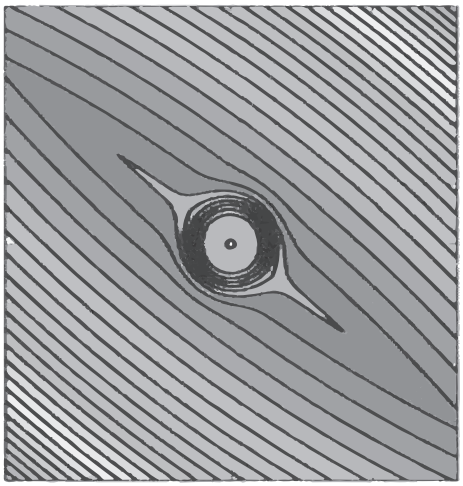
Final Program and Abstracts

SIAM Conference on



OPTIMIZATION

Based on Audet and Dennis' plot of Kolda, Lewis and Torczon's modification of the Dennis-Wood canoe function.

May 22-25, 2017
Sheraton Vancouver Wall Centre
Vancouver, British Columbia, Canada

Sponsored by the SIAM Activity Group on Optimization

The SIAM Activity Group on Optimization fosters the development of optimization theory, methods, and software -- and in particular the development and analysis of efficient and effective methods, as well as their implementation in high-quality software. It provides and encourages an environment for interaction among applied mathematicians, computer scientists, engineers, scientists, and others active in optimization. In addition to endorsing various optimization meetings, this activity group organizes the triennial SIAM Conference on Optimization, awards the SIAG/Optimization Prize, and sponsors minisymposia at the annual meeting and other SIAM conferences. The activity group maintains a wiki, a membership directory, and an electronic discussion group in which members can participate, and also publishes a newsletter - SIAG/OPT News and Views.

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The SIAM registration desk is located in the Grand Ballroom Foyer - North Tower. It is open during the following hours:

Sunday, May 21
5:00 PM – 8:00 PM

Monday, May 22
7:00 AM – 7:00 PM

Tuesday, May 23
7:45 AM – 3:30 PM

Wednesday, May 24
7:45 AM – 5:00 PM

Thursday, May 25
7:45 AM – 2:45 PM

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Check-in time is 3:00 PM.
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- Nannies on Call
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  www.nanniesoncall.com

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Funding Agencies

SIAM and the conference organizing committee wish to extend their thanks and appreciation to U.S. National Science Foundation for its support of this conference.

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If you are a SIAM member, it only costs $15 to join the SIAM Activity Group on Optimization (SIAG/OPT). As a SIAG/OPT member, you are eligible for an additional $15 discount on this conference, so if you paid the SIAM member rate to attend the conference, you might be eligible for a free SIAG/OPT membership. Check at the registration desk.

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The Plenary Session Room will have two (2) screens, one (1) data projector and one (1) overhead projector. The data projectors support VGA connections only. Presenters requiring an HDMI or alternate connection must provide their own adaptor.

All other concurrent/breakout rooms will have one (1) screen and one (1) data projector. The data projectors support VGA connections only. Presenters requiring an HDMI or alternate connection must provide their own adaptor.

If you have questions regarding availability of equipment in the meeting room of your presentation, please see a SIAM staff member at the registration desk.

Internet Access

Attendees booked within the SIAM room block will receive complimentary wireless internet access in their guest rooms.

Complimentary wireless Internet access in the meeting space is also available to SIAM attendees.

In addition, a limited number of computers with Internet access will be available during registration hours.

Registration Fee Includes

- Admission to all technical sessions
- Business Meeting (open to SIAG/OPT members)
- Coffee breaks daily
- Room set-ups and audio/visual equipment
- Welcome Reception and Poster Session

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Please check with the SIAM registration desk regarding the availability of job postings or visit *http://jobs.siam.org*.

Important Notice to Poster Presenters

The poster session is scheduled for Monday, May 22 at 6:30 PM. Poster presenters are expected to set up their poster material on the provided 4' x 8' poster boards in the Grand Ballroom CD - North Tower beginning at 7:00 AM on Monday. All materials must be posted by Monday, May 22, 6:30 PM, the official start time of the session. Posters must be removed by 9:30 AM on Thursday, May 25.

SIAM Books and Journals

Display copies of books and complimentary copies of journals are available on site. SIAM books are available at a discounted price during the conference. The books booth will be staffed from 8:30 AM through 5:00 PM. If a SIAM books representative is temporarily away from the booth, completed order forms and payment (credit cards are preferred) may be taken to the SIAM registration desk. The books table will close at 2:30 PM on Thursday.

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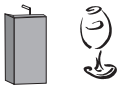
Comments?

Comments about SIAM meetings are encouraged! Please send to: Cynthia Phillips, SIAM Vice President for Programs (*vpp@siam.org*).

Get-togethers

Welcome Reception
Monday, May 22
6:30 PM – 8:30 PM

Business Meeting
(open to SIAG/OPT members)
Tuesday, May 23
4:30 PM – 5:15 PM



Complimentary beer and wine will be served.

Statement on Inclusiveness

As a professional society, SIAM is committed to providing an inclusive climate that encourages the open expression and exchange of ideas, that is free from all forms of discrimination, harassment, and retaliation, and that is welcoming and comfortable to all members and to those who participate in its activities. In pursuit of that commitment, SIAM is dedicated to the philosophy of equality of opportunity and treatment for all participants regardless of gender, gender identity or expression, sexual orientation, race, color, national or ethnic origin, religion or religious belief, age, marital status, disabilities, veteran status, field of expertise, or any other reason not related to scientific merit. This philosophy extends from SIAM conferences, to its publications, and to its governing structures and bodies. We expect all members of SIAM and participants in SIAM activities to work towards this commitment.

Please Note

SIAM is not responsible for the safety and security of attendees' computers. Do not leave your personal electronic devices unattended. Please remember to turn off your cell phones and other devices during sessions.

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Audio and video recording of presentations at SIAM meetings is prohibited without the written permission of the presenter and SIAM.

Social Media

SIAM is promoting the use of social media, such as Facebook and Twitter, in order to enhance scientific discussion at its meetings and enable attendees to connect with each other prior to, during and after conferences. If you are tweeting about a conference, please use the designated hashtag to enable other attendees to keep up with the Twitter conversation and to allow better archiving of our conference discussions. The hashtag for this meeting is #SIAMOP17.

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ACTIVITIES INCLUDE:

- *SIAG/OPT News and Views* newsletter
- SIAG/OPT Wiki
- SIAG/OPT Prize
- Triennial conference
- Special sessions at SIAM Meetings

BENEFITS OF SIAG/CSE membership:

- Listing in the SIAG's online membership directory
- Additional $15 discount on registration at the SIAM Conference on Optimization
- Subscription to *SIAG/OPT News and Views*
- Electronic communications about recent developments in your specialty
- Eligibility for candidacy for SIAG/OPT office
- Particpation in the selection of SIAG/OPT officers

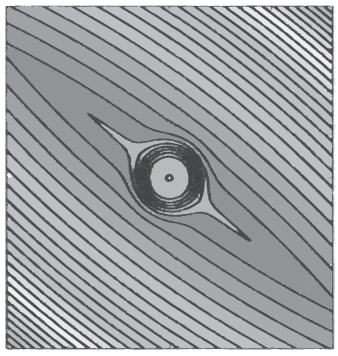
ELIGIBILITY:

- Be a current SIAM member.

COST:

- $15 per year
- Student members can join two activity groups for free!

SIAM Conference on



OPTIMIZATION

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May 22-25, 2017
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Invited Plenary Speakers

All Invited Plenary Presentations will take place in Grand Ballroom AB - North Tower*

Monday, May 22

8:15 AM – 9:00 AM

IP1 Rigorous Guarantees for Nonconvex Optimization?

