professor, University of Connecticut, School of Business, Storrs, CT, 06269, United States, jcruz@business.uconn.edu

We develop a dynamic framework for the modeling and analysis of supply chain networks with corporate social responsibility. We model the multicriteria decision-making behavior of the various decision-makers, which includes the maximization of profit, the minimization of emission, and the minimization of risk. We explore the dynamic evolution of the product flows, the prices, as well as the levels of social responsibility activities. We illustrate the model with numerical examples.

- 4 - Sustainable Supply Chain and Transportation Networks**

Anna Nagurney, John F. Smith Memorial Professor, University of Massachusetts at Amherst, Isenberg School of Management, Amherst, MA, 01003, United States, nagurney@gbfin.umass.edu, Zugang Liu, Trisha Woolley

In this paper, we prove that a new supply chain model with multiple tiers of decision-makers with environmental concerns can be reformulated and solved as an elastic demand transportation network equilibrium problem. This equivalence allows for a new interpretation of the governing supply chain equilibrium conditions in terms of paths and path flows. Numerical supply chain examples are presented for illustration purposes.

■ WB05

Rio Mar Salon 5

Decision Analysis

Contributed Session

Chair: Tim Elkins, Force Transformation, United States Military Academy, Department of Systems Engineering, West Point NY 10996-1779, United States of America, timothy.elkins@usma.edu

- 1 - Case Study: A Quantitative Decision Making Model for Manufacturing Outsourcing**

Ahmed Abdelrahim, Assistant Professor, Abu Dhabi University, P.O. Box 59911, Abu Dhabi, United Arab Emirates, ahmed.abdelrahim@adu.ac.ae

In today's competitive market, there is an ongoing trend for outsourcing, hence there is a serious need for a rational decision making process that takes into consideration all the political, social, risk, economical, and financial factors. In this paper a quantitative outsourcing decision-making model is introduced. The model takes into account the factors that affect the outsourcing decision by providing a quantitative measure for ranking potential countries as candidates for outsourcing.

- 2 - Human Behavioral Model in Menu Selection Using Hidden Markov Model**

SeokWon Lee, Student, Korea University, Anam-dong Seongbuk-Gu, Seoul, Korea, Seoul, 136-701, South Korea, wooritj@korea.ac.kr, Rohae Myung, HongChul Lee

In order to predict subject's decision making in selecting a right menu target, human behavioral studies have been conducted. However, in this study, Hidden Markov Model (HMM) was introduced to model human behavioral activities in menu selection in cell phones. The results showed that HMM could be used to help design the optimal menu structure.

- 3 - Balancing Security versus Accessibility of Army Research Databases**

Tim Elkins, Chair, Force Transformation, United States Military Academy, Department of Systems Engineering, West Point, NY, 10996-1779, United States of America, timothy.elkins@usma.edu

The Army maintains a number of research databases that are unclassified and available to the public. The intention was to allow the DoD as well as the non-DoD community to utilize this knowledge. However, as our adversaries have become more technically capable, there has been a growing concern over security of the information contained in these databases and its potential malicious use. A systems decision analysis approach is employed to ascertain the correct.

■ WB06

Rio Mar Salon 6

Tutorial: Systems Decision Process

Cluster: Tutorials
Invited Session

Chair: Gregory Parnell, Professor of Systems Engineering, United States Military Academy, Mahan 432, West Point, NY, 12520, United States, Gregory.Parnell@usma.edu

1 - Tutorial: Systems Decision Process

Gregory Parnell, Professor of Systems Engineering, United States Military Academy, Mahan 432, West Point, NY, 12520, United States, Gregory.Parnell@usma.edu

We present a systems decision process for determining solutions to problems with uncertainties, complex alternatives, conflicting objectives, and significant resource implications. The process phases are problem definition, solution design, decision making, and solution implementation. The process uses systems thinking, modeling, multiobjective decision analysis, optimization, simulation, life cycle costing, and project management techniques. An example is given using Excel macros and add-ins.

■ WB07

Rio Mar Salon 7

Exploitation of Structure for Search

Sponsor: Interface of Computing Science & OR
Sponsored Session

Chair: Meinolf Sellmann, Assistant Professor, Brown University, P.O. Box 1910, Providence, RI, 02912, United States, sello@cs.brown.edu

1 - Typical Case Hardness in Combinatorial Search

Carla Gomes, Cornell, gomes@cs.cornell.edu

We will discuss typical case hardness of combinatorial problems, considering both decision and optimization problems.

2 - A Constraint Programming Model and Strategy for Inventory Matching Problems

Philippe Refalo, ILOG, Les Taissounieres, 1681 Routes des Dolines, Sophia Antipolis, 06560, France, prefalo@ilog.fr

A constraint programming approach based on a large neighborhood search method is applied to inventory matching problems. We show how impact-based strategies can recover some of the structural information of the problem. The effect of symmetry breaking constraints as well as the neighborhood structure are studied and we present some results on realistic instances.

3 - Large Neighborhood Search for Large-Scale Vehicle Routing Problem

Pascal Van Hentenryck, Brown University, Providence, RI, pvh@cs.brown.edu

This talk considers large-scale vehicle routing problems with time windows. It shows how to exploit their spatial and temporal structure with large neighborhood search. Experimental results show benefits both in finding high-quality solutions quickly and in improving best-known solutions.

4 - Disco Novo GoGo: Learning Better Value Orderings During Search

Meinolf Sellmann, Assistant Professor, Brown University, P.O. Box 1910, Providence, RI, 02912, United States, sello@cs.brown.edu, Carlos Ansotegui, 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.

