

# 2009 ISMP

## 20TH INTERNATIONAL SYMPOSIUM ON MATHEMATICAL PROGRAMMING

**August 23-28, 2009**  
**Chicago, Illinois, USA**

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### TABLE OF CONTENTS

Welcome from the Chair .....	2
Schedule of Daily Events & Sessions .....	3
Speaker Information .....	5
Social Events & Excursions .....	6
Internet Access .....	7
Opening Session & Prizes .....	8
Area Map .....	9
Exhibitors .....	10
Plenary & Semi-Plenary Sessions .....	12
Track Schedule .....	17
Floor Plans & Maps .....	22
Cluster Chairs .....	24
<b>Technical Sessions</b>	
Monday .....	25
Tuesday .....	49
Wednesday .....	74
Thursday .....	98
Friday .....	121
Session Chair Index .....	137
Author Index .....	139
Session Index .....	147
<b>Advertisers</b>	
World Scientific .....	150
IOS Press .....	151
OptiRisk Systems .....	152
Taylor & Francis .....	153
LINDO Systems .....	154
Springer .....	155
Mosek .....	156
Sponsors .....	<b>Back Cover</b>



The University of Chicago Booth School of Business

On behalf of the Organizing Committee and The University of Chicago, I welcome you to ISMP 2009, the 20th International Symposium on Mathematical Programming. This year we celebrate the 60th anniversary of the Zero<sup>th</sup> ISMP, the meeting organized in Chicago by Tjalling Koopmans and the Cowles Commission that featured George Dantzig's presentation of the simplex method. Chicago and its renowned architecture once again form the backdrop of this year's symposium with venues in the heart of the city at the Chicago Booth School's Gleacher Center on the Chicago River and the Chicago Marriott Downtown Magnificent Mile on Michigan Avenue.

The Cowles Commission's inaugural event in 1949 included the presentation of 32 papers discussed among fewer than 50 participants. ISMP 2009 includes 1,050 invited and contributed research paper presentations, 14 plenary and semi-plenary talks, and more than 1,100 attendees. The topics span the entire range of theory, computational methods, and applications of mathematical programming.

I want to thank each of the sponsors of ISMP 2009 for making it possible for so many people to participate in and benefit from this assembly of the latest and greatest in optimization. I would also like to express my sincere appreciation to all of the many volunteers who made this meeting possible by organizing talks, sessions and thematic clusters. I wish to acknowledge, in particular, the members of the Program Committee for arranging an exceptional group of plenary and semi-plenary lectures and the Organizing Committee for their efforts in efficiently composing the scientific program, smoothly coordinating local arrangements, tightly connecting with our sponsors, and vividly presenting the image of ISMP 2009 to the outside world. I am also indebted to the INFORMS meetings staff for pulling together all of the many moving parts in this diffuse organizational array to operate as a single, well-oiled machine.

As you listen to discussions of new discoveries and novel applications for mathematical programming, I hope you will take a moment to reflect on all that the field has accomplished in the six decades since that first meeting and to consider how mathematical programming can contribute to society's future in the decades ahead. In addition to expanding your view of mathematical programming, I also hope you have a chance to extend other horizons by experiencing some of Chicago's cultural attractions, entertainment venues, parks, beaches and neighborhoods.

With my best wishes for a pleasing and rewarding time in Chicago and at ISMP 2009.

John Birge  
University of Chicago Booth School of Business

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John R. Birge  
*Jerry W. and Carol Lee Levin*  
Professor of Operations Management

**SUNDAY, AUGUST 23**

3:00pm-9:00pm	Registration	M – Chicago Foyer, 5th Floor
6:00pm-7:30pm	Opening Session	Orchestra Hall, Chicago Symphony Center
<i>Buses depart from the Marriott (on Ohio Street, around the corner to the left from the Michigan Avenue exit, see map on page 9) to Chicago Symphony Center <b>beginning at 5:30pm</b>. Some people may prefer to take the 15-minute walk; see map on page 9. Buses return to the Marriott for the reception immediately after the opening session.</i>		
8:00pm-9:30pm	Reception	M – Chicago Ballroom, 5th Floor

**MONDAY, AUGUST 24**

7:30am-5:00pm	Registration	M – Chicago Foyer, 5th Floor
8:30am-5:00pm	Exhibits	M – Chicago Foyer, 5th Floor
9:00am-9:50am	Plenary: Stephen Boyd	M – Chicago DE, 5th Floor
10:00am-10:30am	Coffee Break*	
10:30am-12:00pm	Technical Sessions (MA)	Marriott & Gleacher Center
12:00pm-1:00pm	COSP Meeting	G – Room 208
12:00pm-1:15pm	Lunch Break (on your own)	
1:15pm-2:45pm	Technical Sessions (MB)	Marriott & Gleacher Center
2:45pm-3:15pm	Coffee Break*	
3:15pm-4:45pm	Technical Sessions (MC)	Marriott & Gleacher Center
5:00pm-5:50pm	Semi-Plenary: Éva Tardos	M – Chicago D
5:00pm-5:50pm	Semi-Plenary: Mihai Anitescu	M – Chicago E
7:00pm-11:00pm	MPS Council Meeting	G – 420 South Lounge

**TUESDAY, AUGUST 25**

7:30am-5:00pm	Registration	M – Chicago Foyer, 5th Floor
8:30am-5:00pm	Exhibits	M – Chicago Foyer, 5th Floor
9:00am-9:50am	Plenary: Friedrich Eisenbrand	M – Chicago DE, 5th Floor
10:00am-10:30am	Coffee Break*	
10:30am-12:00pm	Technical Sessions (TA)	Marriott & Gleacher Center
12:00pm-1:15pm	Lunch Break (on your own)	
1:15pm-2:45pm	Technical Sessions (TB)	Marriott & Gleacher Center
2:45pm-3:15pm	Coffee Break*	
3:15pm-4:45pm	Technical Sessions (TC)	Marriott & Gleacher Center
5:00pm-5:50pm	Semi-Plenary: Martin Skutella	M – Chicago D
5:00pm-5:50pm	Semi-Plenary: Paul Tseng	M – Chicago E
6:15pm-7:15pm	MPS Business Meeting	M – Chicago D

**NOTE:**

Technical sessions are held at the Marriott Chicago Downtown and the Gleacher Center, University of Chicago. Check the Track Schedule on pages 17-21 for specific room locations.

**KEY**

M - Marriott  
G - Gleacher Center

**BADGES REQUIRED FOR TECHNICAL SESSIONS**

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

**\* COFFEE BREAKS**

M – Chicago Foyer, 5th Floor  
G – 220 South Lounge  
250 North Lounge  
320 South Lounge  
350 North Lounge



Conference Bag Sponsor



Notebook Sponsor



Badge Holder Sponsor



Program Book Sponsor



\* COFFEE BREAKS

- M – Chicago Foyer, 5th Floor
- G – 220 South Lounge
- 250 North Lounge
- 320 South Lounge
- 350 North Lounge



WEDNESDAY, AUGUST 26

8:00am-5:00pm	Registration	M – Chicago Foyer, 5th Floor
8:30am-5:00pm	Exhibits	M – Chicago Foyer, 5th Floor
9:00am-9:50am	Plenary: Matteo Fischetti	M – Chicago DE, 5th Floor
10:00am-10:30am	Coffee Break*	
10:30am-12:00pm	Technical Sessions (WA)	Marriott & Gleacher Center
12:00pm-1:15pm	MP Editorial Luncheon	G - 320 South Lounge
12:00pm-1:15pm	Lunch Break (on your own)	
1:15pm-2:45pm	Technical Sessions (WB)	Marriott & Gleacher Center
2:45pm-3:15pm	Coffee Break*	
3:15pm-4:45pm	Technical Sessions (WC)	Marriott & Gleacher Center
5:00pm-5:50pm	Semi-Plenary: Shuzhong Zhang	M – Chicago D
5:00pm-5:50pm	Semi-Plenary: David Shmoys	M – Chicago E
7:00pm-10:00pm	Conference Banquet	Field Museum

*Buses depart from the Marriott (on Ohio Street, around the corner to the left from the Michigan Avenue exit, see map on page 9) from 6:30pm-6:45pm. Buses leave the museum to return to the Marriott beginning at 9:30pm, with the last bus leaving at 10:00pm.*