Martin Wainwright, *University of California, Berkeley, USA*

1:00 PM – 1:45 PM

IP2 Innovation in Big Data Analytics

Eva K. Lee, *Georgia Institute of Technology, USA*

Tuesday, May 23

8:15 AM – 9:00 AM

IP3 Optimizing Today's Communication Networks

Zhi-Quan Luo, *The Chinese University of Hong Kong, Hong Kong*

Invited Plenary Speakers

***** All Invited Plenary Presentations will take place in the Ballroom*****

Wednesday, May 24

8:15 AM – 9:00 AM

IP4 Subgradient Methods

James M. Renegar, *Cornell University, USA*

1:00 PM – 1:45 PM

IP5 Using Second-order Information in Training Large-scale Machine Learning Models

Katya Scheinberg, *Lehigh University, USA*

Thursday, May 25

8:15 AM – 9:00 AM

IP6 Using Local Measurements to Infer Global Network Properties

Ali Pinar, *Sandia National Laboratories, USA*

1:00 PM – 1:45 PM

IP7 Recent Progress on Dual Decomposition for Stochastic Integer Programming

Jeffrey Linderoth, *University of Wisconsin, Madison, USA*

Minitutorials

***** All Minitutorials will take place in Grand Ballroom AB - North Tower*****

Monday, May 22

9:30 AM – 11:00 AM

MT1 Optimal Power Flow

Organizers: **Daniel Bienstock,** *Columbia University, USA*
Pascal Van Hentenryck, *University of Michigan, USA*

Tuesday, May 23

9:30 AM – 11:00 AM

MT2 Stochastic Optimization for Machine Learning

Organizers: **Francis Bach** *Inria and École Normale Supérieure, France*
Mark Schmidt, *University of British Columbia, Canada*

Prize Lecture

***** Prize Lecture will take place in Grand Ballroom AB - North Tower *****

Tuesday, May 23

1:00 PM–1:45 PM

SP1 SIAG/OPT Prize Lecture:

Proximal Minimization Algorithms for Nonconvex and Nonsmooth Problems

Shoham Sabach, *Technion Israel Institute of Technology, Israel*

SIAM Presents is an audio-visual archive

comprised of more than 2,000 presentations posted in over 40 searchable topics, including:

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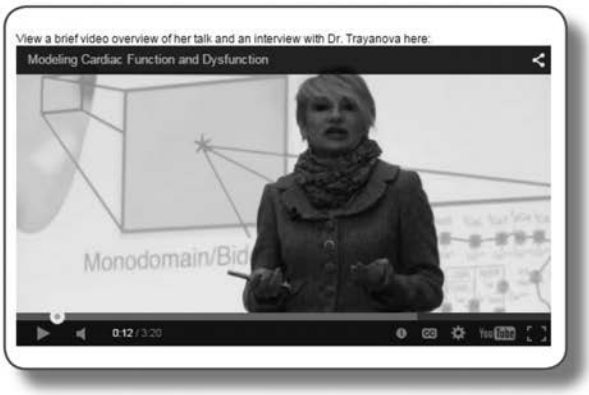
- **atmospheric and oceanographic science**
- **computational science**
- **data mining**
- **geophysical science**
- **optimization**
- **uncertainty quantification and more...**

The collection, *Featured Lectures from our Archives*, includes audio and slides from more than 30 conferences since 2008, including talks by invited and prize speakers, select minisymposia, and minitutorials. Presentations from SIAM meetings are being added throughout the year.

In addition you can view short video clips of speaker interviews from sessions at Annual Meetings starting in 2010.

Plans for adding more content are on the horizon. Keep an eye out!

The audio, slide, and video presentations are part of SIAM's outreach activities to increase the public's awareness of mathematics and computational science in the real world, and to bring attention to exciting and valuable work being done in the field. Funding from SIAM, the National Science Foundation, and the Department of Energy was used to partially support this project.



New presentations are posted every few months as the program expands with sessions from additional SIAM meetings. Users can search for presentations by category, speaker name, and/or key words.

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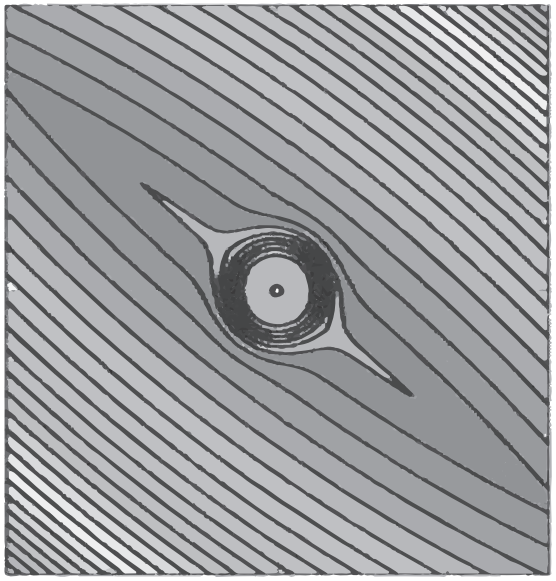
6/16

Program Schedule

SIAM Conference on



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Sunday, May 21

Registration

5:00 PM-8:00 PM

Room:Grand Ballroom Foyer - North Tower

Monday, May 22

Registration

7:00 AM-7:00 PM

Room:Grand Ballroom Foyer - North Tower

Welcome Remarks

8:00 AM-8:15 AM

Room:Grand Ballroom AB - North Tower

IP1

Rigorous Guarantees for Nonconvex Optimization?

8:15 AM-9:00 AM

Room:Grand Ballroom AB - North Tower

Chair: Alexandre d'Aspremont, CNRS - Ecole Normale Superieure, France

The classical complexity barrier in continuous optimization is between convex (solvable in polynomial time) and nonconvex (intractable in the worst-case setting). However, many problems of interest are not constructed adversarially, but instead arise from statistical models of scientific phenomena. Can we provide rigorous guarantees for such random ensembles of nonconvex optimization problems? In this talk, we survey various positive answers to this question, including optimal results for sparse regression with nonconvex penalties, direct approaches to low-rank matrix recovery, and non-local guarantees for the EM algorithm. All of these results involve natural weakenings of convexity that hold for various classes of nonconvex functions, thus shifting the barrier between tractable and intractable. Joint work with Sivaraman Balakrishnan, Yudong Chen, Po-Ling Loh and Bin Yu.

Martin Wainwright

University of California, Berkeley, USA

Coffee Break

9:00 AM-9:30 AM

Room:Grand Ballroom CD - North Tower

Monday, May 22

MT1

Optimal Power Flow

9:30 AM-11:30 AM

Room:Grand Ballroom AB - North Tower

Chair: Pascal Van Hentenryck, University of Michigan, USA

Chair: Daniel Bienstock, Columbia University, USA

Optimal Power Flow

The design, control, and operation of the power grid, likely the largest and most complex system ever engineered, require as an essential ingredient the solution of optimization problems over a set of constraints describing steady-state power flow physics. The resulting mixed nonconvex programs are often computationally challenging and increasingly so with the increased stochasticity in generation and load due to renewables and intelligent loads. This tutorial is an introduction to optimal power flow problems, their complexity, recent developments in the field, and applications. It covers convex relaxations, including semi-definite programming and polynomial relaxations, as well as approximations. Extensive computational results demonstrate some of the benefits of the proposed techniques.

Daniel Bienstock, Columbia University, USA

Optimal Power Flows: A Tale of Complexity, Approximations, Relaxations, Challenges, and Opportunities

The planning, control, and operation of energy systems require solving large-scale, non-convex optimization problems over physical laws. Moreover, renewable energy, power electronics, and progress in battery technology challenge the fundamental assumptions on which the electrical power grid has been built for over a century.

continued in next column

This tutorial will review these challenges in the context of optimal power flows. It will present key results in complexity, relaxations, and approximations, and recent extensive experimental results. It is both a tale of significant achievements by the optimization community and a road ahead full of computational challenges.