■ WB08

Rio Mar Salon 8

Data Mining/Machine Learning

Contributed Session

Chair: Kaizhi Tang, Research Scientist, Intelligent Automation, 15400 Calhoun Dr., Rockville, MD, 20855, United States, ktang@i-a-i.com

1 - Discrete Choice Modeling: Analysis of Consumer Decisions

John Ang, Merchandise Research Analyst, AutoZone, 123 S Front St, Dept 9013, Memphis, TN, 38103, United States, john.ang@autozone.com

Discrete choice modeling involves the prediction of an individual's response given a discrete set of alternatives, where one and only one decision must be made. The discrete choice model attempts to explain the relationship between a set of attributes that define the alternatives, and the eventual response of the consumer. This paper postulates a formulation based on utility theory, utilizes mathematical optimization to generate solutions, and interprets them accordingly.

2 - High-Dimension Data Mining Techniques Applied in Bioscience

Kaizhi Tang, Research Scientist, Intelligent Automation, 15400 Calhoun Dr., Rockville, MD, 20855, United States, ktang@i-a-i.com, Jiawei Han, Atul Phadke

With the rapid progress of sensor, wireless, biomechanics, anthropometry, digital human modeling, and computer technologies, enormous amounts of data have been collected from multiple sources. An imminent task is to transform those data to high-level knowledge that would allow a quick response to "What If" questions. Working with US Air Force research lab, we developed a knowledge discovery tool named ABMiner (Air-Borne) for in-depth analysis of bioscience data.

■ WB10

Rio Mar Salon 10

Marketing III

Contributed Session

Chair: Wen Yin, Adelphi University, 1 South Avenue, Garden City, NY, 11530, United States, yin@adelphi.edu

1 - Predicting Movie Attendance Using Text Mining of Movie Reviews

Dirk Van den Poel, Professor of Marketing, Ghent University, Tweeckerkenstraat 2, Gent, B-9000, Belgium, dirk.vandenpoel@UGent.be

New movies are typically being reviewed by several national US newspapers. This textual information is analyzed by text-mining software. These data can be supplemented with all the other publicly available data such as estimated advertising budget, names of director as well as actors. All these variables are being integrated into one decision support system to predict total movie attendance (www.crm.UGent.be).

2 - Internal and External Market Signaling in New Product Development and Introduction

Ashutosh Prasad, Assoc. Professor, The University of Texas - Dallas, School of Management, SM 32, Richardson, TX, 75083, United States, aprasad@utdallas.edu, Robert Peterson, Barry Mishra

Two market signaling activities undertaken during new product development and introduction are internal marketing, defined as communication directed at a firm's employees to convince them to exert substantial effort, and external marketing, defined as communication directed at potential buyers to convince them of the product's quality and encourage them to purchase it. An integrated model of these activities is analyzed to determine their optimal levels and ratio in a new product introduction.

3 - Financial Services Marketing Channel: The Case of Customers' Search for the Best Terms

Wen Yin, Adelphi University, 1 South Avenue, Garden City, NY, 11530, United States, yin@adelphi.edu

Customers' search for the best terms would directly determine their consequent investment and loan borrowing decisions and hence customer loyalty and cross-buying. The study intends to find out determinants of customers' usage of different channels and whether the amount of effort customers input is related to the channel that the customers employ by using ordered Probit models to aid financial services in leveraging their resources across different channels.

■ WB12

Caribbean Salon 2

Multiobjective Algorithms

Contributed Session

Chair: Radjef Sonia, University USTO, Algeria, Dept. Maths, Faculty of Science, USTO, Oran, Algeria, sonia.radjef@caramail.com

1 - A Perturbation Algorithm to Solve Multi-valued Implicit Complementarity Problems

Vyacheslav Kalashnikov, ITESM (Tecnologico de Monterrey), Av. Eugenio Garza Sada 2501 Sur, Monterrey, NL, Mexico, slavkamx@mail.ru, Nataliya Kalashnykova

We present an algorithm solving multi-valued implicit complementarity problems using a perturbation approach. Existence of solutions to a perturbed multi-valued implicit complementarity problem with parameters is established, and the convergence of solutions of the perturbed problem to a solution of the original problem is demonstrated.

2 - Direct Support Method to Solution a Multiobjective Quadratic Convex Program with Bounded Variables

Radjef Sonia, University USTO, Algeria, Dept. Maths, Faculty of Science, USTO, Oran, Algeria, sonia.radjef@caramail.com

We present a new method of resolution of a multi-objective convex quadratic program with bounded variables. The method is based on the principle of scalarization of objectives and on the direct support method. This last method is known in mono-objective programming and developed by the Russian professors R. Gabassov and F.M Kirillova. His particularity is the fact it handles the bounds of variables as they are initially presented.

■ WB13

Caribbean Salon 3

Reverse Supply Chains

Contributed Session

Chair: Sudheer Gupta, Simon Fraser University, Faculty of Business, 8888 University Drive, Burnaby, BC, V5A 1S6, Canada, sudheerg@sfu.ca

1 - Process Planning for Sustainable Decisions in Reverse Logistics System (RLS)

Subhash Wadhwa, Professor, IIT New Delhi, DEpt of Mechanical Engineering, IIT Delhi, New Delhi, De, 110016, India, jitman77@yahoo.com, Jitendra Madaan

This paper investigates the green approaches leading to the development of an integrated reverse logistics system. In order to develop green process as a competitive initiative, various approaches have been proposed; including the calculation of ecological impact factor i.e. Green Impact Factor GIF for reverse logistics system. An example is shown to highlight the procedure of the proposed method. This case example illustrates suitability of a green process selection decisions in RLS.