THURSDAY, AUGUST 27

8:00am-5:00pm	Registration	M – Chicago Foyer, 5th Floor
9:00am-9:50am	Plenary: Lars Peter Hansen	M – Chicago DE, 5th Floor
10:00am-10:30am	Coffee Break*	
10:30am-12:00pm	Technical Sessions (ThA)	Marriott & Gleacher Center
12:00pm-1:15pm	Lunch Break (on your own)	
1:15pm-2:45pm	Technical Sessions (ThB)	Marriott & Gleacher Center
2:45pm-3:15pm	Coffee Break*	
3:15pm-4:45pm	Technical Sessions (ThC)	Marriott & Gleacher Center
5:00pm-5:50pm	Semi-Plenary: Eddie Anderson	M – Chicago D
5:00pm-5:50pm	Semi-Plenary: Jong-Shi Pang	M – Chicago E

FRIDAY, AUGUST 28

8:00am-1:00pm	Registration	M – Chicago Foyer, 5th Floor
8:30am-9:20am	Plenary: Andrzej Ruszczyński	M – Chicago DE, 5th Floor
9:30am-10:00am	Coffee Break	M – Chicago Foyer, 5th Floor
		G – 220 South Lounge
		Rooms 222, 226, 230
10:00am-11:30am	Technical Sessions (FA)	Marriott & Gleacher Center
11:30am-1:00pm	Lunch Break (on your own)	
1:00pm-1:50pm	Plenary: Pablo Parrilo	M – Chicago D
2:00pm-3:30pm	Technical Sessions (FB)	Marriott & Gleacher Center

Thank You



For support from the Division of Mathematical Sciences at NSF for travel of early career U.S. attendees to ISMP.

## SPEAKER GUIDELINES

### Audio-Visual Services

Please follow these guidelines to ensure a successful presentation. All session rooms will be equipped with a computer projector, but please note that you must bring your own laptop or pre-arrange to share with others in your session.

- Bring your laptop to your session. We strongly recommend that you pre-arrange with other speakers in your session to ensure that at least one of you brings a laptop from which you can project your talks.
- Please bring a power adaptor with you. We recommend that you do not attempt to run your presentation off the laptop battery.
- If your laptop is not compatible with AC power, please bring an electrical adaptor so that you can connect to U.S. electricity.
- If your laptop is a Mac, you will need the appropriate adapter for the external video output.
- Arrive at your session at least 15 minutes before it begins. All presenters in a session should set up and test the connection to the projector before the session begins.
- We encourage speakers to put their presentations on a USB stick.

### Presentation Guidelines

The room and location of your session are listed in the Technical Sessions section of this program and in the Track Schedule. Please arrive at your session at least 15 minutes early for AV set-up and to check in with the session chair. Time your presentation to fit within your designated time span, leaving time for audience questions.

### Program Information Desk

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

### For Assistance During Your Session:

#### Session Monitor Desks

Session Monitor Desks are located in several areas in the Marriott and Gleacher Center (see maps on pages 22-23 for specific locations). If you have a problem in your session room related to AV needs or any other requests, please go to the Session Monitor Desk in the area to ask for assistance.

## SESSION CHAIR GUIDELINES

The role of the Chair is to coordinate the smooth running of the session and introduce each speaker. The chair begins and ends each session on time. Each session lasts 90 minutes, with equal time given to each paper.

## REGISTRATION & GENERAL INFORMATION

### Registration

Your registration fee includes admittance to the complete technical program and most special programs. The following social/food events are also included: Sunday evening reception, and all morning and afternoon coffee breaks. The Wednesday evening banquet requires a separate payment of \$95.

### Badges Required for Conference Sessions

ISMP badges must be worn to all sessions and events. Attendees without badges will be asked to go to the registration desk to register and pick up their badges. All attendees, including speakers and session chairs, must register and pay the registration fee.

### Conference Banquet Tickets

The Wednesday evening banquet is open to attendees and guests who registered and paid in advance for tickets. The ticket(s) is included in your registration envelope. There may be a limited number of tickets available on site. Go to the ISMP registration desk to inquire. Tickets are \$95.

### 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 Marriott at 312-836-0100 and ask for the ISMP registration desk. Registration staff will transcribe the message and post it on the message board located near registration. You can also contact colleagues attending the meeting using this message board. Please check the board periodically to see if you have received any messages.

### Business Centers & Internet

The business center in the Marriott is located on the second floor. Hours of operation are Sunday, 9:00am-5:00pm; Monday-Friday, 7:00am-7:00pm. There is a small, self-serve business center in the Gleacher Center, Suite 540, 5th floor.

**See page 7 for information on Internet access.**



## SOCIAL EVENTS

### Opening Ceremony & Reception - Orchestra Hall & Marriott Hotel

Sunday, August 23

6:00pm-9:30pm

Buses depart from the Marriott (on Ohio Street, around the corner to the left from the Michigan Avenue exit, see map on page 9) to Chicago Symphony Center **beginning at 5:30pm**. Some people may prefer to take the 15-minute walk; see map on page 9.

We welcome you to Chicago and ISMP 2009 with an opening ceremony at famed Orchestra Hall, followed by a reception at the Marriott Magnificent Mile. Orchestra Hall, home of the Chicago Symphony, is a national landmark building opened in 1904 and the site of thousands of performances by musical legends from Toscanini to B.B. King.

The welcome ceremony will feature the presentation of awards by the Mathematical Programming Society. In addition, the Midwest Young Artists Big Band will perform and narrate a program on Chicago jazz – a combination of history and performance that will introduce you to the city's unique musical heritage.

Following the ceremony, we invite you to enjoy the Welcome Reception, held at the Marriott Magnificent Mile Hotel. Bus transportation will be provided between the Marriott Hotel and Orchestra Hall. *Some people may prefer to take the 15-minute walk; see map on page 9.*

### Thank You



The **Field**  
Museum



### Conference Banquet - Field Museum

Wednesday, August 26

7:00pm-10:00pm

Buses depart from the Marriott (on Ohio Street, around the corner to the left from the Michigan Avenue exit, see map on page 9) **from 6:30pm-6:45pm**.

A Chicago icon, the Field Museum is one of the premier natural history museums in the United States. Our banquet will take place in Stanley Field Hall, a stunning architectural space with gleaming marble interiors and "Sue," the largest, most complete and best preserved Tyrannosaurus Rex specimen in the world. Key exhibits will be open for our exclusive viewing, including The Ancient Americas, a new installation that tells the 13,000-year story of human life on the American continents. To cap a wonderful evening, you are invited to step out onto the Museum Terrace at 9:30pm for a great view of the fireworks off Navy Pier, compliments of the City of Chicago.

The banquet is open to attendees and guests who registered and paid in advance for tickets. The ticket(s) is included in your registration envelope. There may be a limited number of tickets available on site. Go to the ISMP registration desk to inquire. Tickets are \$95.

### Program Schedule:

- 6:30-6:45pm Buses depart Marriott Hotel (on Ohio Street, around the corner to the left from the Michigan Ave. exit, see map on page 9).
- 7:00-8:00pm Beverage reception; museum exhibits open for viewing.
- 8:00-9:30pm Dinner in Stanley Field Hall.
- 9:30pm Step out onto the Museum Terrace for a great view of the fireworks off Navy Pier.
- 9:30-10:00pm Buses return to Marriott.

### Thank You

**GAMS**



**IBM**

## EXCURSIONS

Buses will leave at the beginning time listed for each tour, and will return at the ending time listed. Meet in the Marriott lobby. The tour guide will direct you to the bus (or the tour boat for the Monday river cruise).

### Highlights of Chicago Tour – SOLD OUT

Sunday, August 23, 9:00am-1:00pm  
\$42 (lunch not included)

This all-encompassing tour covers the city's major features and architecture in the downtown area, north and south sides. The guided tour visits Chicago's major parks, including Grant, Lincoln and Millennium Park. Purchase lunch on your own at Navy Pier, Chicago's number one tourist attraction. The tour provides many scenic opportunities to view Lake Michigan, a fresh water, "inland sea" over 300-miles long and 100 miles wide.

### Exclusive Guided Tour of the Art Institute: Masterpieces & Modern Wing Art Institute of Chicago

Sunday, August 23, 12:00pm-3:30pm  
\$75 (lunch not included)

Explore the Art Institute of Chicago on this exclusive, escorted tour featuring acclaimed masterpieces. The Art Institute is renowned for its medieval masterpieces and French Impressionist works. The tour guide will take requests from the group and include these in this exclusive tour. Open in May 2009, the Modern Wing features painters such as Picasso, Matisse and Magritte.

### Architectural River Cruise

Monday, August 24, 9:15am-12:00pm  
\$39

(Meet in the Marriott Lobby. The tour guide will direct you to the tour boat.)