Pascal Van Hentenryck , University of Michigan, USA

Monday, May 22

MS1

Recent Progress in Conic Programming - Part I of II

9:30 AM-11:30 AM

Room:Pavilion Ballroom A - Third Floor North Tower

For Part 2 see MS16

This minisymposium highlights recent progress in conic programming, the emerging research topic including second-order cone programming and semidefinite programming. The eight talks cover rather wide area of conic programming, which include theorerical results on algorithms and geometry, computational results based on novel ideas, and new applications of conic programmig.

Organizer: Masakazu Muramatsu

University of Electro-Communications, Japan

Organizer: Akiko Yoshise

University of Tsukuba, Japan

9:30-9:55 Finding Infimum Point with Respect to the Second Order Cone

Marta Cavaleiro, Rutgers University, USA

10:00-10:25 The Conic Optimizer in Mosek: A Status Report

Joachim Dahl and Erling D. Andersen, MOSEK ApS, Denmark

10:30-10:55 Analysis of Newton's Method via Semidefinite Programming Performance Estimation Problems

Etienne De Klerk, Tilburg University, The Netherlands; Francois Glineur and Adrien Taylor, Université Catholique de Louvain, Belgium

11:00-11:25 Perturbation Analysis of Singular Semidefinite Programming via the Facial Reduction

Yoshiyuki Sekiguchi, Tokyo University of Marine Science and Technology, Japan

Monday, May 22

MS2

Optimization with Polynomials, Matrices and Tensors - Part I of II

9:30 AM-11:30 AM

Room:Pavilion Ballroom B - Third Floor North Tower

For Part 2 see MS17

Polynomial optimization, matrix problems and tensor computation are recent hot topics in computational math. This session consists of talks about most recent research results in the area. The invited speakers will talk about tensor nuclear norm, Crouzeix's conjecture in linear algebra, upper bounds for polynomial optimization by SOS-hierarchies, and polynomial optimization in dynamic systems. This is the first of a stream of 2 sessions.

Organizer: Jiawang Nie

University of California, San Diego, USA

9:30-9:55 Symmetric Tensor Nuclear Norm

Jiawang Nie, University of California, San Diego, USA

10:00-10:25 Investigation of Crouzeix's Conjecture via Nonsmooth Optimization

Michael L. Overton, Courant Institute of Mathematical Sciences, New York University, USA; Anne Greenbaum, University of Washington, USA; Adrian Lewis, Cornell University, USA

10:30-10:55 Convergence Rate of SoS Based Upper Bounds in Polynomial Optimization

Monique Laurent, Centrum voor Wiskunde en Informatica, The Netherlands; Etienne De Klerk, Tilburg University, The Netherlands; Roxana Hess and Jean B. Lasserre, LAAS-CNRS, Toulouse, France; Zhao Sun, Symetrics, The Netherlands

11:00-11:25 Polynomial Norms

Amir Ali Ahmadi, Princeton University, USA; Etienne De Klerk, Tilburg University, The Netherlands; Georgina Hall, Princeton University, USA

Monday, May 22

MS3

PDE-Constrained Optimization, Control and Games: New Models and Methods - Part I of II

9:30 AM-11:30 AM

Room:Pavilion Ballroom C - Third Floor North Tower

For Part 2 see MS18

Partial differential equation (PDE) models have a growing importance in industrial and societal domains, for instance in engineering (fluid dynamics, structural mechanics) or urban mobility (pedestrian, vehicular traffic). The construction of efficient (sometimes multidecision) optimization strategies for such systems requires the development of dedicated numerical algorithms, accounting for the particular nature of the underlying model (regularity of the solution, computational cost, etc). The objective of this minisymposium is to gather researchers from different fields, interested in numerical methods to improve the efficiency of real-life systems based on PDE models. This includes sensitivity analysis and control of PDE models, optimization and game strategies for systems governed by PDEs, and Gaussian Process surrogate models.

Organizer: Regis Duvigneau

Université Côte d'Azur, INRIA, CNRS, France

Organizer: Abderrahmane Habbal

Université Côte d'Azur, INRIA, CNRS, France

9:30-9:55 A Fokker-Planck Nash Game to Model Pedestrian Motion

Alfio Borzi, University of Würzburg, Germany; *Abderrahmane Habbal*, Université Côte d'Azur, INRIA, CNRS, France; Souvik Roy, University of Würzburg, Germany

10:00-10:25 Optimization and Control in Free Boundary Fluid-Structure Interactions

Lorena Bociu and *Lucas Castle*, North Carolina State University, USA

10:30-10:55 Traffic Regulation via Controlled Speed Limit

Maria Laura Delle Monache, Inria, France; Benedetto Piccoli, Rutgers University, USA; Francesco Rossi, Aix-Marseille Université, France

11:00-11:25 Sensitivity Analysis for Hyperbolic Systems of Conservation Laws

Camilla Fiorini, University of Versailles, France; Regis Duvigneau, Université Côte d'Azur, INRIA, CNRS, France; Christophe Chalons, Versailles Saint-Quentin-en-Yvelines University, France

continued in next column

Monday, May 22

MS4

Lift and Project Methods in Data Analysis

9:30 AM-11:30 AM

Room:Pavilion Ballroom D - Third Floor North Tower

The lifting of an optimization problem to higher dimensions is a key idea underlying relaxations for combinatorial problems as well as in efficient descriptions of convex sets via the introduction of additional variables. In this minisymposium we explore the role of lifting from the viewpoint of a data-analyst. We examine settings where the introduction of additional variables allows one to obtain more concisely parameterized models (e.g. latent-variable modeling), and learn richer data representations. A common theme in these works is using convex geometry to develop inference procedures.

Organizer: Armeen Taeb

California Institute of Technology, USA

Organizer: Yong Sheng Soh

California Institute of Technology, USA

9:30-9:55 Fitting Convex Sets to Data via Matrix Factorization

Yong Sheng Soh, California Institute of Technology, USA

10:00-10:25 Generalized Permutohedra from Probabilistic Graphical Models

Caroline Uhler, Massachusetts Institute of Technology, USA

10:30-10:55 Low Rank Factor Analysis

Dimitris Bertsimas, *Martin S. Copenhaver*, and Rahul Mazumder, Massachusetts Institute of Technology, USA

11:00-11:25 Interpreting Latent Variables in Factor Models via Convex Optimization

Armeen Taeb, California Institute of Technology, USA

Monday, May 22

MS5

Efficient Algorithms For Large Convex Optimization Problems - Part I of III

9:30 AM-11:30 AM

Room:Junior Ballroom A -Third Floor North Tower

For Part 2 see MS20

In our digital world -- with ever increasing problem sizes -- one has to abandon traditional methods, which are becoming prohibitively expensive. This gives an opportunity to explore new research directions, and design new algorithms, which have the potential to achieve faster convergence and each iteration is either relatively cheap or can be easily parallelized. One popular way how to produce cheap iterations is to use e.g. coordinate descent methods. Another popular way is to explore randomization. It turns out that in many applications randomized algorithms outperform their deterministic variants. Acceleration is another traditional approach of modifying existing algorithms to obtain optimal convergence speed.

Organizer: Martin Takac

Lehigh University, USA

Organizer: Chenxin Ma

Lehigh University, USA

9:30-9:55 Linear Convergence of the Randomized Feasible Descent Method Under the Weak Strong Convexity Assumption

Chenxin Ma and Martin Takac, Lehigh University, USA

10:00-10:25 Linear Convergence of Gradient and Proximal-Gradient Methods Under the Polyak-Lojasiewicz Condition

Hamed Karimi, Julie Nutini, and Mark Schmidt, University of British Columbia, Canada

10:30-10:55 Randomized Projection Methods for Convex Feasibility Problems

Ion Necoara, University Politehnica of Bucharest, Romania; Peter Richtarik, University of Edinburgh, United Kingdom; Andrei Patrascu, University Politehnica of Bucharest, Romania

11:00-11:25 Stochastic Heavy Ball Method for Solving Linear Systems

Nicolas Loizou and Peter Richtarik, University of Edinburgh, United Kingdom

continued in next column

Monday, May 22

MS6

Optimization with PDEs: Theory and Numerics - Part I of III

9:30 AM-11:30 AM

Room:Junior Ballroom B -Third Floor North Tower

For Part 2 see MS21

Optimal control problems with partial differential equations are of huge interest from the theoretical point of view as well as in a variety of practical applications. This minisymposium will bring together researchers working on actual topics in PDE-constrained optimization. This includes for instance control in measure spaces and sparse controls, control problems for different classes of underlying PDEs including semilinear, complex-valued, and fractional equations as well as optimal experimental design problems, discretization concepts based on model reduction and finite element analysis, and the treatment of practical applications.