2 - Product Durability and Channel Choice under Extended Producer Responsibility

Sudheer Gupta, Simon Fraser University, Faculty of Business, 8888 University Drive, Burnaby, BC, V5A 1S6, Canada, sudheerg@sfu.ca

As environmental concerns mount, an increasing number of durable goods fall under the umbrella of extended producer responsibility (EPR). We examine the impact of EPR policies on manufacturers' choice of optimal product durability and channel coordination incentives. We show how some commonly used contractual forms, such as two-part tariffs, quantity discounts, leasing, and buy-backs perform under EPR and their effect on the manufacturer's incentive to practice planned obsolescence.

■ WB15

El Morro 2

OR in Weather Prediction

Cluster: OR in Environment

Invited Session

Chair: Nazario D. Ramirez Beltran, Professor, University of Puerto Rico, P.O. Box 9043, Mayagüez, PR, 00680, Puerto Rico, nazario@ece.uprm.edu

1 - Statistical Techniques to Detect Climate Changes Over Caribbean Basin

Nazario D. Ramirez Beltran, Professor, University of Puerto Rico, P.O. Box 9043, Mayagüez, PR, 00680, Puerto Rico, nazario@ece.uprm.edu, Oswaldo Julca Benites, Jorge Gonzalez

This work introduces a tool to determine without ambiguity when climate change occurs. The Northern Hemisphere and the Caribbean have shown a significant increment of minimum air temperature starting in 1970 and 1995 respectively. Sea levels have shown a significant increment at the same time. Global and Caribbean cloud cover were studied and a sequential statistical test introduced to detect when significant climate change has occurred by removing the autocorrelation structure of the process to determine when the fingerprint of the process exhibits a significant change.

2 - Time Series Models to Predict Hurricane Tracks

Nazario D. Ramirez Beltran, Professor, University of Puerto Rico, P.O. Box 9043, Mayagüez, PR, 00680, Puerto Rico, nazario@ece.uprm.edu, Joan Manuel Castro

A multivariate time series model is used to predict hurricane tracks in the North Atlantic basin. Two types of data sets are developed to build the prediction scheme. The first data set and a self organized neural network (NN) with the Kohonen learning rule identify the storm analogs. Then the second set of data is developed. An algorithm is used to identify the optimal lags and the best three variables that best explain hurricane displacement. A different model is built every 6 hours. Preliminary results show that this scheme has potential to increase accuracy of displacement prediction.

3 - Validation and Enhancing the Radar Rain Rates for Puerto Rico

Nazario D. Ramirez Beltran, Professor, University of Puerto Rico, P.O. Box 9043, Mayagüez, PR, 00680, Puerto Rico, nazario@ece.uprm.edu, Robert Kuliowski, Joan Manuel Castro, Sandra Cruz-Pol, Mara Ortiz

Improving rainfall estimates during heavy storms is especially important to save human lives and to protect property. Puerto Rico has been selected as test bed due to its extremely climatologically diverse terrain, dense rain-gauge network and severe rainstorms. An algorithm is developed to enhance the NEXRAD-rain-rate measurements. 125 rain gauges network is installed and data collected every 15 minutes. Radar data is interpolated to location of each rain gauge. Z-R equations are developed. The relationship between Z-R may change because of the climatology conditions.

4 - Neural Networks and Time Series Models to Estimate Soil Moisture

Nazario D. Ramirez Beltran, Professor, University of Puerto Rico, P.O. Box 9043, Mayagüez, PR, 00680, Puerto Rico, nazario@ece.uprm.edu, Ramón Vásquez Espinoza, Joan Manuel Castro, Christian Calderon

A model for estimating the spatial and temporal variability of soil moisture. Radar and in-situ observations are the major sources of information to develop a nonlinear stochastic transfer function that represents the dynamic water content in the soil. Observations were collected from 17 soil moisture stations, and a sequential quadratic programming algorithm was used to estimate the parameters of the transfer function at each station. The algorithm estimates soil moisture in an hourly basis at 1 km spatial resolution, and up to 1 meter depth. The algorithm was successfully applied under PR climate conditions.

■ WB16

San Cristobal

Dynamic Programming Tutorial

Cluster: Bellman Continuum

Invited Session

Chair: Moshe Sniedovich, University of Melbourne, Department of mathematics and Statistics, Melbourne, VI, 3010, Australia, moshe@unimelb.edu.au

1 - FAQs about Dynamic Programming

Moshe Sniedovich, University of Melbourne, Department of mathematics and Statistics, Melbourne, VI, 3010, Australia, moshe@unimelb.edu.au

In this 90-minute tutorial we shall address some of the basic questions regarding the methodological, theoretical and computational aspects of dynamic programming.

■ WB17

Egret

Queuing Systems

Contributed Session

Chair: Sidney Hantler, Manager, Stochastic Analysis, IBM TJ Watson Research Center, P.O. Box 704, Yorktown Heights, NY, 10567, United States, hantler@us.ibm.com

1 - Optimal Resource Allocation for Remanufacturing/Repair Operations Under Fill Rate Constraints

Isilay Talay Degirmenci, Graduate Student, Duke University, Fuqua School of Business, 1 Towerview Drive, Durham, NC, 27708, United States, isilay.talay@duke.edu, Otis Jennings, Francis de Véricourt

Consider a remanufacturing/repair facility responsible for keeping a fixed number of machines in working condition by utilizing a combination of service and spare parts resources. Using many-server/many-spare limiting results, we approximate the refurbished parts fill rate as a function of the number of machines and the machine failure and repair rates. We then depict the service/spare efficient frontier and find the asymptotically optimal resource settings, subject to a fill rate constraint.

2 - Analysis of a Multiserver Priority Queueing System

Sidney Hantler, Manager, Stochastic Analysis, IBM TJ Watson Research Center, P.O. Box 704, Yorktown Heights, NY, 10567, United States, hantler@us.ibm.com, B. Alan Taylor

We give a method for finding the stationary distribution of (multidimensional) multiserver multiclass priority queues by successively reducing the system of equations to equivalent systems of homogeneous linear equations describing a natural sequence of embedded Markov chains. This method can be viewed as an extension of the method proposed by M. Neuts for solving one dimensional queueing systems of M/G/1 type.