A tour boat on the Chicago River takes you past an array of great structures, including Lake Point Tower, Wrigley Building, IBM Building, NBC Tower, Tribune Tower, Civic Opera House, Sears Tower (now Willis Tower), Marina City, Board of Trade, and many more. An architectural docent will provide live narration featuring an overview of architecture and history, including some of the scandals and conflicts involved.

### Frank Lloyd Wright in Oak Park- Exclusive Escorted Tour

Tuesday, August 25, 9:00am-1:00pm  
\$66 (lunch not included)

Visit the place where Frank Lloyd Wright, lacking both formal training and an academic degree, began a quiet movement in the Oak Park house he designed and built for a growing family. From this home, his imaginative art and daring designs became world famous. More than a century later, it ranks as America's most influential architectural expression. Specially trained architectural docents will conduct comprehensive, small group inspections of the residence, now fully restored to its original 1889 appearance. A second visit will be made to nearby Unity Temple, one of Wright's most daring works.

## INTERNET ACCESS

### Marriott

Complimentary wireless access is available in the lobby of the Marriott (no codes are needed). There is no wireless in the Marriott meeting rooms. For a daily rate of \$14.95, Marriott guests can obtain high-speed Internet access and unlimited local phone calls in their rooms.

### Gleacher Center

There is wireless in the Gleacher Center. The ID codes are as follows:

Monday	meeting-skim
Tuesday	meeting-rb8y
Wednesday	meeting-r5yk
Thursday	meeting-qk7g
Friday	meeting-vaxa

There are three steps to connect to the University of Chicago wireless network:

- Enable your wireless adapter. The process of enabling wireless adapters varies. Consult your laptop documentation for instructions.
- Connect your wireless adapter to a "uchicago" wireless access point. Look for the wireless connection icon on your taskbar. Move your mouse pointer over the icon – if the hover tip indicates "uchicago" and "connected," you are connected to a wireless access point but your Internet connection is not enabled yet.
- Authenticate your meeting-id (from list above) – be sure you have the correct ID for that day. A new ID is required each day, the first time you connect, and will remain in your wireless connection settings until midnight, even in you power off your laptop.

Launch Internet Explorer. The Authentication page appears. If the authentication page does not appear type the following address in the address bar and click GO: [www.uchicago.edu](http://www.uchicago.edu). Enter your meeting-id, using all lower case, in the CNetID box and **leave the password box empty**.

Click Authenticate - the Welcome page appears. (If a pop-up is blocked prompt appears, click to enable the pop-up.) **Do not click the logout button** – doing so will disconnect you from the wireless network. Your wireless Internet connection is now fully enabled. Close the Welcome page by exiting Internet Explorer or type another address in the address bar and click GO.

## OPENING CEREMONY

Sunday, August 23

6:00pm-7:30pm

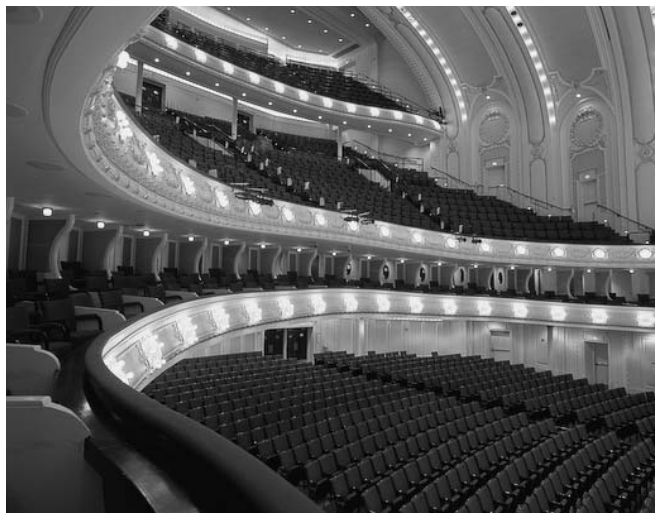
Orchestra Hall, Chicago Symphony Center

Buses depart from the Marriott (on Ohio Street, around the corner to the left from the Michigan Avenue exit, see map on page 9) to Chicago Symphony Center **beginning at 5:30pm**. Some people may prefer to take the 15-minute walk; see map on page 9.

We welcome you to Chicago and ISMP 2009 with an opening ceremony at famed Orchestra Hall. Chicago Symphony Center, home of the Chicago Symphony, is a national landmark building opened in 1904 and the site of thousands of performances by musical legends from Toscanini to B.B. King.

The opening session will feature the presentation of awards by the Mathematical Programming Society. In addition, the Midwest Young Artists Big Band will perform and narrate a program on Chicago jazz - a combination of history and performance that will introduce you to the city's unique musical heritage. Midwest Young Artists, founded in 1993, offers training in jazz, choral, chamber music and orchestra for students from 7 to 18 years old. Leading the nation in chamber music instruction, MYA groups have won numerous medals in the prestigious Fischhoff competition.

Following the opening ceremony, we invite you to enjoy the Welcome Reception at the Marriott Magnificent Mile Hotel. Bus transportation will be provided. Some people may prefer to take the 15-minute walk; see map on page 9.



## SCHEDULE OF EVENTS

### Welcome to 20th ISMP

John Birge, Chair, ISMP 2009

### MPS Chair's Message

Stephen Wright, Chair, Mathematical Programming Society

### Awarding of Prizes

- Dantzig Prize - for original research having a major impact on mathematical programming. Awarded by committee chair Jong-Shi Pang.
- Tucker Prize - for an outstanding thesis in mathematical programming. Announcement and presentation of finalists by committee chair Franz Rendl.
- Lagrange Prize in Continuous Optimization - for outstanding work in continuous optimization. Presentation by committee member Philippe Toint.
- Beale-Orchard-Hays Prize - for outstanding work in computational mathematical programming. Presentation by committee chair Nicholas Sahinidis.
- Fulkerson Prize - for outstanding papers in discrete mathematics. Recognition of Fulkerson family. Presentation by committee chair Bill Cook.