Organizer: Axel Kroener

Inria Saclay and CMAP Ecole Polytechnique, France

Organizer: Johannes Pfefferer

Technische Universität München, Germany

9:30-9:55 A Priori Error Estimates for Space-Time Finite Element Discretization of Parabolic Time-Optimal Control Problems

Lucas Bonifacius and Boris Vexler, Technische Universität München, Germany; Konstantin Pieper, Florida State University, USA

10:00-10:25 Sparse Control for Inverse Point Source Location with the Helmholtz Equation

Konstantin Pieper, Florida State University, USA; Bao Q. Tang and Philip Trautmann, University of Graz, Austria; Daniel Walter, Technische Universität München, Germany

10:30-10:55 Fractional Elliptic QVI: Theory and Numerics

Harbir Antil, George Mason University, USA; Carlos N. Rautenberg, Humboldt University Berlin, Germany

continued in next column

11:00-11:25 Numerical Aspects and Error Estimates for Dirichlet Boundary Control Problems

Johannes Pfefferer, Technische Universität München, Germany; Thomas Apel, Universität der Bundeswehr München, Germany; Mariano Mateos, Universidad de Oviedo, Spain; Arnd Rösch, University of Duisburg-Essen, Germany

Monday, May 22

MS7

Recent Advances in Large-Scale Nonlinear Optimization - Part I of II

9:30 AM-11:30 AM

Room:Junior Ballroom C -Third Floor North Tower

For Part 2 see MS22

In recent years, large-scale nonlinear optimization has developed in multiple directions. “Classical” techniques have been re-examined with (in some cases) surprising results, notably in areas such as machine learning and data science; innovative ideas from other areas of mathematics have been incorporated into optimization methods; and progress in linear algebra has made direct contributions to optimization algorithms and software. These two minisymposia will feature speakers who have worked in all of these directions, always with the unifying idea of creating effective solution methods for large-scale problems.

Organizer: Margaret H. Wright

Courant Institute of Mathematical Sciences, New York University, USA

9:30-9:55 Shape-Changing Limited-Memory SR1 Trust-Region Methods

Jennifer Erway, Wake Forest University, USA; Johannes J. Brust, University of California, Merced, USA; Oleg Burdakov, Linköping University, Sweden; Roummel F. Marcia, University of California, Merced, USA; Yaxiang Yuan, Chinese Academy of Sciences, China

10:00-10:25 On Solving Symmetric Systems of Linear Equations Arising in Optimization

Anders Forsgren, KTH Royal Institute of Technology, Sweden

10:30-10:55 Adding Primal Regularization to a Primal-Dual Augmented Lagrangian Approach

Joshua Griffin, Riadh Omheni, and Wenwen Zhou, SAS Institute, Inc., USA

11:00-11:25 Using Nonlinear Optimization to Adjust Protein Similarity Score Matrices for Amino Acid Composition

E. Michael Gertz, National Center for Biotechnology Information and National Institutes of Health

Monday, May 22

MS8

Low-Complexity Algorithms for Structured Optimization

9:30 AM-11:30 AM

Room:Junior Ballroom D -Third Floor North Tower

Many optimization problems arising from real applications have certain structures. For instance, some problems have separable structure in the objective functions and separable block variables; some problems come from network applications so that the network topology needs to be considered for algorithm design; some problems consider optimization on manifold, which is a nonconvex problem but with special structure. This minisymposium will focus on theory and algorithms for optimization with certain structures, and by taking advantage of these special structures, the algorithms should have low complexity, so that it can scale up for large problems. The four talks in this minisymposium will cover the following topics: (i) design and analyze first-order algorithms for structured nonconvex optimization problems; (ii) algorithm design for nonsmooth optimization on manifolds; (iii) distributed resource sharing on dynamic communication topology; (iv) stochastic quasi-Newton method for nonconvex learning problem. This minisymposium will bring together experts working on first-order methods, manifold optimization, distributed optimization and randomized algorithms. The topics will be interesting to general audience who work on convex or nonconvex continuous optimization, and their applications in network and machine learning.

Organizer: Shiqian Ma

Chinese University of Hong Kong, Hong Kong

9:30-9:55 Gradient Sampling Methods on Riemannian Manifolds and Algebraic Varieties

Andre Uschmajew and Seyedehsomayeh Hosseini, University of Bonn, Germany

10:00-10:25 A Distributed ADMM-Like Method for Resource Sharing Under Conic Constraints Over Time-Varying Networks

Necdet S. Aybat and Erfan Yazdandoost Hamedani, Pennsylvania State University, USA

10:30-10:55 Structured Nonconvex and Nonsmooth Optimization: Algorithms and Iteration Complexity Analysis

Bo Jiang, Shanghai University of Finance and Economics, China

11:00-11:25 Geometric Descent Method for Composite Convex Minimization

Shiqian Ma and Shixiang Chen, Chinese University of Hong Kong, Hong Kong

continued in next column

Monday, May 22

MS9

Nonsmooth Optimization with Complex Constraints: Duality, Algorithms, and Applications - Part I of III

9:30 AM-11:30 AM

Room:Parksville - Third Floor North Tower

For Part 2 see MS24

This symposium brings together modeling, theory, and algorithms for large-scale nonsmooth (nonconvex) optimization. Practical effects of these developments are illustrated on several applications, including sparse and low rank optimization, nonconvex trimmed formulations for machine learning, and computer vision.

Organizer: Aleksandr Aravkin

University of Washington, USA

Organizer: Dmitriy Drusvyatskiy

University of Washington, USA

9:30-9:55 Fast Algorithms for Nonconvex Robust Learning

Aleksandr Aravkin, University of Washington, USA; Damek Davis, Cornell University, USA

10:00-10:25 Nonsmooth Optimization Using Taylor-Like Models: Error Bounds, Convergence, and Termination Criteria

Dmitriy Drusvyatskiy, University of Washington, USA

10:30-10:55 First-Order Methods for Singular Kalman smoothing with PLQ Penalties

Jonathan Jonker and Aleksandr Aravkin, University of Washington, USA

11:00-11:25 Radial Subgradient Descent

Benjamin Grimmer, Cornell University, USA

Monday, May 22

MS10

Structured Integer Programs

9:30 AM-11:30 AM

Room:Orca - Third Floor B Tower

This minisymposium consist of four talks on new polyhedral and algorithmic results for structured integer programs. Three talks focus on mixed-integer convex programs: one on deriving new cut-generating functions for mixed-integer second-order conic sets, and the other two on efficient decomposition algorithms for routing problems with convex objectives. The last talk is on optimal control of a switched linear system; complexity and polyhedral results are introduced.

Organizer: Qie He

University of Minnesota, USA

9:30-9:55 A Polyhedral Approach to Optimal Control of Switched Linear Systems

Zeyang Wu, University of Minnesota, USA

10:00-10:25 Some Cut-Generating Functions for Second-Order Conic Sets

Asteroide Santana and Santanu S. Dey, Georgia Institute of Technology, USA

10:30-10:55 A Joint Routing and Speed Optimization Problem

Ricardo Fukasawa, University of Waterloo, Canada; Qie He, University of Minnesota, USA; Fernando Santos, Universidade Federal de Itajubá, Brazil; Yongjia Song, Virginia Commonwealth University, USA

11:00-11:25 Vehicle Routing Problems with Time Windows and Convex Node Costs

Yongjia Song, Virginia Commonwealth University, USA; Qie He, University of Minnesota, USA

Monday, May 22

MS11

Advances in Dynamic Optimization - Part I of III

9:30 AM-11:30 AM

Room:Finback - Third Floor B Tower

For Part 2 see MS26

Dynamic optimization – – the problem of seeking optimality constrained by the trajectories of the dynamical system – – presents both persistent and new conceptual and computational challenges. In this sequence of minisymposia, we present new approaches, formulations, and computational methods for such problems. We will be interested in complexity reduction themes, such as the usage of decomposition, reduced modeling, and hierarchical structures; as well as new computational frameworks and platforms in which to carry out efficient calculations involving dynamic optimization.