■ WB19

Sea Gull

Business Competitiveness

Contributed Session

Chair: Philip Birnbaum-More, Professor, University of Southern California, Marshall School of Business, Bridge Hall 307C, Los Angeles, CA, 90089-0808, United States, phbmore@marshall.usc.edu

1 - Interval-Valued Evidence Sets From Simulated Product Competitiveness: A Bulgarian Winery Decision

Margaret F. Shipley, Professor of Management, University of Houston-Downtown, One Main Street, Houston, TX, 77002, United States, shipleym@uhd.edu, David L. Olson

Interval-valued evidence sets are used to assess risk of product introduction by a transitional economy firm. Simulated competitiveness and profitability of a Bulgarian winery determined the intervals. The DM model thus uses fuzzy logic to handle uncertainty and soft systems modeling to provide input into the determination of type of wine to type of market (local, regional, international).

2 - Globalization and Diversity

Philip Birnbaum-More, Professor, University of Southern California, Marshall School of Business, Bridge Hall 307C, Los Angeles, CA, 90089-0808, United States, phbmore@marshall.usc.edu, Michael Hyung-J Park, Il Im

One result of globalization is greater diversity. The good news is that diversity has been studied for a long time. The bad news is that there is little agreement on what is meant by diversity, how to measure it, and what it means for organizations. To illustrate the problem as well as suggest some alternative solutions, we simulate published findings from past research on functional diversity within organizations to illustrate the more general problem showing that the results differ.

■ WB20

Parrot

Graphs and Networks II

Contributed Session

Chair: Paola A. Hernandez-Ramirez, MSE Student Department Industrial Engineering, University of Puerto Rico at Mayagüez, University of Puerto Rico at Mayagüez, Industrial Eng. Department P.O. Box 9043, Mayagüez, PR, 00681, Puerto Rico, paitohr@yahoo.com

1 - Self Organization in Adhoc Networks Using Swarm Technology

Rajini Girinath, MNM Jain Engg College, Thorapakkam, Chennai, Chennai, 600096, India, dgirinath@gmail.com, Selvan Peter

Information exchange in communication networks can be organized by flooding the messages through the entire network. Optimized flooding strategies try to prevent the forwarding of duplicates of the packet by using a maximum time-to-live or sequence numbers. The probability that a message will arrive at a destination is very high even in case of mobility and error-prone wireless channels. Gossiping and rumor routing as alternatives to flooding have been developed to cope with this problem.

2 - A Novel Graph-Theoretic Clustering Methodology

Arjun Manrai, Student, Harvard University, 107 Adams Mail Center, Cambridge, MA, 02138, United States, manrai@fas.harvard.edu

Cluster analysis enables the inference of underlying patterns from large sets of multidimensional data that are difficult to decipher and analyze on a global scale. We develop a new methodology that incorporates several clustering and optimization algorithms into a more precise and efficient model. The key distinguishing feature of our model is its ability to treat each cluster as an individual graph-theoretic tree and then apply a systematic methodology to each of these trees.

3 - Network Optimization With High Failure Probability Using Redundancy Allocation

Paola A. Hernandez-Ramirez, MSE Student Department Industrial Engineering, University of Puerto Rico at Mayagüez, University of Puerto Rico at Mayagüez, Industrial Eng. Department P.O.Box9043, Mayagüez, PR, 00681, Puerto Rico, paitohr@yahoo.com, Noel Artilles

This research develops a methodology to optimize the reliability of a network whose arcs are not necessarily in series or in parallel and have low known reliability. Network reliability is improved by using redundant arcs with a budgetary restriction. Two heuristic optimization algorithms are used and compared to solve this redundancy allocation problem: a genetic algorithm and an algorithm developed by the authors based on sequential integer linear programming.

■ WB21

Canary

Telecommunications

Contributed Session

Chair: Hanan Luss, Senior Scientist, Telcordia Technologies, 444 Hoes Lane, Room 1D254, Piscataway, NJ, 08854, United States, hluss@telcordia.com

1 - A Multi-Agent Based System for Operations Scheduling

Jesuk Ko, Prof., Gwangju University, Dept. of Industrial & Information Eng., 592-1 Jinwol-Dong, Nam-Gu, Gwangju, 503-703, South Korea, jko@gwangju.ac.kr

The system framework presented here is based on a novel paradigm: multi-agent systems. The ideas suggested in this study describe the first development phase of an intelligent manufacturing system, focusing on the intelligent agent technology adopted. The interactions, such as communications between different classes of agents, are defined. Finally, some aspects of multi-agent cooperative scheduling are discussed, specifically those supporting it within the holonic manufacturing environment.

2 - Delay Constrained Minimum Power Broadcasting in Wireless Networks

Kerem Bulbul, Assistant Professor, Sabanci University, Manuf Sys.&Industrial Eng., Orhanli, Tuzla, Istanbul, 34956, Turkey, bulbul@sabanciuniv.edu, Tonguc Unluyurt, Ozgur Ercetin

We consider the minimum power broadcasting problem in an ad hoc wireless network operating under a hard constraint on the end-to-end delay between the source and each node in the network. We first characterize the optimal solution to a closely related problem in dense networks using a dynamic programming (DP) formulation. The insights provided by the structure of the optimal DP solution lead to effective algorithms for the original problem, and we demonstrate their performance computationally.