### Midwest Young Artists Big Band

Chicago Jazz: a Musical History

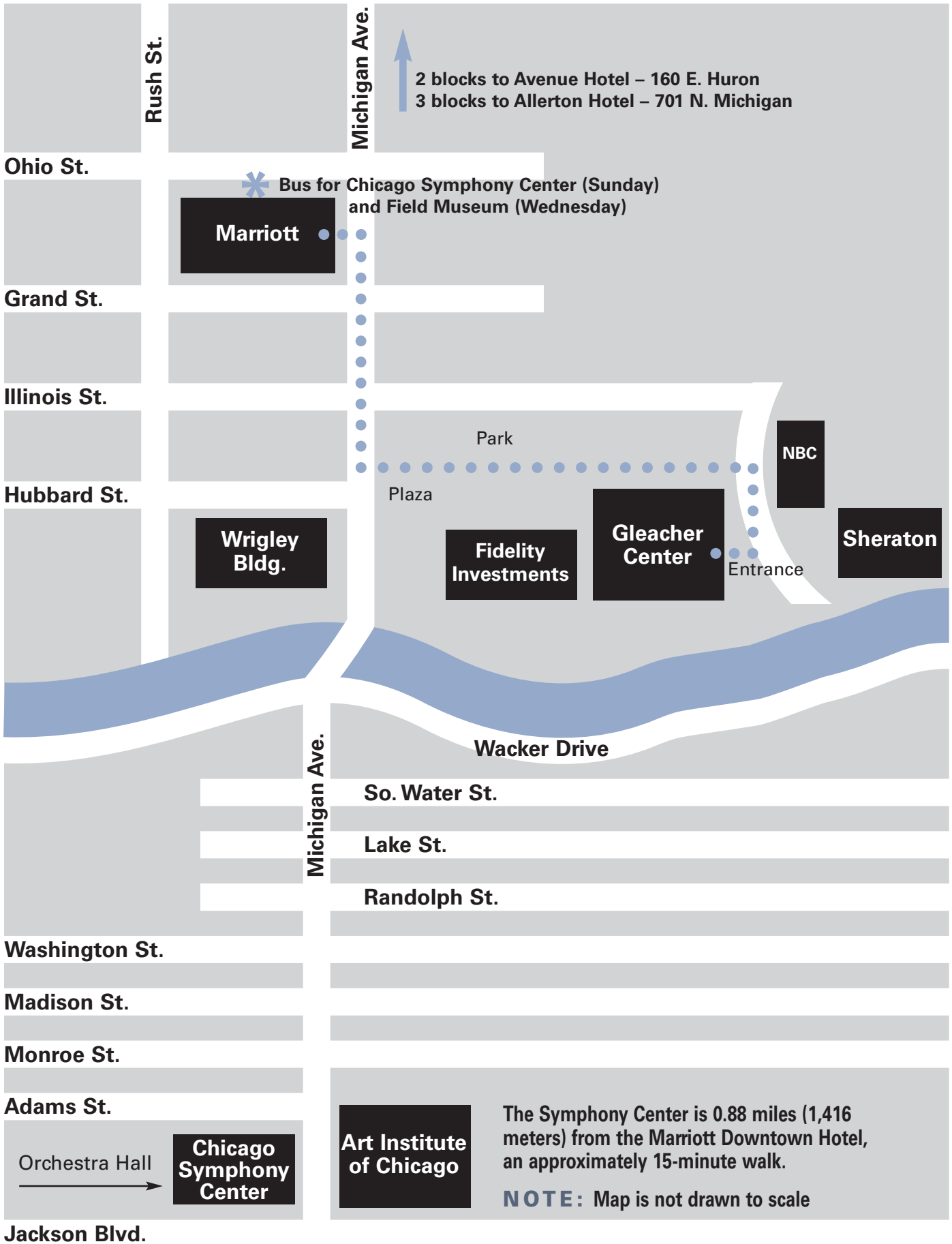
## Thank You



# 2009 ISMP

20TH INTERNATIONAL SYMPOSIUM ON  
MATHEMATICAL PROGRAMMING





**Exhibit Area**

Marriott-Chicago Foyer, 5th Floor

**Exhibit Hours**

Mon.–Wed. 8:30am–5:00pm

**AIMMS (Paragon Decision Technology)**

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**Mathematical Programming Society**

3600 Market St, 6th Floor  
Philadelphia, PA 19104-2688  
[www.mathprog.org](http://www.mathprog.org)

The Mathematical Programming Society is an international organization dedicated to the promotion and the maintenance of high professional standards in mathematical programming. MPS publishes the journals *Mathematical Programming A and B* and *Mathematical Programming Computation*; the MPS/SIAM *Series on Optimization*, and the newsletter *Optima*. The society awards a number of the most prestigious prizes in the field and is the primary sponsor of several of the most important conferences, including the International Symposium on Mathematical Programming (ISMP), the International Conference on Continuous Optimization (ICCOPT), and Integer Programming and Combinatorial Optimization (IPCO).

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Marriott - Chicago Foyer, 5th Floor

Gleacher Center - 220 South Lounge,  
250 North Lounge,  
320 South Lounge,  
350 North Lounge

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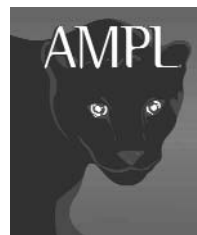
Gleacher - 220 South Lounge,  
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## MONDAY

## PLENARY

9:00am-9:50am  
Marriott, Chicago DE

**Real-time Embedded Convex Optimization**

Stephen P. Boyd  
Samsung Professor of Engineering; Professor of Electrical Engineering  
Stanford University, Information Systems Laboratory

This talk concerns the use of convex optimization, embedded as part of a larger system that executes automatically with newly arriving data, in areas such as automatic control, signal processing, real-time estimation, real-time resource allocation and decision making, and fast automated trading. We describe a code generation system that can generate solvers that can execute at the millisecond or microsecond time scale, by exploiting problem structure at code generation time.

**Stephen P. Boyd** received an AB degree in Mathematics from Harvard University in 1980, and a PhD in EECS from UC Berkeley in 1985. He is the author of many research articles and three books, and has received many awards and honors for his research in control systems engineering and optimization. In 1993 he was elected Distinguished Lecturer of the IEEE Control Systems Society, and in 1999, he was elected Fellow of the IEEE. In 1994 he received the Perrin Award for Outstanding Undergraduate Teaching in the School of Engineering, and he received the 2003 AACC Ragazzini Education award, for contributions to control education. His current research focus is on convex optimization applications in control, signal processing and circuit design.

## SEMI-PLENARY

5:00pm-5:50pm  
Marriott, Chicago D

**Games in Networks: The Price of Anarchy, Stability, and Learning**

Éva Tardos  
Professor & Chair  
Cornell University, Dept. of Computer Science

Network games are used to model selfish behavior in various domains. The price of anarchy compares Nash equilibria of a game to a centrally designed optimum, but says little about whether selfish players will coordinate on an equilibrium, nor which equilibrium they are likely to select if the game has more than one. Learning has been suggested as a natural model of players' behavior in games. In this talk, we consider the outcome of natural learning algorithms in a couple of simple games.

**Éva Tardos** received a Dipl. Math. in 1981, and a PhD in 1984 from Eötvös University, Budapest, Hungary. She is a member of the National Academy of Engineering and the American Academy of Arts and Sciences. Dr. Tardos received the George B. Dantzig Prize in 2006, and is an ACM Fellow. Her research interest focuses on the design and analysis of efficient methods for combinatorial-optimization problems on graphs or networks. She is working on problems that are related to the design, maintenance, and management of communication networks; problems that arise from vision. Her recent work focuses on algorithmic game theory, an emerging new area of designing systems and algorithms for selfish users. Dr. Tardos is most interested in network games and the price of anarchy.

## SEMI-PLENARY

5:00pm-5:50pm  
Marriott, Chicago E

**The Challenge of Large-Scale Differential Variational Inequalities**

Mihai Anitescu, Computational Mathematician  
Argonne National Laboratory

Differential variational inequalities (DVIs) model some of the most challenging problems of modern science. An example is the most-manipulated material in industry after water: granular materials. After centuries of investigation, particle-by-particle simulation and experimentation are still the only widely applicable predictive tools. We demonstrate the excellent performance and predictive power of time-stepping schemes for solving the resulting large-scale DVIs, including on GPU architectures.

**Mihai Anitescu** is a Computational Mathematician, Mathematics and Computer Science Division, at Argonne National Laboratory. He received an MS in Electrical Engineering in 1992 from the Polytechnic University of Bucharest, Romania, and a PhD in Applied Mathematical and Computational Sciences from the University of Iowa in 1997. His areas of research interest include numerical optimization, numerical analysis, uncertainty quantification and multi-rigid body dynamics. Dr. Anitescu serves as an Associate Editor, *Mathematical Programming*, and Software Editor, *Optimization Methods and Software*.

## TUESDAY

## PLENARY

9:00am-9:50am  
Marriott, Chicago DE

**Algorithmic Geometry of Numbers and Integer Programming**

Friedrich Eisenbrand, Professor  
Ecole Polytechnique Fédérale de Lausanne

In this tutorial, I survey some classical results, recent developments and current trends from the interplay of integer programming, algorithms and complexity, and the geometry of numbers. I focus in particular on efficient algorithms for integer programming in fixed dimension (the quest for a linear-time algorithm), parametric integer programming and the complexity of some real-time periodic scheduling problems.

**Friedrich Eisenbrand** was a full professor of mathematics at the University of Paderborn before joining EPFL in March 2008. He received the Heinz Maier-Leibnitz award of the German Research Foundation (DFG) in 2004 and the Otto Hahn medal of the Max Planck Society in 2001. His main research interests lie in the field of discrete optimization, in particular in algorithms and complexity, integer programming, geometry of numbers, and applied optimization. Dr. Eisenbrand is best known for his work on efficient algorithms for integer programming in fixed dimension and the theory of cutting planes, which is an important tool to solve large-scale industrial optimization problems in practice.

## SEMI-PLENARY

5:00pm-5:50pm  
Marriott, Chicago D

**Flows Over Time: Classical and More Recent Results**

Martin Skutella, Professor  
Technische Universität Berlin, Institut für Mathematik

Since the groundbreaking work of Ford and Fulkerson in the 1950s, the area of network flows has developed into many interesting directions. Network flows over time (also called "dynamic" network flows) form a particularly interesting area. They include a temporal dimension and therefore provide a more realistic modeling tool for numerous real-world applications. In this lecture, we give a survey of classical and more recent results on network flows over time.

**Martin Skutella** is a full professor of mathematics at TU Berlin and at the research center Matheon in Berlin. He received his PhD in Mathematics from TU Berlin in 1998. From 2003 to 2004 he was associate professor at the Max-Planck Institute for Computer Science before he moved to Dortmund University where he held the Chair of Discrete Optimization. His main research interests lie in the area of combinatorial optimization, in particular in network optimization and scheduling. Dr. Skutella is an associate editor of the journals *Mathematics of Operations Research*, *Operations Research Letters* (until 2008), *Networks*, and *Journal of Scheduling*. He is editor in chief of the *Notices of the German Mathematical Society*.