Organizer: Mihai Anitescu

University of Chicago, USA

Organizer: Victor Zavala

University of Wisconsin, Madison, USA

9:30-9:55 Accelerating Newton's Method for Nonlinear Parabolic Control via Reduced-Order Modeling

Matthias Heinkenschloss and Caleb C. Magruder, Rice University, USA

10:00-10:25 New Multilevel Strategies in Optimal Feedback Control

Ekaterina Kostina, Gregor Kriwet, and Hans Georg Bock, Universität Heidelberg, Germany

10:30-10:55 Exponentially Accurate Temporal Decomposition for Long Horizon Dynamic Optimization Problem

Mihai Anitescu and Wanting Xu, University of Chicago, USA

11:00-11:25 An Online Experimental Design Approach for Fast Detection of Extrasystoles

Tobias Weber and Sebastian Sager, Universität Magdeburg, Germany

Monday, May 22

MS12

Stochastic Optimization for Hydroelectric Systems - Part I of II

9:30 AM-11:30 AM

Room:Beluga - Third Floor B Tower

For Part 2 see MS27

Power production using renewable sources is of great importance to our society. Optimizing these systems is a challenging task mostly due to the undertain nature of many parameters. Most commonly, the problem is divided into smaller, though still challenging, optimization models that differ in time-scale, numerical precision and optimization objective. Stochastic optimization, and specifically stochastic dynamic programming, is widely used for hydropower systems management. While it has many advantages, these approaches suffer from the curse-of-dimensionality (the computation time grows exponentially with the number of state variables) and the curse-of-modelling (the time decomposition scheme limits the complexity of the stochastic modelling of the random variable). The first part of this minisymposium is concerned with improvements for computation with such models, in particular through the use of inflow scenarios. The next challenge is to link all the optimization models so as to obtain a coherent operational decision tool system, also accounting for other renewable sources and for energy storage. This is the focus of the second part of the minisymposium that reports new results in the modeling and integration aspects. This minisymposium will be of interest to researchers in the fields of stochastic optimization and renewable energy systems.

Organizer: Miguel F. Anjos

GERAD & Polytechnique Montreal, Canada

continued on next page

9:30-9:55 Sampling Stochastic Dynamic Programming for Mid-Term Hydropower Optimization

Pascal Côté, Rio Tinto, Canada; James Merleau, Ireq, Canada; Kenjy Demeester, École Polytechnique de Montréal, Canada

10:00-10:25 Numerical Assessment of an Adaptive Simplicial Approximation Method for Hydroelectric Planning

Luckny Zéphyr, Cornell University, USA; Pascal Lang and *Bernard F. Lamond*, Université Laval, Canada; Pascal Côté, Rio Tinto, Canada

10:30-10:55 Optimal Control in Hydropower Management with a Simulation and Regression Approach to Dynamic Programming

Michel Denault, HEC Montréal, Canada

11:00-11:25 Direct Policy Search Gradient Method using Inflow Scenarios

Quentin Desreumaux, University of Sherbrooke, Canada; Pascal Côté, Rio Tinto, Canada; Robert Leconte, University of Sherbrooke, Canada

Monday, May 22

MS13

Nonconvex Optimization for Imaging Analysis

9:30 AM-11:00 AM

Room:Azure - Third Floor South Tower

While convex optimization for imaging analysis has received considerable attention by the imaging community, non-convex optimization techniques for image processing and compressive sensing are still in their nascent stages. In general, non-convex problem formulations are notoriously difficult to solve; however, recent advances in non-convex optimization imaging approaches have made significant headway in performance and accuracy. In this minisymposium, we discuss different approaches for solving non-convex optimization problems that arise in image processing and consider future research directions in this field.

Organizer: Lasith Adhikari

University of California, Merced, USA

Organizer: Roummel F. Marcia

University of California, Merced, USA

9:30-9:55 Nonconvex Sparse Poisson Intensity Reconstruction for Time-Dependent Tomography

Lasith Adhikari, Arnold D. Kim, and Roummel F. Marcia, University of California, Merced, USA

10:00-10:25 Extended Gauss-Newton-Type Methods for a Class of Matrix Optimization Problems

Quoc Tran-Dinh and Zheqi Zhang, University of North Carolina at Chapel Hill, USA

10:30-10:55 Kernel-Based Reconstruction Algorithm for Anatomically-Aided Optical Tomography

Reheman Baikejiang, University of California, Merced, USA

Monday, May 22

MS14

Nonlinear and Stochastic Optimization - Part I of II

9:30 AM-11:30 AM

Room:Gulf Islands B - Lower Lobby North Tower

For Part 2 see MS29

This minisymposium concerns nonlinear optimization methods that use a range of function information: from zero-order, to first-order and second-order information. Most of this research is motivated by stochastic optimization applications, e.g., supervised training in machine learning. The goal is to develop algorithms with provable convergence properties and practical efficiency. In these sessions optimization algorithms for both convex and non-convex functions will be discussed. The performance of stochastic and batch methods on deep neural networks is also investigated.

Organizer: Jorge Nocedal

Northwestern University, USA

9:30-9:55 Exact and Inexact Subsampled Newton Methods for Optimization

Jorge Nocedal and Raghu Bollapragada, Northwestern University, USA; Richard H. Byrd, University of Colorado, USA

10:00-10:25 Random Projections for Faster Second Order Constrained Optimization Methods

Mert Pilanci, Stanford University, USA

10:30-10:55 Adaptive Sampling Strategies for Stochastic Optimization

Raghu Bollapragada, Northwestern University, USA; Richard H. Byrd, University of Colorado, USA; Jorge Nocedal, Northwestern University, USA

11:00-11:25 The Role of Over-Parametrization in Optimization with a Focus on Deep Learning

Levent Sagun, Courant Institute of Mathematical Sciences, New York University, USA

Monday, May 22

MS15

Optimization and Large-Scale Data Analysis - Part I of III

9:30 AM-11:30 AM

Room:Gulf Tower C - Lower Lobby North Tower

For Part 2 see MS30

In this minisymposium, we bring together researchers working on optimization algorithms from both the mathematical programming community and the machine learning (ML) community, to facilitate interdisciplinary interactions and collaborations. Recently, optimization theory and methods (both old and new) have became increasingly important in various ML tasks, while emerging ML applications continue to inspire new optimization theory and methods. Therefore it is important for the two communities to establish close interactions and to communicate their recent findings. Our minisyposium intends to provide such a venue. The main topic of this symposium include the recent advances in zeroth/first/second-order methods, convex and non-convex optimization, stochastic optimization, distributed/parallel optimization and their applications in machine learning and data sciences, such as training neural networks, adaptive trial design and low rank matrix recovery. These are all topics under extensive recent research, in both the optimization and ML communities. The focus of this symposium will be on methods that have rigorously theoretical properties (such as convergence, rate of convergence, high-dimensional scaling properties, etc), while at the same time achieving superior practical performance in data-intensive applications. This is a great opportunity for researchers in this area to make lasting contributions.