3 - Modeling the Process of Information Relay Through Inter-Vehicle Communication

Xiubin Wang, Researcher, National Center for Freight and Infrastructure Research and Education, University of Wisconsin at Madison, Madison, United States, wangx@engr.wisc.edu

In a new paradigm of the decentralized traffic information system as a recent thrust in the Intelligent Transportation Systems (ITS), vehicles form ad hoc mobile networks, and information may be propagated between vehicles through wireless communication with a short transmission range. Fundamental to the system design is effective information propagation. In this paper, we study information propagation along a traffic stream.

4 - Improving Communication in Wireless Networks via Mobility

Penina Orenstein, Assistant Professor, Seton Hall University, 400 South Orange Avenue, South Orange, NJ, 07079, United States of America, orenstpe@shu.edu, Zory Marantz

The modeling of mobility for a collection of wireless devices operating over a large area is a formidable task as it involves many degrees of freedom such as network topology, local densities and speed. We quantify the impact of mobility and interference on the connectivity properties of large scale ad-hoc networks by adapting a cellular automaton model. This reduces the mobility problem to its simplest forms, yet it still maintains the essential features of radio propagation.

5 - Optimal Content Distribution in Video-on-Demand Tree Networks

Hanan Luss, Senior Scientist, Telcordia Technologies, 444 Hoes Lane, Room 1D254, Piscataway, NJ, 08854, United States, hluss@telcordia.com

We present a model for content distribution in a tree network where each node may have demands for multiple, different video-on-demand program families. The decision variables include location of servers and assignment of program families to servers. The model considers cost of servers, cost of assigning program families to servers, and cost of link bandwidths used to broadcast programs. We develop a dynamic programming algorithm with multiple state variables that solves this model.

■ WB22

Pelican

New Product Development

Contributed Session

Chair: Eman Al Banna, Environmental Scientist, Hyder Consulting Middle East, P.O.Box 32158, Isa Town, NA, NA, Bahrain, e_albanna@hotmail.com

1 - A Performance-Oriented Risk Management Framework for Pharmaceutical R&D Projects

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The objective of this paper is to develop a proactive and performance-oriented risk management framework to increase the success rate of a pharmaceutical R&D project. The proposed framework integrating Quality Function Deployment with Balanced Scorecard provides a useful planning framework that links corporate strategic vision to individual project implementation and prioritizes project risks according to their strategic importance.

2 - Environmental Impact Assessments

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Coastal environments are arguably the most important and intensely used of all areas settled by humans. This rapid development is due to the increasing number of marine-related projects and development along the coastal areas. Today, Environmental Impact Assessment, a systematic process that examines the environmental consequences of a development in an advanced stage aimed at aiding decision-makers, is a legal requirement in many countries around the world.

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Sunday, 10:00 -11:30am

- SB01 Current Issues in Project Scheduling
- SB02 Issues in Supply Chain Management
- SB03 Supply Chain Optimization and Risk Management
- SB04 Peter Hammer's Memorial Session
- SB05 Logistics Network Design and Inventory
- SB06 Tutorial: Mathematical Programming in Sports
- SB07 Joint Session ICS/Minority Issues/Optimization
- SB08 Evolutionary Algorithms
- SB09 Business Applications
- SB10 OR in the Forest Sector I
- SB11 Advances in Integer Programming
- SB12 Risk Averse Optimization
- SB13 Transportation and Logistics
- SB14 Applied Data Envelopment Analysis
- SB15 Innovation/Entrepreneurship
- SB16 Modeling Logistics and Transportation Problems
- SB17 Data Mining and Business Decision Making
- SB18 Education and Distance Learning I
- SB19 Dynamic Programming and Its Applications
- SB20 Methodologies to Tame Complexity
- SB21 Deterministic Models in Information Systems
- SB22 Tutorial: Advances in Simulation Optimization

Sunday, 1:30 - 3:00pm

- SC01 Project Selection
- SC02 Retail Operations
- SC03 The Impact of Strategic Purchasing Behavior on Pricing and Ordering Decisions
- SC04 Software Seminars: AMPL
- SC05 Public- and Private-Sector Facility Location
- SC06 Tutorial: Getting and Dealing with Media Attention for Your Research
- SC07 Optimization and Computational Biology
- SC08 Artificial Intelligence and Neural Networks
- SC09 Practice- Industrial Applications
- SC10 OR in the Forest Sector II
- SC11 Cutting and Packing
- SC12 Multi-stage Stochastic Programming
- SC13 Online and Fixed Routing
- SC14 DEA Applications in Service Operations
- SC15 Strategic Planning and Management
- SC16 Evolutionary Computation in Engineering Applications
- SC17 Innovation Science: A Data-Driven Perspective
- SC18 Education and Distance Learning II
- SC19 Dynamic Programming
- SC20 Using Agents to Tame Complexity
- SC21 Special Topics in Information Systems
- SC22 OR in Public Health

Monday, 8:00 - 9:30am

- MA01 Project and Risk Management I
- MA02 Retail Operations Management
- MA03 Pricing and Capacity Decision Models Under Uncertainty
- MA05 Risk, Forecasting, and Decision Rules
- MA06 Tutorial: When More is Better
- MA07 Latest Methodologies in Mixed Integer Programming
- MA08 Computer Science- Optimization
- MA10 OR in the Forest Sector III
- MA11 Exact and Heuristic Algorithms for Combinatorial Optimization
- MA12 Risk Management in Mixed-Integer Stochastic Programming
- MA13 Routing and Scheduling Applications
- MA14 Emergency Planning
- MA15 Joint Session MAS/SRA
- MA16 Optimization and Simulation Applications
- MA17 Quality Management I
- MA18 Using OR Students in Consulting and Cases
- MA19 Dynamic Programming Applications
- MA20 Using System Dynamics to Tame Complexity
- MA21 Management Information Systems and Technology
- MA22 Improving Health Care Service Operations