## SEMI-PLENARY

5:00pm-5:50pm  
Marriott, Chicago E

**Approximations and Error Bounds for Structured Convex Optimization**

Paul Tseng, Professor  
University of Washington

Convex optimization problems arising in applications, possibly as approximations of intractable problems (e.g., sensor network localization, compressed sensing, regularized regression/denoising), are often structured and large scale. When the data are noisy, it is of interest to bound the solution error relative to the (unknown) true solution of the original noiseless problem. Such error bounds are also central to the convergence rate analysis of first-order methods for solving these problems.

**Paul Tseng** received a BSc from Queens University in 1981 and a PhD from Massachusetts Institute of Technology in 1986. After spending one year at the University of British Columbia and three years at Massachusetts Institute of Technology, he joined the faculty at the University of Washington in 1990. His research area is mainly in continuous optimization, with side interests in discrete optimization, distributed computation, network and graph algorithms.



## WEDNESDAY

## PLENARY

9:00am-9:50am  
Marriott, Chicago DE

**Pure Cutting Plane Methods for Integer Linear Programming: A Computational Perspective**

Matteo Fischetti, Professor  
University of Padova

Modern branch-and-cut methods for (mixed or pure) integer linear programs are heavily based on general-purpose cutting planes that are used to reduce the number of branching nodes needed to reach optimality. However, pure cutting plane methods alone are typically not used in practice, due to their poor convergence properties. Branching can be viewed as a symptomatic cure to the well-known drawbacks deriving from the use of a long sequence of cuts: saturation, bad numerical behavior, etc. From the cutting plane point of view, however, the cure is worse than the disease, in that it hides the real source of the troubles. Indeed, we believe that a deeper understanding of cut behavior can only be achieved if the cutting plane generation is pushed to its limit, i.e., if an important research effort is devoted to the design of a numerically stable pure cutting plane method—even if on most problems this approach is likely not to be competitive with enumerative methods. In this talk we address the main issues arising when designing a computationally sounded pure cutting plane method. In particular, we present a detailed computational analysis related to the massive dual degeneracy that pure cutting plane methods have to face when solving strongly NP-hard problems.

**Matteo Fischetti** received the Laurea in Ingegneria Elettronica (100/100 cum laude) in 1982 from the University of Bologna; he received a PhD degree (Dottorato di Ricerca in Ingegneria dei Sistemi) in 1987 from the University of Bologna. His research interests include mixed integer programming, combinatorial optimization, vehicle routing and scheduling problems, graph theory, design and analysis of combinatorial algorithms, polyhedral combinatorics and 2-d nesting problems. Dr. Fischetti was a member of the 2008 Edelman Award winning team, the Netherlands Railways.

## SEMI-PLENARY

5:00pm-5:50pm  
Marriott, Chicago D

**Approximation Algorithms for Homogeneous Polynomial Optimization with Quadratic Constraints**

Shuzhong Zhang, Professor  
The Chinese University of Hong Kong

We discuss approximation algorithms for optimizing a generic multivariate homogeneous polynomial function, subject to homogeneous quadratic constraints. Such optimization models have wide applications. The problems under consideration are all NP-hard in general. We focus on the polynomial-time approximation algorithms and the worst-case performance ratios. Numerical experiments will be reported as well. Coauthors: Simai He and Zhening Li, The Chinese University of Hong Kong

**Shuzhong Zhang** received a BS in Mathematics from Fudan University in 1984 and a PhD from the Tinbergen Institute, Erasmus University in 1991. His research interests include optimization, operations research, mathematical programming, interior point methods, semidefinite programming, financial engineering and stochastic programming. He is an editorial board member on *Operations Research* and the *SIAM Journal on Optimization*.

## SEMI-PLENARY

5:00pm-5:50pm  
Marriott, Chicago E

**Strong LP Formulations in the Design and Analysis of Approximation Algorithms**

David Shmoys, Professor  
Cornell University

The power of natural LP relaxations has long been the source of much progress in approximation algorithms. Combinatorially defined valid inequalities have led to great advances in computational IP, but had been used only rarely for approximation algorithms. We survey recent approximation results based on flow- and knapsack-cover inequalities for covering problems: LP-rounding methods of Levi, Lodi and Sviridenko, primal-dual results of Carnes and Shmoys, and a partial enumerative approach of Bienstock.

**David Shmoys** obtained his PhD in Computer Science from the University of California at Berkeley in 1984. He has faculty appointments in both the School of Operations Research and Information Engineering and the Department of Computer Science at Cornell University. His research has focused on the design and analysis of efficient algorithms for discrete optimization problems. His current work includes the application of discrete optimization techniques to several issues in computational biology, as well as in the development of approximation algorithms for stochastic models of clustering, inventory and related problems in logistics.

## THURSDAY

## PLENARY

9:00am-9:50am  
Marriott, Chicago DE

**Valuation in Dynamic Stochastic Economies**

Lars Peter Hansen  
Homer J. Livingston Distinguished Service Professor  
University of Chicago

I explore the equilibrium value implications of economic models that incorporate reactions to a stochastic environment. I propose a dynamic value decomposition (DVD) designed to distinguish components of an underlying economic model that influence values over long horizons from components that impact only the short run. To quantify the role of parameter sensitivity and to impute long-term risk prices, I develop an associated perturbation technique. Finally, I use DVD methods to study formally some example economies and to speculate about others. A DVD is enabled by constructing operators indexed by the elapsed time between the date of pricing and the date of the future payoff. Thus formulated, methods from applied mathematics permit me to characterize valuation behavior as the time between price determination and payoff realization becomes large. An outcome of this analysis is the construction of a *multiplicative* martingale component of a process that is used to represent valuation in a dynamic economy with stochastic growth.

**Lars Peter Hansen** is an economist at the University of Chicago. He received a BS in Mathematics and Political Science (1974) from Utah State University and a PhD in Economics (1978) from the University of Minnesota, and is a member of the National Academy of Sciences. He is the co-winner of the Frisch Medal (with Kenneth Singleton in 1984), was awarded the Erwin Plein Nemmers Prize in Economics in 2006, and the CME Group-MSRI Prize in Innovative Quantitative Applications in 2008. Dr. Hansen is best known as the developer of the econometric technique GMM or generalized method of moments. His current research interests include pricing long run macroeconomic risk.

## SEMI-PLENARY

5:00pm-5:50pm  
Marriott, Chicago D

**Supply Functions for Electricity Markets: The Priority of Optimization Over Equilibrium**

Eddie Anderson, Professor  
University of Sydney

This paper provides an introduction to the theory of supply functions, particularly as developed for electricity markets. It includes a brief review of work in this area over the last two decades. We will argue that a thorough understanding of the difficulties of finding optimal monotonic supply functions in a stochastic environment is helpful in

attacking some of the difficulties that occur in looking for supply function equilibrium in an electricity market oligopoly. We will discuss both pay-as-bid and uniform price auction formats. We also briefly discuss some of the practical difficulties of applying this theory, arising from: networks and demand correlation, implicit collusion, and the non-existence of an equilibrium.

**Eddie Anderson** has an honours degree in Mathematics and a PhD in Engineering from the University of Cambridge. His recent research has looked at the problems of optimal decisions in a stochastic environment, for example when firms bid in auctions or decide on investments. He also uses game theory to investigate equilibrium outcomes. Dr. Anderson has published three books and over 50 papers in international academic journals. His recent research on the behavior of participants in electricity markets, such as the NEM in Australia, has been supported by two ARC Discovery grants.

## SEMI-PLENARY

5:00pm-5:50pm  
Marriott, Chicago E

**Some Paths in Mathematical Programming**

Jong-Shi Pang, Caterpillar Professor and Head of the Department of Industrial and Enterprise Systems Engineering  
University of Illinois at Urbana-Champaign

Celebrating the sixtieth anniversary since the Zero<sup>th</sup> International Symposium on Mathematical Programming in 1949, this paper discusses several recent paradigms in mathematical programming: competition, dynamics, hierarchy and inverse problems. The discussion emphasizes the interplay between these paradigms and their connections with existing subfields. We will describe the modeling approaches and formulations of these paradigms, provide state-of-the-art summaries of existing results, and identify open mathematical and computational challenges arising from the resulting optimization and equilibrium problems.