Organizer: Mingyi Hong
Iowa State University, USA

Organizer: George Lan
University of Florida, USA

continued in next column

9:30-9:55 Stochastic Gradient Descent for Nonconvex Problems
George Lan, University of Florida, USA

10:00-10:25 Nonconvex Proximal Primal Dual Methods
Mingyi Hong, Iowa State University, USA

10:30-10:55 Distributed Stochastic Second-Order Method for Training Large Scale Deep Neural Networks
Xi He, Lehigh University, USA; Dheevatsa Mudigere and Mikhail Smelyanskiy, Intel Corporation, USA; *Martin Takac*, Lehigh University, USA

11:00-11:25 SVS-Free Algorithms for Low-Rank Matrix Recovery
Chinmay Hegde, Iowa State University, U

Lunch Break

11:30 AM-1:00 PM

Attendees on their own

Monday, May 22

IP2

Innovation in Big Data Analytics

1:00 PM-1:45 PM

Room:Grand Ballroom AB - North Tower

Chair: Juan Meza, University of California, Merced, USA

Risk and decision models and predictive analytics have long been cornerstones for advancement of business analytics in industrial, government, and military applications. In particular, multi-source data system modeling and big data analytics and technologies play an increasingly important role in modern business enterprise. Many problems arising in these domains can be formulated into mathematical models and can be analyzed using sophisticated optimization, decision analysis, and computational techniques. In this talk, we will share some of our successes in healthcare, defense, and service sector applications through innovation in predictive and big data analytics.

Eva K. Lee
Georgia Institute of Technology, USA

Intermission

1:45 PM-2:00 PM

Monday, May 22

MS16

Recent Progress in Conic Programming - Part II of II

2:00 PM-4:00 PM

Room:Pavilion Ballroom A - Third Floor North Tower

For Part 1 see MS1

This minisymposium highlights recent progress in conic programming, the emerging research topic including second-order cone programming and semidefinite programming. The eight talks cover rather wide area of conic programming, which include theorerical results on algorithms and geometry, computational results based on novel ideas, and new applications of conic programmig.

Organizer: Masakazu Muramatsu

University of Electro-Communications, Japan

Organizer: Akiko Yoshise

University of Tsukuba, Japan

2:00-2:25 Primal-Dual Algorithm for Symmetric Programming Problems with Nonlinear Objective Functions

Leonid Faybusovich, University of Notre Dame, USA

2:30-2:55 New Developments in Primal-Dual Interior-Point Algorithms for Convex Optimization

Levent Tuncel, University of Waterloo, Canada

3:00-3:25 Characterization of the Robust Isolated Calmness for a Class of Conic Programming

Chao Ding, Chinese Academy of Sciences, China; Defeng Sun, National University of Singapore, Republic of Singapore; Liwei Zhang, Dalian University of Technology, China

3:30-3:55 Inner and Outer Approximations of the Semidefinite Cone Using SD Bases and their Applications to Some NP-Hard Problems

Daigo Narushima, Akihiro Tanaka, and Akiko Yoshise, University of Tsukuba, Japan

Monday, May 22

MS17

Optimization with Polynomials, Matrices and Tensors - Part II of II

2:00 PM-4:00 PM

Room:Pavilion Ballroom B - Third Floor North Tower

For Part 1 see MS2

Polynomial optimization, matrix problems and tensor computation are recent hot topics in computational math. This session consists of talks about most recent research results in the area. The invited speakers will talk about tensor nuclear norm, Crouzeix's conjecture in linear algebra, upper bounds for polynomial optimization by SOS-hierarchies, and polynomial optimization in dynamic systems. This is the second one in the stream of two sessions.

Organizer: Jiawang Nie

University of California, San Diego, USA

2:00-2:25 Tensor Eigenvalue Complementarity Problems

Jinyan Fan, Shanghai Jiaotong University, China; Jiawang Nie, University of California, San Diego, USA; Anwa Zhou, Shanghai University, China

2:30-2:55 Geometric Measure of Entanglement of Symmetric D-Qubits is Polynomial-Time Computable

Shmuel Friedland and *Li Wang*, University of Illinois, Chicago, USA

3:00-3:25 Real Eigenvalues of Nonsymmetric Tensors

Xinzhen Zhang, Tianjin University, China; Jiawang Nie, University of California, San Diego, USA

3:30-3:55 More NP-Hard Tensor Problems

Lek-Heng Lim, University of Chicago, USA

Monday, May 22

MS18

PDE-Constrained Optimization, Control and Games: New Models and Methods - Part II of II

2:00 PM-4:00 PM

Room:Pavilion Ballroom C - Third Floor North Tower

For Part 1 see MS3

Partial differential equation (PDE) models have a growing importance in industrial and societal domains, for instance in engineering (fluid dynamics, structural mechanics) or urban mobility (pedestrian, vehicular traffic). The construction of efficient (sometimes multidecision) optimization strategies for such systems requires the development of dedicated numerical algorithms, accounting for the particular nature of the underlying model (regularity of the solution, computational cost, etc). The objective of this minisymposium is to gather researchers from different fields, interested in numerical methods to improve the efficiency of real-life systems based on PDE models. This includes sensitivity analysis and control of PDE models, optimization and game strategies for systems governed by PDEs, and Gaussian Process surrogate models.

Organizer: Regis Duvigneau

Université Côte d'Azur, INRIA, CNRS, France

Organizer: Abderrahmane Habbal

Université Côte d'Azur, INRIA, CNRS, France

2:00-2:25 High-Order Taylor Expansions for Compressible Flows

Regis Duvigneau, Université Côte d'Azur, INRIA, CNRS, France

continued on next page

Monday, May 22

MS18

PDE-Constrained Optimization, Control and Games: New Models and Methods - Part II of II

2:00 PM-4:00 PM

continued

2:30-2:55 Surrogates and Classification Approaches for Efficient Global Optimization (EGO) with Inequality Constraints

Matthieu Sacher, Ecole Navale, France; Regis Duvigneau, Université Côte d'Azur, INRIA, CNRS, France; Olivier Le Maitre, LIMSI-CNRS, France; Mathieu Durand, Epsilon Ingénierie, France; Elisa Berrini, Université Côte d'Azur, INRIA, CNRS, France; Frederic Hauville and Jascque-Andre Astolfi, Ecole Navale, France

3:00-3:25 Bayesian Optimization Approaches to Compute Nash Equilibria

Victor Picheny, Inria, France; Micka\"el Binois, University of Chicago, USA; Abderrahmane Habbal, Université Côte d'Azur, INRIA, CNRS, France

3:30-3:55 A Comparison of Regularization Methods for Gaussian Processes

Rodolphe Le Riche, Hossein Mohammadi, Nicolas Durrande, and Eric Touboul, Ecole des Mines de St Etienne, France; Xavier Bay, CNRS and Ecole des Mines de St Etienne, France

Monday, May 22

MS19

Recent Developments in First-Order Methods for Convex Optimization

2:00 PM-4:00 PM

Room:Pavilion Ballroom D - Third Floor North Tower

First-order methods for convex optimization have blossomed in the past 10 years partly because of their applicability to large-scale problems in data science and machine learning. One notable trend is that old algorithms have recently been reanalyzed more carefully to obtain new methods with improved robustness and efficiency. The four talks in this minisymposium highlight these and related developments.

Organizer: Stephen A. Vavasis
University of Waterloo, Canada

2:00-2:25 A Unified Convergence Bound for Conjugate Gradient and Accelerated Gradient

Stephen A. Vavasis, University of Waterloo, Canada; Sahar Karimi, 1QBit, Canada

2:30-2:55 An Optimal First-order Method Based on Optimal Quadratic Averaging

Scott Roy, Dmitriy Drusvyatskiy, and Maryam Fazel, University of Washington, USA

3:00-3:25 A New Perspective on Boosting in Linear Regression via First Order Methods

Rahul Mazumder and Robert M. Freund, Massachusetts Institute of Technology, USA; Paul Grigas, University of California, Berkeley, USA

3:30-3:55 Ellipsoid Method vs Accelerated Gradient Descent

Sébastien Bubeck, *Yin Tat Lee*, and Mohit Singh, Microsoft Research, USA

Monday, May 22

MS20

Efficient Algorithms For Large Convex Optimization Problems - Part II of III

2:00 PM-4:00 PM

Room:Junior Ballroom A -Third Floor North Tower

For Part 1 see MS5
For Part 3 see MS31

In our digital world -- with ever increasing problem sizes -- one has to abandon traditional methods, which are becoming prohibitively expensive. This gives an opportunity to explore new research directions, and design new algorithms, which have the potential to achieve faster convergence and each iteration is either relatively cheap or can be easily parallelized. One popular way how to produce cheap iterations is to use e.g. coordinate descent methods. Another popular way is to explore randomization. It turns out that in many applications randomized algorithms outperform their deterministic variants. Acceleration is another traditional approach of modifying existing algorithms to obtain optimal convergence speed.