Monday, 10:00 -11:30am

- MB01 Project and Risk Management II
- MB02 Managing Supply Chains with Multiple Products and/or Multiple Stages
- MB03 Managing Reverse Flows
- MB05 Decision Analysis Arcade
- MB06 Tutorial: An Introduction to Semidefinite Programming and its Applications
- MB07 Latest Applications in Mixed Integer Programming
- MB08 Joint Session Optimization/Minority Issues
- MB09 Industry-Research Applications / 2006 Wagner Prize Winning Paper
- MB10 Mining Applications
- MB11 Routing Problems
- MB12 Non-Linear and PDE-Constrained Stochastic Optimization
- MB13 Metaheuristics for Routing and Location
- MB14 Intelligent Transportation
- MB15 Deterministic Operations Research in Military Applications
- MB16 Multicriteria Decision Making: Practical Applications
- MB17 Quality Management II
- MB18 Issues in Modeling and OR Education
- MB20 Panel Discussion: Algebraic Modeling Languages Roundup
- MB21 Data Envelope and Decision Support Systems I
- MB22 Health Systems Research

Monday, 1:30 - 3:00pm

- MC01 Scheduling
- MC02 Operations Management in the Process Industries
- MC03 Supply Chain Response to Risks, Disruptions, and Disasters
- MC05 Behavioral Decision Making
- MC06 Tutorial: Does More Money Buy You More Happiness?
- MC07 Panel: Benchmarking Solvers: Who, What, When, Why, How, How Much?
- MC08 Tutorial: Combinatorial Auctions
- MC09 Optimization Problems in Industry
- MC11 Integer Programming
- MC12 Stochastic Programming and Applications
- MC13 Robust and Dynamic Routing
- MC14 Topics in Public Sector Operations Research
- MC15 US Military Academy Operations Research Support of Defense Issues
- MC16 Forecasting and Decision Analysis using Bayesian Theory
- MC17 Concepts and Applications in Quality Control
- MC18 Undergraduate Research in OR
- MC19 Honoring Alex Rubinov- Memorial Session
- MC20 Success Stories: OR impacts ROI
- MC21 Decision Support Systems II
- MC22 OR in Biology and Medicine

Tuesday, 8:00 - 9:30am

- TA01 Production and Scheduling I
- TA02 Supply Chain Models Including Inventory and Logistics Considerations
- TA03 Production Planning in the Supply Chain
- TA04 Software Seminar: SAS
- TA05 Decision Analysis in Societal Health Issues
- TA06 Tutorial: Linking Decision Analysis and Behavioral Decision Research
- TA07 Information Security - I
- TA08 Tutorial: Introduction to Social Network Analysis for the Operations Research and Management Science Community
- TA09 Industry Related Research in a Global Environment
- TA10 OR Methods in the Energy Sector
- TA11 Theory and Practice of Integer Programming
- TA13 Travel Behaviour Models
- TA14 Representing Human Behavior in Virtual Environments
- TA15 Military Applications Arcade
- TA16 OR Analysis for Leadership Decisions
- TA17 Quality Control
- TA18 Increasing Student Engagement in Their OR Educations
- TA19 Game Theory
- TA20 Optimization Modeling in Practice
- TA21 Panel Discussion: How to Write a Good Practice Paper. What Makes a Good Practice Paper, Why You Should Write One, Who is the Audience and What Are You Trying to Accomplish
- TA22 Health Care-Modeling

Tuesday, 10:00 - 11:30am

- TB01 Production and Scheduling II
- TB02 Risk Management Applications
- TB03 Customer Assignment and Inventory Transportation Planning
- TB04 Software Seminar: GAMS
- TB05 New Perspectives on Decisions: Happiness, Identity, Power, Control, and Geography
- TB06 Tutorial: Toward a Science of White Collar Workforce Management
- TB07 Information Security - II
- TB08 Hybrid Approaches in Constraint Programming
- TB09 Unsolved Problems in OR Practice
- TB10 Environmental Management
- TB11 Optimization-Combinatorial I
- TB12 Finance and Risk Management
- TB13 Routing
- TB14 Analysis to Support Emerging Democracies
- TB15 Joint Session: Military Applications Society and Decision Analysis Society
- TB16 Operations Research and Computational Biology
- TB17 Research and Applications in Service-Profit Chain (SPC)
- TB18 Operations Research and Outreach to Middle and High Schools
- TB19 Social Networks Methodology and Applications I
- TB20 Optimization- Modeling I
- TB21 Simulation Applications
- TB22 Optimization in Radiation Therapy

Tuesday, 1:30 - 3:00pm

- TC01 Supply Chain I
- TC02 Manufacturing
- TC03 Distribution Systems Optimization
- TC05 Public Sector Applications of Decision Analysis
- TC06 Tutorial: Symmetry in Integer Programming
- TC07 Harvey Greenberg and Sandia National Laboratories I: Decision Support
- TC08 Free Open-Source Software for Operations Research: An Introduction to COIN-OR
- TC09 Efficiency Improvements in Hospital Operations
- TC10 Optimization in Marketing
- TC11 Optimization-Combinatorial II
- TC12 Finance and Stochastics
- TC13 Aviation Applications
- TC14 Analysis for Nation Building: Afghanistan
- TC15 Experimental Methods for Characterization and Optimization
- TC16 Homeland Security and Risk Applications
- TC17 Emergency Services and Disaster Relief Applications
- TC18 Services Research at IBM
- TC19 Social Networks Methodology and Applications II
- TC20 Optimization- Modeling II
- TC21 Efficient Simulation Optimization and Applications
- TC22 Health Care- Practice