**Jong-Shi Pang** received a PhD in Operations Research from Stanford University in 1976 and joined the University of Illinois at Urbana-Champaign in August 2007. He was a winner of the 2003 George B. Dantzig Prize awarded jointly by MPS and SIAM for his work on finite-dimensional variational inequalities, and a co-winner of the 1994 Frederick W. Lanchester Prize awarded by INFORMS. Some of his most recent research topics include: the novel subject of differential variational inequalities, nonsmooth dynamical systems, the global solution of certain nonconvex optimization problems with disjunctive constraints, frictional contact problems and their optimization, dynamic traffic equilibrium problems, game-theoretic models in communication networks, electricity markets and supply chain systems.

## FRIDAY

## PLENARY

8:30am-9:20am  
Marriott, Chicago DE

**Risk-Averse Optimization**

Andrzej Ruszczyński, Professor  
Rutgers University, Dept. of Management Science and Information Systems

We shall discuss ways to model risk aversion in stochastic optimization problems: utility theory, risk measures, and stochastic dominance constraints. We shall review optimality and duality theory for the resulting risk-averse optimization problems. Particular attention will be paid to dynamic problems, for which we shall outline our new theory of risk-averse dynamic programming. Finally, we shall sketch ideas of numerical methods of risk-averse optimization.

**Andrzej Ruszczyński** received a PhD from the Warsaw University of Technology. He is author of numerous publications in operations research and applied mathematics journals such as *Mathematical Programming*, *Mathematics of Operations Research* and *Operations Research*, and is chairman of the Stochastic Programming Committee of the Mathematical Programming Society. Dr. Ruszczyński's interests are in the theory, numerical methods and applications of stochastic optimization.

## PLENARY

1:00pm-1:50pm  
Marriott, Chicago D

**The Convex Algebraic Geometry of Rank Minimization**

Pablo A. Parrilo, Finmeccanica Career Development Professor of Engineering at the Department of Electrical Engineering and Computer Science  
Massachusetts Institute of Technology

Optimization problems involving ranks of matrices are of great importance in applied mathematics and engineering. They provide a rich and fruitful interaction between algebraic-geometric concepts and convex optimization, with strong synergies with popular techniques for sparsity minimization like compressed sensing. In this lecture we will provide a gentle introduction to this exciting research area, highlighting key geometric concepts as well as a survey of recent developments and algorithms

**Pablo A. Parrilo** received a PhD in Control and Dynamical Systems from the California Institute of Technology in 2000. He is the recipient of the 2005 Donald P. Eckman Award of the American Automatic Control Council, as well as the 2005 SIAM Activity Group on Control and Systems Theory (SIAG/CST) Prize. His research interests include optimization methods for engineering applications, control and identification of uncertain complex systems, robustness analysis and synthesis, and the development and application of computational tools based on convex optimization and algorithmic algebra to practically relevant engineering problems.





Track	Room	Plenary 9:00-9:50	MA 10:30-12:00	MB 1:15-2:45	MC 3:15-4:45	Semi-Plenaries 5:00-5:50
1	M - Chicago A	Stephen Boyd Marriott Chicago D E 5th Floor	Approximation Algorithms	Approximation Algorithms	Approximation Algorithms	Éva Tardos Marriott Chicago D 5th Floor Mihai Anitescu Marriott Chicago E 5th Floor
2	M - Chicago B		Complementarity Problems & Variational Inequalities	Complementarity Problems & Variational Inequalities	Complementarity Problems & Variational Inequalities	
3	M - Chicago C		Complementarity Problems & Variational Inequalities	Complementarity Problems & Variational Inequalities	Complementarity Problems & Variational Inequalities	
4	M - Denver		Combinatorial Optimization	Combinatorial Optimization	Combinatorial Optimization	
5	M - Houston		Conic Optimization	Conic Optimization	Conic Optimization	
6	M - Kansas City		Conic Programming	Conic Programming	Conic Programming	
7	M - Chicago D		Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	
8	M - Chicago E		Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	
9	M - Chicago F		Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	
10	M - Chicago G		Global Optimization	Global Optimization	Global Optimization	
11	M - Chicago H		Global Optimization	Global Optimization	Global Optimization	
12	M - Los Angeles		Derivative-free & Simulation-based Optimization	Derivative-free & Simulation-based Optimization	Derivative-free & Simulation-based Optimization	
13	M - Miami		Optimization in Energy Systems	Optimization in Energy Systems	Optimization in Energy Systems	
14	M - Scottsdale		Game Theory	Game Theory	Game Theory	
15	G - 100		No Session	No Session	No Session	
16	G - 200		Stochastic Optimization	Stochastic Optimization	Stochastic Optimization	
17	G - 204		Logistics & Transportation	Logistics & Transportation	Logistics & Transportation	
18	G - 206		Nonlinear Mixed Integer Programming	Nonlinear Mixed Integer Programming	Nonlinear Mixed Integer Programming	
19	G - 208		Telecommunications & Networks	Stochastic Optimization	Stochastic Optimization	
20	G - 300		Nonlinear Programming	Nonlinear Programming	Nonlinear Programming	
21	G - 304		Telecommunications & Networks	Telecommunications & Networks	Telecommunications & Networks	
22	G - 306		Implementations, Software	Implementations, Software	Implementations, Software	
23	G - 308		No Session	No Session	No Session	
24	G - 400		Telecommunications & Networks	Telecommunications & Networks	Telecommunications & Networks	
25	G - 404		Variational Analysis	Variational Analysis	Variational Analysis	
26	G - 406		Portfolio & Option Problems	Portfolio & Option Problems	Portfolio & Option Problems	
27	G - 408		Variational Analysis	Variational Analysis	Variational Analysis	
28	G - 600		No Session	No Session	No Session	
29	G - 602		No Session	No Session	No Session	

Track	Room	Plenary 9:00-9:50	TA 10:30-12:00	TB 1:15-2:45	TC 3:15-4:45	Semi-Plenaries 5:00-5:50
1	M - Chicago A	Friedrich Eisenbrand  Marriott Chicago D E 5th Floor	Approximation Algorithms	Approximation Algorithms	Approximation Algorithms	Martin Skutella  Marriott Chicago D 5th Floor  Paul Tseng  Marriott Chicago E 5th Floor
2	M - Chicago B		Complementarity Problems & Variational Inequalities	Complementarity Problems & Variational Inequalities	Complementarity Problems & Variational Inequalities	
3	M - Chicago C		Complementarity Problems & Variational Inequalities	Complementarity Problems & Variational Inequalities	Complementarity Problems & Variational Inequalities	
4	M - Denver		Combinatorial Optimization	Combinatorial Optimization	Combinatorial Optimization	
5	M - Houston		Combinatorial Optimization	Combinatorial Optimization	Combinatorial Optimization	
6	M - Kansas City		Conic Programming	Conic Programming	Conic Programming	
7	M - Chicago D		Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	
8	M - Chicago E		Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	
9	M - Chicago F		Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	
10	M - Chicago G		Global Optimization	Global Optimization	Global Optimization	
11	M - Chicago H		Global Optimization	Global Optimization	Global Optimization	
12	M - Los Angeles		Derivative-free & Simulation-based Optimization	Derivative-free & Simulation-based Optimization	Derivative-free & Simulation-based Optimization	
13	M - Miami		Optimization in Energy Systems	Optimization in Energy Systems	Optimization in Energy Systems	
14	M - Scottsdale		Game Theory	Game Theory	Game Theory	
15	G - 100		Stochastic Optimization	Stochastic Optimization	Stochastic Optimization	
16	G - 200		Stochastic Optimization	Stochastic Optimization	Stochastic Optimization	
17	G - 204		Logistics & Transportation	Logistics & Transportation	Logistics & Transportation	
18	G - 206		Nonlinear Mixed Integer Programming	Nonlinear Mixed Integer Programming	Nonlinear Mixed Integer Programming	
19	G - 208		Nonlinear Programming	Nonlinear Programming	Nonlinear Programming	
20	G - 300		Nonlinear Programming	Nonlinear Programming	Nonlinear Programming	
21	G - 304		Telecommunications & Networks	Telecommunications & Networks	Telecommunications & Networks	
22	G - 306		Implementations, Software	Implementations, Software	Implementations, Software	
23	G - 308		Sparse Optimization	Sparse Optimization	Sparse Optimization	
24	G - 400		No Session	No Session	No Session	
25	G - 404		Variational Analysis	Variational Analysis	Variational Analysis	
26	G - 406		No Session	No Session	No Session	
27	G - 408		Variational Analysis	Variational Analysis	Variational Analysis	
28	G - 600		Nonsmooth & Convex Optimization	Nonsmooth & Convex Optimization	Nonsmooth & Convex Optimization	
29	G - 602		No Session	No Session	No Session	