Organizer: Martin Takac
Lehigh University, USA

Organizer: Chenxin Ma
Lehigh University, USA

2:00-2:25 Let's Make Block Coordinate Descent Go Fast!

Julie Nutini, Issam Laradji, and Mark Schmidt, University of British Columbia, Canada

2:30-2:55 Efficiency of Coordinate Descent on Structured Problems

Sebastian Stich, EPFL, Switzerland; Yurii Nesterov, Universite Catholique de Louvain, Belgium

3:00-3:25 Flexible Coordinate Descent

Rachael Tappenden, University of Edinburgh, United Kingdom

3:30-3:55 Smoothing Technique for Nonsmooth Composite Minimization with Linear Operator

Volkan Cevher, École Polytechnique Fédérale de Lausanne, Switzerland; *Olivier Fercoq*, Télécom ParisTech, France; Quang Nguyen, EPFL, France

Monday, May 22

MS21

Optimization with PDEs: Theory and Numerics - Part II of III

2:00 PM-4:00 PM

Room:Junior Ballroom B -Third Floor North Tower

For Part 1 see MS6
For Part 3 see MS32

Optimal control problems with partial differential equations are of huge interest from the theoretical point of view as well as in a variety of practical applications. This minisymposium will bring together researchers working on actual topics in PDE-constrained optimization. This includes for instance control in measure spaces and sparse controls, control problems for different classes of underlying PDEs including semilinear, complex-valued, and fractional equations as well as optimal experimental design problems, discretization concepts based on model reduction and finite element analysis, and the treatment of practical applications.

Organizer: Axel Kroener

Inria Saclay and CMAP Ecole Polytechnique, France

Organizer: Johannes Pfefferer

Technische Universität München, Germany

2:00-2:25 On Optimal Experimental Design Problems for PDEs

Roland Herzog, Technische Universitat Chemnitz, Germany

2:30-2:55 Nonlinear Robust PDE Constrained Optimization Using a Second Order Approximation Technique and Model Order Reduction

Oliver Lass and Stefan Ulbrich, Technische Universität Darmstadt, Germany

3:00-3:25 Approximation and Reduction of Optimal Control Problems in Infinite Dimension

Mickael Chekroun, University of California, Los Angeles, USA; Axel Kroener, Inria Saclay and CMAP Ecole Polytechnique, France; *Honghu Liu*, Virginia Tech, USA

3:30-3:55 Ultrasound Tomography for Breast Cancer Detection

Christian Boehm, Naiara Korta Martiartu, and Andreas Fichtner, ETH Zürich, Switzerland

Monday, May 22

MS22

Recent Advances in Large-Scale Nonlinear Optimization - Part II of II

2:00 PM-4:00 PM

Room:Junior Ballroom C -Third Floor North Tower

For Part 1 see MS7

In recent years, large-scale nonlinear optimization has developed in multiple directions. “Classical” techniques have been re-examined with (in some cases) surprising results, notably in areas such as machine learning and data science; innovative ideas from other areas of mathematics have been incorporated into optimization methods; and progress in linear algebra has made direct contributions to optimization algorithms and software. These two minisymposia will feature speakers who have worked in all of these directions, always with the unifying idea of creating effective solution methods for large-scale problems.

Organizer: Margaret H. Wright

Courant Institute of Mathematical Sciences, New York University, USA

2:00-2:25 Compact Representation of Quasi-Newton Matrices

Omar DeGuchy, University of California, Merced, USA; Jennifer Erway, Wake Forest University, USA; *Roummel F. Marcia*, University of California, Merced, USA

2:30-2:55 An Enhanced Truncated-Newton Algorithm for Large-Scale Optimization

Daniel Robinson, Johns Hopkins University, USA

3:00-3:25 Sequential Quadratic Programming Methods for Nonlinear Optimization

Elizabeth Wong and Philip E. Gill, University of California, San Diego, USA

3:30-3:55 Large-Scale Linear Algebra and its Role in Optimization

Michael A. Saunders, Stanford University, USA

Monday, May 22

MS23

Sparse Optimization and Signal Processing

2:00 PM-4:00 PM

Room:Junior Ballroom D -Third Floor North Tower

In recent years, there has been an increasing merge of sparse optimization, signal processing, wireless communications, information theory, machine learning, data mining, and statistics. This minisymposium addresses the interdisciplinary topics of sparse optimization and its various applications to signal processing. The goal of this minisymposium is to give an introduction to recent advances of sparse optimization theory, algorithms, applications, as well as emerging challenges. The speakers shall particularly talk about recent interesting applications of sparse optimization techniques to solve problems arising from signal processing, wireless communications, and information theory.

Organizer: Ya-Feng Liu

Chinese Academy of Sciences, China

2:00-2:25 A Distributed Semi-Asynchronous ADMM Type Algorithm for Network Traffic Engineering

Zhi-Quan Luo, University of Minnesota, USA and Chinese University of Hong Kong, Hong Kong

2:30-2:55 Randomized Block Proximal Damped Newton Method for Composite Self-Concordant Minimization

Zhaosong Lu, Simon Fraser University, Canada

3:00-3:25 *Lp*-Norm Regularization Algorithms for Optimization Over Permutation Matrices

Bo Jiang, Nanjing Normal University, China; Ya-Feng Liu, Chinese Academy of Sciences, China; Zaiwen Wen, Peking University, China

3:30-3:55 Joint Power and Admission Control: A Sparse Optimization Perspective

Ya-Feng Liu, Chinese Academy of Sciences, China

Monday, May 22

MS24

Nonsmooth Optimization with Complex Constraints: Duality, Algorithms, and Applications - Part II of III

2:00 PM-4:00 PM

Room:Parksville - Third Floor North Tower

For Part 1 see MS9
For Part 3 see MS33

This symposium brings together modeling, theory, and algorithms for large-scale nonsmooth (nonconvex) optimization. Practical effects of these developments are illustrated on several applications, including sparse and low rank optimization, nonconvex trimmed formulations for machine learning, and structure from motion.

Organizer: Aleksandr Aravkin

University of Washington, USA

Organizer: Dmitriy Drusvyatskiy

University of Washington, USA

2:00-2:25 An Accelerated Proximal Method for Minimizing Compositions of Convex Functions with Smooth Maps

Courtney Kempton and Dmitriy Drusvyatskiy, University of Washington, USA

2:30-2:55 What's the Shape of your Penalty?

Zheng Peng and Aleksandr Aravkin, University of Washington, USA

3:00-3:25 Nonasymptotic and Asymptotic Linear Convergence of an Almost Cyclic Shqp Dykstra's Algorithm for Polyhedral Problems

C.H. Jeffrey Pang, National University of Singapore, Singapore

3:30-3:55 Optimization in Structure from Motion

Karthik Ramamurthy, Unaffiliated

Monday, May 22

MS25

Computational Mixed Integer Conic Programming

2:00 PM-4:00 PM

Room:Orca - Third Floor B Tower

Mixed integer conic programming (MICP) considers the combination of discrete and conic constraints. MICP problems have many applications in control, finance and statistics, but are extremely challenging. For this reason, MICP problems are often relaxed to pure conic programming problems (CP) or mixed integer linear programming problems (MILP). CP and MILP are still challenging, but the technology to solve them is significantly more mature and effective. However, recent advanced are beginning to allow the practical solution of certain MICP. In particular, commercial solvers can now solve some mixed integer second order cone programming problems and there are several emerging mixed integer semidefinite programming solvers. In this minisymposium we explore the techniques that can be used to effectively solve MICPs and the application opportunities opened by the associated solvers. In particular, the talks in the minisymposium describe both techniques that leverage existing technology for CP and MILP and challenges that are unique to MICP.