Tuesday, 3:30 - 5:00pm

- TD01 Supply Chain II
- TD02 Manufacturing and Operations Management
- TD03 Managing Supply Chain and Service Operations
- TD04 Software Seminar: ILOG - CPLEX/OPL
- TD05 Applications of Decision Analysis
- TD06 Tutorial: Modeling and Optimizing Nonlinear Systems in Integrated Computing Environments
- TD07 Harvey Greenberg and Sandia National Laboratories II: Mathematical Programming
- TD08 Using Modeling Languages With COIN-OR
- TD09 Emerging Research Opportunities in Supply Chain Management
- TD10 Marketing I
- TD11 Discrete Geometry Methods
- TD12 Integrated Corporate-wide Risk/Return Management
- TD13 Logistics
- TD14 Main Session: Applying OR to Deliver Development in Africa
- TD15 Military OR I
- TD16 Optimization and Equilibrium Problems in Networked Systems and Markets
- TD17 Statistics
- TD18 Strategic Planning and Forecasting: The Future of Services
- TD19 Economics, Societies and Transition I
- TD20 Optimization- Modeling III
- TD21 Simulation I

Wednesday, 10:00 -11:30am

- WB02 Accounting
- WB03 Supply Chains and the Environment
- WB05 Decision Analysis
- WB06 Tutorial: Systems Decision Process
- WB07 Exploitation of Structure for Search
- WB08 Data Mining/Machine Learning
- WB10 Marketing III
- WB12 Multiobjective Algorithms
- WB13 Reverse Supply Chains
- WB15 OR in Weather Prediction
- WB16 Dynamic Programming Tutorial
- WB17 Queuing Systems
- WB19 Business Competitiveness
- WB20 Graphs and Networks II
- WB21 Telecommunications
- WB22 New Product Development

Wednesday, 8:00 - 9:30am

- WA01 Supply Chain III
- WA02 Inventory Management
- WA05 Decision Theory and Analysis
- WA06 Tutorial: Perl in an Hour
- WA07 Critical HP Resource Allocation Problems. HP Labs Researchers will Present Computing, Workforce, and Spare Parts Resource Allocation Problems Tackled with Operations Research Techniques
- WA08 Tutorial: Healthcare Facility Evacuation – Plans, Requirements, and Effectiveness
- WA09 Translating Academic Knowledge Into Practical Approaches for the Industry
- WA10 Marketing II
- WA11 Advances in Combinatorial and Integer Programming
- WA12 Facility Location and Production and Inventory Systems
- WA13 Warehouse Design, Planning, and Control
- WA15 Military OR II
- WA16 Auctions
- WA17 Programming, Linear and Integer
- WA18 Enterprise Mobility and Interoperability
- WA19 Economics, Societies and Transition II
- WA20 Graphs and Networks I
- WA21 Simulation II
- WA22 E-Business/Commerce

MASTER TRACK SCHEDULE

SUNDAY & MONDAY

Wyndham Rio Mar

		SUNDAY			MONDAY				
		SB	Plenary	SC	MA	MB	Plenary	MC	
Room	Track	10:00am – 11:30am	11:45am – 12:15pm	1:30pm – 3:00pm	8:00am – 9:30am	10:00am – 11:30am	11:40am – 12:30pm	1:30pm – 3:00pm	Track
Rio Mar Salon 1	1	Project Mgt. & Scheduling	Welcome Session Rio Mar 5	Project Mgt. & Scheduling	Project & Risk Mgt.			Scheduling	1
Rio Mar Salon 2	2	Manufacturing & Service Operations Mgt.		Manufacturing & Service Operations Mgt.	Manufacturing & Service Operations Mgt.			Manufacturing & Service Operations Mgt.	2
Rio Mar Salon 3	3	Supply Chain Optimization & Risk Mgt.		Supply Chain Optimization	Supply Chain Optimization			Supply Chain Optimization	3
Rio Mar Salon 4	4	Honoring Peter Hammer		Software Seminar-AMPL	No Session			No Session	4
Rio Mar Salon 5	5	Location Analysis		Location Analysis	Decision Analysis			Decision Analysis	5
Rio Mar Salon 6	6	Tutorials		Tutorials	Tutorials			Tutorials	6
Rio Mar Salon 7	7	Computing Science & OR, Minority Issues, Opt.		Interface of Computing Science & OR	Interface of Computing Science & OR			Interface of Computing Science & OR	7
Rio Mar Salon 8	8	Evolutionary Algorithms		Artificial Intelligence & Neural Networks	Computer Science - Optimization	Optimization & Minority Issues		Tutorials	8
Rio Mar Salon 9	9	Business Applications		Practice: Industrial Applications	No Session	Industry-Research Interface		Industry-Research Interface	9
Rio Mar Salon 10	10	OR in the Forest Sector		OR in the Forest Sector	OR in the Forest Sector	ENRE: Mining Applications in OR		No Session	10
Caribbean 1	11	Optimization/Integer Programming		Combinatorial Optimization	Combinatorial Optimization			Combinatorial Optimization	11
Caribbean 2	12	Optimization/Stochastic Programming		Optimization/Stochastic Programming	Optimization/Stochastic Programming			Optimization/Stochastic Programming	12
Caribbean 3	13	Transportation & Logistics		Transportation & Logistics	Transportation & Logistics			Transportation & Logistics	13
El Morro 1	14	Data Envelopment Analysis		Data Envelopment Analysis	OR in the Public Sector			OR in the Public Sector	14
El Morro 2	15	Innovation/Entrepreneurship		Strategic Planning & Mgt.	Military Applications/ Risk Analysis	Military Applications		Military Applications	15
San Cristobal	16	OR in the Americas		OR in the Americas	OR in the Americas			OR in the Americas	16
Egret	17	Quality, Statistics & Reliability/Data Mining		Quality, Statistics & Reliability/Data Mining	Quality Mgt.			Quality Control	17
Heron	18	Education & Distance Learning		Education & Distance Learning	Educational Issues			Undergraduate Research in OR	18
Sea Gull	19	Bellman Continuum		Bellman Continuum	Bellman Continuum	No Session		Honoring Alex Rubinov	19
Parrot	20	Complex & Dynamic Systems		Complex & Dynamic Systems	Complex & Dynamic Systems	OR in Practice		OR in Practice	20
Canary	21	Information Systems		Information Systems	Mgt. Information Systems & Technology	Data Env. & Decision Support Systems		Decision Support Systems	21
Pelican	22	Tutorials		OR in Medicine & Health Care	Health Applications	OR in Medicine & Health Care		OR in Medicine & Health Care	22