Track	Room	Plenary 9:00–9:50	WA 10:30–12:00	WB 1:15–2:45	WC 3:15–4:45	Semi-Plenaries 5:00–5:50
1	M - Chicago A	Matteo Fischetti Marriott Chicago D E 5th Floor	Approximation Algorithms	Approximation Algorithms	Approximation Algorithms	Shuzhong Zhang Marriott Chicago D 5th Floor David Shmoys Marriott Chicago E 5th Floor
2	M - Chicago B		Complementarity Problems & Variational Inequalities	Complementarity Problems & Variational Inequalities	Complementarity Problems & Variational Inequalities	
3	M - Chicago C		Complementarity Problems & Variational Inequalities	Global Optimization	Optimization in Energy Systems	
4	M - Denver		Combinatorial Optimization	Combinatorial Optimization	Combinatorial Optimization	
5	M - Houston		Combinatorial Optimization	Combinatorial Optimization	Complementarity Problems & Variational Inequalities	
6	M - Kansas City		Conic Programming	Conic Programming	Conic Programming	
7	M - Chicago D		Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	
8	M - Chicago E		Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	
9	M - Chicago F		Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	
10	M - Chicago G		Global Optimization	Global Optimization	Global Optimization	
11	M - Chicago H		Global Optimization	Robust Optimization	Robust Optimization	
12	M - Los Angeles		Derivative-free & Simulation-based Optimization	PDE-Constrained Optimization	PDE-Constrained Optimization	
13	M - Miami		Optimization in Energy Systems	Optimization in Energy Systems	Optimization in Energy Systems	
14	M - Scottsdale		Game Theory	Game Theory	Game Theory	
15	G - 100		Stochastic Optimization	Stochastic Optimization	Stochastic Optimization	
16	G - 200		Stochastic Optimization	Stochastic Optimization	Stochastic Optimization	
17	G - 204		Logistics & Transportation	Logistics & Transportation	Logistics & Transportation	
18	G - 206		Nonlinear Mixed Integer Programming	Nonlinear Mixed Integer Programming	Nonlinear Mixed Integer Programming	
19	G - 208		Nonlinear Programming	Nonlinear Programming	Multicriteria & Global Optimization	
20	G - 300		Nonlinear Programming	Nonlinear Programming	Nonlinear Programming	
21	G - 304		Telecommunications & Networks	Telecommunications & Networks	Telecommunications & Networks	
22	G - 306		Implementations, Software	Implementations, Software	Implementations, Software	
23	G - 308		Sparse Optimization	Sparse Optimization	Sparse Optimization	
24	G - 400		No Session	No Session	No Session	
25	G - 404		Variational Analysis	Variational Analysis	Variational Analysis	
26	G - 406		No Session	No Session	No Session	
27	G - 408		No Session	No Session	No Session	
28	G - 600		Nonsmooth & Convex Optimization	Nonsmooth & Convex Optimization	Nonsmooth & Convex Optimization	
29	G - 602		Finance & Economics	Finance & Economics	Finance & Economics	

Track	Room	Plenary 9:00-9:50	ThA 10:30-12:00	ThB 1:15-2:45	ThC 3:15-4:45	Semi-Plenaries 5:00-5:50
1	M - Chicago A	Lars Peter Hansen Marriott Chicago D E 5th Floor	Approximation Algorithms	Approximation Algorithms	Approximation Algorithms	Eddie Anderson Marriott Chicago D 5th Floor Jong-Shi Pang Marriott Chicago E 5th Floor
2	M - Chicago B		Complementarity Problems & Variational Inequalities	Complementarity Problems & Variational Inequalities	Complementarity Problems & Variational Inequalities	
3	M - Chicago C		Optimization in Energy Systems	Optimization in Energy Systems	Optimization in Energy Systems	
4	M - Denver		Combinatorial Optimization	Combinatorial Optimization	Combinatorial Optimization	
5	M - Houston		Combinatorial Optimization	Combinatorial Optimization	Combinatorial Optimization	
6	M - Kansas City		Conic Programming	Conic Programming	Conic Programming	
7	M - Chicago D		Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	
8	M - Chicago E		Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	
9	M - Chicago F		Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	Integer & Mixed Integer Programming	
10	M - Chicago G		Global Optimization	Global Optimization	Global Optimization	
11	M - Chicago H		Robust Optimization	Robust Optimization	Robust Optimization	
12	M - Los Angeles		PDE-Constrained Optimization	PDE-Constrained Optimization	PDE-Constrained Optimization	
13	M - Miami		Optimization in Energy Systems	Optimization in Energy Systems	Optimization in Energy Systems	
14	M - Scottsdale		No Session	Game Theory	Game Theory	
15	G - 100		Stochastic Optimization	Stochastic Optimization	Stochastic Optimization	
16	G - 200		Stochastic Optimization	Stochastic Optimization	Stochastic Optimization	
17	G - 204		Logistics & Transportation	Logistics & Transportation	Logistics & Transportation	
18	G - 206		Nonlinear Mixed Integer Programming	Nonlinear Mixed Integer Programming	Nonlinear Mixed Integer Programming	
19	G - 208		Nonlinear Mixed Integer Programming	Nonlinear Mixed Integer Programming	Stochastic Optimization	
20	G - 300		Nonlinear Programming	Nonlinear Programming	Nonlinear Programming	
21	G - 304		Telecommunications & Networks	Telecommunications & Networks	Telecommunications & Networks	
22	G - 306		Implementations, Software	Implementations, Software	Optimization in Energy Systems	
23	G - 308		Sparse Optimization	Sparse Optimization	Sparse Optimization	
24	G - 400		No Session	No Session	No Session	
25	G - 404		Variational Analysis	Variational Analysis	Variational Analysis	
26	G - 406		No Session	No Session	No Session	
27	G - 408		No Session	No Session	No Session	
28	G - 600		Nonsmooth & Convex Optimization	Nonsmooth & Convex Optimization	Nonsmooth & Convex Optimization	
29	G - 602		Finance & Economics	No Session	No Session	

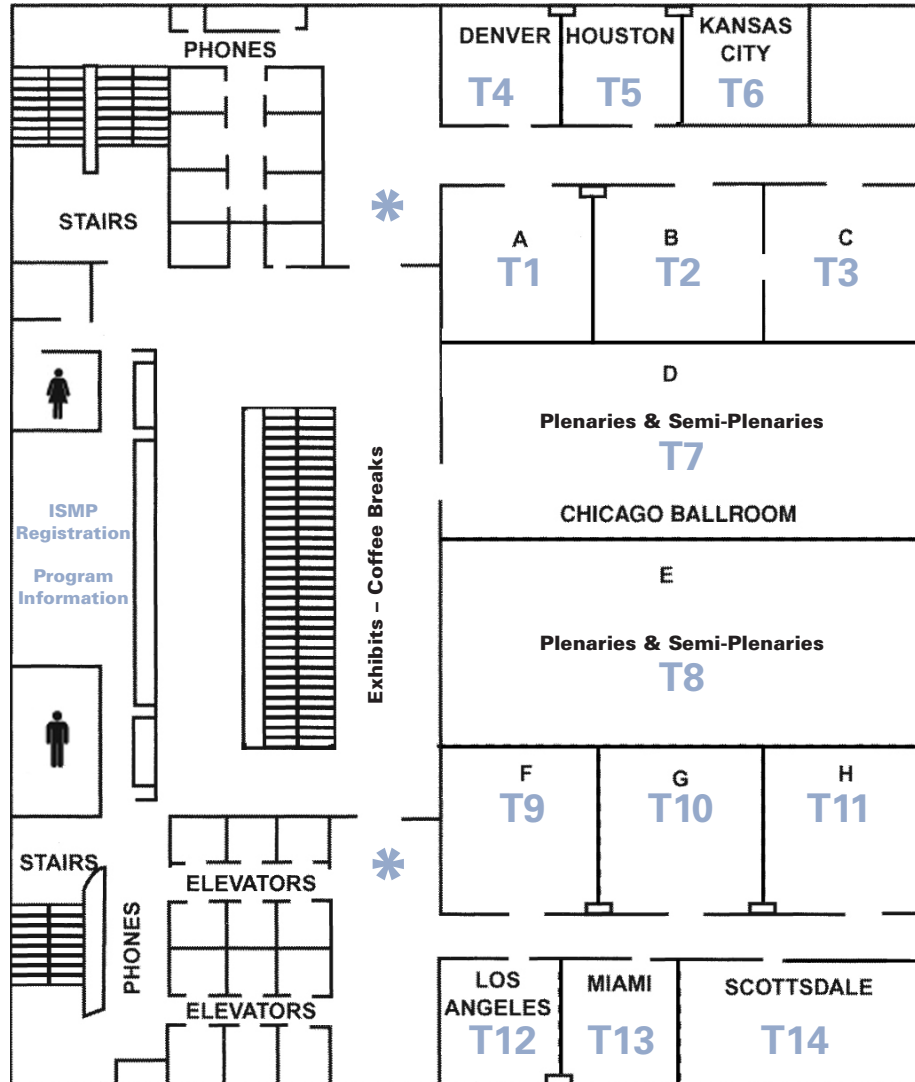
Track	Room	Plenary 8:30–9:20	FA 10:00-11:30	Plenary 1:00-1:50	FB 2:00-3:30
1	M - Chicago A		Approximation Algorithms		Linear Algorithms
2	M - Chicago B		Complementarity Problems & Variational Inequalities		Discrete Optimization
3	M - Chicago C		Optimization in Energy Systems		Optimization in Energy Systems
4	M - Denver		Combinatorial Optimization		Combinatorial Optimization
5	M - Houston		No Session		Combinatorial Optimization
6	M - Kansas City		Conic Programming		Conic Programming
7	M - Chicago D		Integer & Mixed Integer Programming		Integer & Mixed Integer Programming
8	M - Chicago E	Andrzej Ruszczyński	Integer & Mixed Integer Programming	Pablo Parrilo	Integer & Mixed Integer Programming
9	M - Chicago F	Marriott	Integer & Mixed Integer Programming	Marriott	Integer & Mixed Integer Programming
10	M - Chicago G	Chicago D E	Global Optimization	Chicago D	Global Optimization
11	M - Chicago H	5th Floor	Robust Optimization	5th Floor	Robust Optimization
12	M - Los Angeles		PDE-Constrained Optimization		PDE-Constrained Optimization
13	M - Miami		No Session		Derivative-Free & Simulation-Based Optimization
14	M - Scottsdale		PDE-Constrained Optimization		Game Theory
15	G - 100		Stochastic Optimization		Stochastic Optimization
16	G - 200		Stochastic Optimization		Stochastic Optimization
17	G - 204		Logistics & Transportation		Logistics & Transportation
18	G - 206		Nonlinear Mixed Integer Programming		Nonlinear Mixed Integer Programming
19	G - 208		Nonlinear Programming		No Session
20	G - 300		Nonlinear Programming		Nonlinear Programming
21	G - 304		Telecommunications & Networks		Telecommunications & Networks
22	G - 306		Implementations, Software		No Session
23	G - 308		Sparse Optimization		No Session
24	G - 400		No Session		No Session
25	G - 404		Variational Analysis		Variational Analysis
26	G - 406		No Session		No Session
27	G - 408		No Session		No Session
28	G - 600		No Session		No Session
29	G - 602		No Session		No Session

FLOOR 5

TRACKS

1-14

\* Session Monitor Desk



FLOOR 1

TRACK

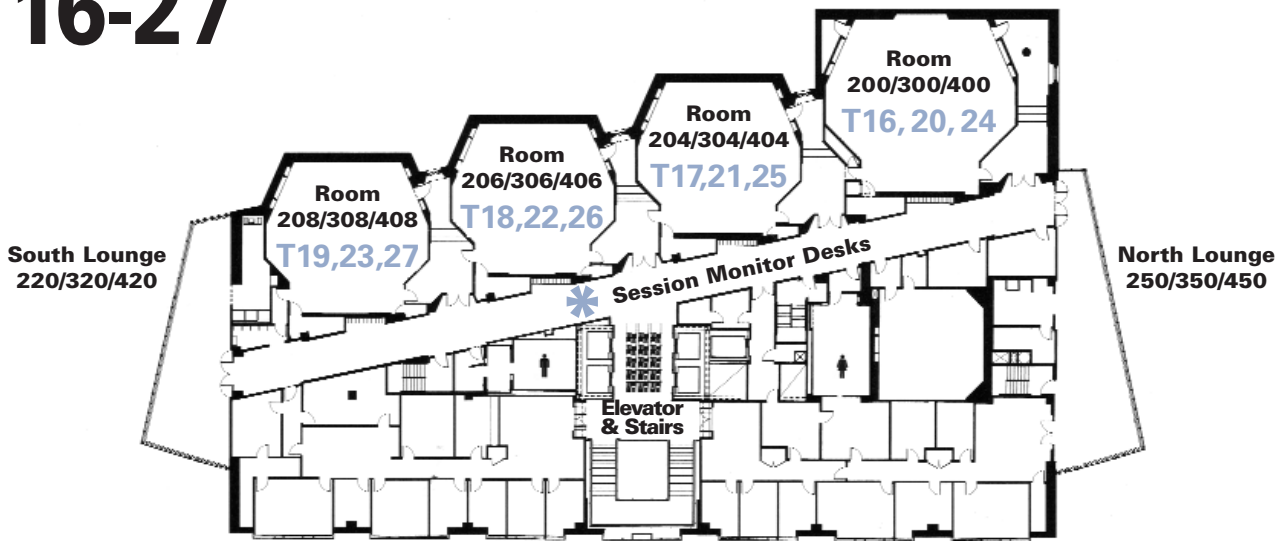
15

Follow signs to Room 100

FLOOR 2, 3 & 4

TRACKS

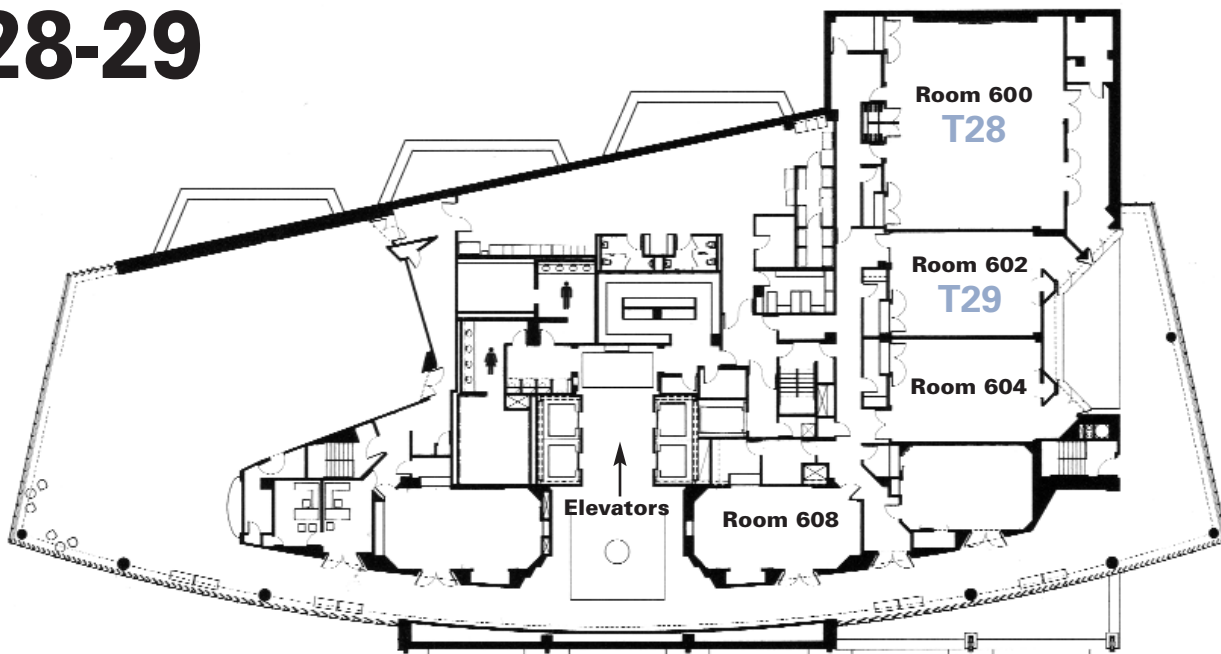
16-27



FLOOR 6

TRACKS

28-29



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**Complementarity Problems & Variational Inequalities**

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**Derivative-Free & Simulation-Based Optimization**

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**Nonlinear Mixed Integer Programming**

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