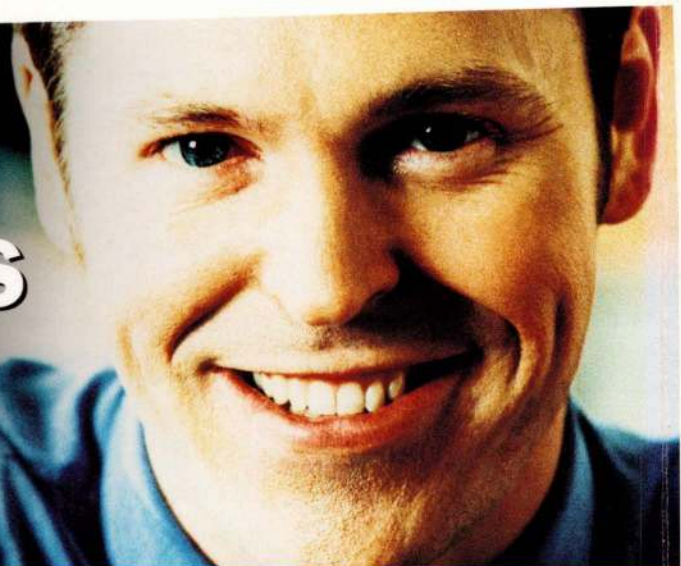
Plenary
Loren Cobb &
Michael
Gonzalez
Rio Mar 5

MASTER TRACK SCHEDULE

Wyndham Rio Mar

		TUESDAY					WEDNESDAY			
		TA	TB	Plenary	TC	TD	WA	WB	Track	
Room	Track	8:00am – 9:30am	10:00am – 11:30am	11:40am – 12:30pm	1:30pm – 3:00pm	3:30pm – 5:00pm	8:00am – 9:30am	10:00am – 11:30am		
Rio Mar Salon 1	1	Production & Scheduling		Plenary Jack Levis Rio Mar 5	Supply Chain		Supply Chain	No Session	1	
Rio Mar Salon 2	2	Manufacturing & Service Operations Mgt.	Risk Mgt.		Manufacturing		Inventory Mgt.	Accounting	2	
Rio Mar Salon 3	3	Supply Chain Optimization			Supply Chain Optimization		No Session	Supply Chain Optimization	3	
Rio Mar Salon 4	4	Software Seminar-SAS	Software Seminar-GAMS		No Session		Software Seminar-ILOG	No Session	No Session	4
Rio Mar Salon 5	5	Decision Analysis			Decision Analysis		Decision Theory & Analysis	Decision Analysis	5	
Rio Mar Salon 6	6	Tutorials			Tutorials		Tutorials			6
Rio Mar Salon 7	7	Interface of Computing Science & OR			Interface of Computing Science & OR		Interface of Computing Science & OR			7
Rio Mar Salon 8	8	Tutorials	Interface of Computing Science & OR		Interface of Computing Science & OR		Tutorials	Data Mining/ Machine Learning	8	
Rio Mar Salon 9	9	Industry-Research Interface			Industry-Research Interface		Industry-Research Interface	No Session	9	
Rio Mar Salon 10	10	Energy, Natural Resources & the Environment/Energy	Environmental Mgt.		Optimization in Marketing		Marketing	Marketing		10
Caribbean 1	11	Combinatorial Optimization	Combinatorial Optimization		Combinatorial Optimization		Honoring Peter Hammer	Honoring Peter Hammer	No Session	11
Caribbean 2	12	No Session	Finance & Risk Mgt.		Financial Engineering		Risk Mgt.	Facility Location/ Prod. & Inventory Systems	Multi-objective Algorithms	12
Caribbean 3	13	Transportation & Logistics	Routing		Aviation Applications		Logistics	Warehouse Design, Planning & Control	Reverse Supply Chains	13
El Morro 1	14	OR in the Public Sector	Analysis for Nation Building		Analysis for Nation Building		Applying OR to Deliver Development in Africa	No Session	No Session	14
El Morro 2	15	Military Applications	Military Applications/ Decision Analysis		Military Applications		Military OR	Military OR	OR in the Environment	15
San Cristobal	16	OR on the Edge			OR on the Edge		Auctions	Bellman Continuum	16	
Egret	17	Quality Control	Measurement Analysis/ Service Ops.		Measurement Analysis/ Service Ops.		Statistics	Linear & Integer Programming	Queuing Systems	17
Heron	18	Educational Issues			Services Research		Services Research	Services Research	No Session	18
Sea Gull	19	Game Theory	Social Networks		Social Networks		Economics, Societies & Transition	Economics, Societies & Transition	Business Competitiveness	19
Parrot	20	OR in Practice	Optimization- Modeling		Optimization- Modeling		Graphs & Networks			20
Canary	21	OR in Practice	Simulation Applications		Simulation		Simulation	Simulation	Telecommunications	21
Pelican	22	Health Care-Modeling	Health Applications		Health Care- Practice		No Session	E-Business/Commerce	New Product Development	22

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- Deploy models without rewriting them
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