Organizer: Juan Pablo Vielma

Massachusetts Institute of Technology, USA

2:00-2:25 Valid Quadratic Inequalities for Some Non-Convex Quadratic Sets

Julio Goez, Norwegian School of Economics, Norway; Miguel F. Anjos, GERAD & Polytechnique Montreal, Canada

2:30-2:55 SCIP-SDP: A Framework for Solving Mixed-Integer Semidefinite Programs

Tristan Gally, Marc E. Pfetsch, and Stefan Ulbrich, Technische Universität Darmstadt, Germany

3:00-3:25 Pajarito: An Open-Source Mixed-Integer Conic Solver

Chris Coey, Miles Lubin, and Juan Pablo Vielma, Massachusetts Institute of Technology, USA

3:30-3:55 Mixed-Integer Sum of Squares: Computation and Applications

Joey Huchette, Massachusetts Institute of Technology, USA

continued in next column

Monday, May 22

MS26

Advances in Dynamic Optimization - Part II of III

2:00 PM-4:00 PM

Room:Finback - Third Floor B Tower

For Part 1 see MS11
For Part 3 see MS34

Dynamic optimization – – the problem of seeking optimality constrained by the trajectories of the dynamical system – – presents both persistent and new conceptual and computational challenges. In this sequence of minisymposia, we present new approaches, formulations, and computational methods for such problems. We will be interested in complexity reduction themes, such as the usage of decomposition, reduced modeling, and hierarchical structures; as well as new computational frameworks and platforms in which to carry out efficient calculations involving dynamic optimization.

Organizer: Mihai Anitescu

University of Chicago, USA

Organizer: Victor Zavala

University of Wisconsin, Madison, USA

2:00-2:25 Novel Computational Framework for Solving Complex Constrained Optimal Control Problems

Anil Rao, University of Florida, USA

2:30-2:55 Architectures for Multi-Scale Predictive Control

Victor Zavala and Yankai Cao, University of Wisconsin, Madison, USA

3:00-3:25 A Bundle Method for Transient Constrained Optimization Problems

Francois Gilbert, Shrirang Abhyankar, Hong Zhang, and Mihai Anitescu, Argonne National Laboratory, USA

3:30-3:55 Towards Dual Control for Acute Myeloid Leukemia

Felix Jost, Kristine Rinke, Sebastian Sager, and Thuy T. T. Le, Universität Magdeburg, Germany

Monday, May 22

MS27

Stochastic Optimization for Hydroelectric Systems - Part II of II

2:00 PM-4:00 PM

Room:Beluga - Third Floor B Tower

For Part 1 see MS12

Power production using renewable sources is of great importance to our society. Optimizing these systems is a challenging task mostly due to the undertain nature of many parameters. Most commonly, the problem is divided into smaller, though still challenging, optimization models that differ in time-scale, numerical precision and optimization objective. Stochastic optimization, and specifically stochastic dynamic programming, is widely used for hydropower systems management. While it has many advantages, these approaches suffer from the curse-of-dimensionality (the computation time grows exponentially with the number of state variables) and the curse-of-modelling (the time decomposition scheme limits the complexity of the stochastic modelling of the random variable). The first part of this minisymposium is concerned with improvements for computation with such models, in particular through the use of inflow scenarios. The next challenge is to link all the optimization models so as to obtain a coherent operational decision tool system, also accounting for other renewable sources and for energy storage. This is the focus of the second part of the minisymposium that reports new results in the modeling and integration aspects. This minisymposium will be of interest to researchers in the fields of stochastic optimization and renewable energy systems.

Organizer: Miguel F. Anjos

GERAD & Polytechnique Montreal, Canada

2:00-2:25 Optimal Planning and Control of Large Scale Hydroelectric Systems: Information Flows and Modeling Tools

Ziad Shawwash, University of British Columbia, Canada

2:30-2:55 Stochastic Co-Optimization of Transmission and Distribution-as-Microgrid Networks with Renewables and Energy Storage

Luckny Zéphyr, Jialin Lui, and C. Lindsay Anderson, Cornell University, USA

3:00-3:25 Model Formulations and Solution Approaches for the Hydropower Maintenance Scheduling Problem

Jesus A. Rodriguez Saras, Miguel F. Anjos, and Guy Desaulniers, GERAD & Polytechnique Montreal, Canada; Pascal Coté, Rio Tinto Alcan and GERAD, Canada

3:30-3:55 Stochastic Short-Term Hydropower Operations Planning

Sara Séguin, Université Laval, Canada; Stein-Erik Fleten, Norwegian University of Science and Technology, Norway; Alois Pichler, Norwegian University of Science and Technology and University of Vienna, Austria; Pascal Côté, Rio Tinto, Canada; Charles Audet, École Polytechnique de Montréal, Canada

continued in next column

Monday, May 22

MS28

Optimization Algorithms for Learning and Decentralized Estimation

2:00 PM-4:00 PM

Room:Azure - Third Floor South Tower

Advances in sensing and processing technologies, communication capabilities and smart devices have enabled deployment of systems where a massive amount of data is collected by many distributed autonomous units in order to make decisions. Two aspects of this big- data-driven revolution in technology necessitate new paradigms for design of optimization algorithms. First, most of the information is collected in a decentralized, distributed manner, and processing of information has to go hand-in-hand with its communication and sharing across these units over a network. Second, the amount of collected information is so large that a new structure of incrementally and rapidly accessing it is necessary as part of the optimization algorithm. In this minisymposium, we will present recent progress on incremental and distributed optimization algorithms that tackle these two fundamental challenges.

Organizer: Mert Gurbuzbalaban

Massachusetts Institute of Technology, USA

2:00-2:25 Incremental Algorithms for Additive Convex Cost Optimization and Learning

Mert Gurbuzbalaban, Massachusetts Institute of Technology, USA

2:30-2:55 An Asynchronous Distributed Newton Method

Ermin Wei and Fatemeh Mansoori, Northwestern University, USA

3:00-3:25 Distributed Learning: Parameter Estimation for the Exponential Family

Cesar A. Uribe and Angelia Nedich, University of Illinois at Urbana-Champaign, USA

3:30-3:55 Global Convergence Rate of Proximal Incremental Aggregated Gradient Methods

Nuri D. Vanli, Mert Gurbuzbalaban, and Asu Ozdaglar, Massachusetts Institute of Technology, USA

Monday, May 22

MS29

Nonlinear and Stochastic Optimization - Part II of II

2:00 PM-4:00 PM

Room:Gulf Islands B - Lower Lobby North Tower

For Part 1 see MS14

This minisymposium concerns nonlinear optimization methods that use a range of function information: from zero-order, to first-order and second-order information. Most of this research is motivated by stochastic optimization applications, e.g., supervised training in machine learning. The goal is to develop algorithms with provable convergence properties and practical efficiency. In these sessions optimization algorithms for both convex and non-convex functions will be discussed. The performance of stochastic and batch methods on deep neural networks is also investigated.

Organizer: Jorge Nocedal

Northwestern University, USA

2:00-2:25 A Numerical Investigation of Sketching and Subsampling

Albert Berahas, Raghu Bollapragada, and Jorge Nocedal, Northwestern University, USA

2:30-2:55 Sub-Sampled Newton Methods and Large-Scale Machine Learning

Fred Roosta and Michael Mahoney, University of California, Berkeley, USA

3:00-3:25 Gradient Descent Efficiently Solves Cubic-Regularized Non-Convex Quadratic Problems

Yair Carmon and John C. Duchi, Stanford University, USA

3:30-3:55 Block BFGS Methods

Wenbo Gao and Donald Goldfarb, Columbia University, USA

Monday, May 22

MS30

Optimization and Large-Scale Data Analysis - Part II of III

2:00 PM-4:00 PM

Room:Gulf Tower C - Lower Lobby North Tower

For Part 1 see MS15
For Part 3 see MS35

In this minisymposium we bring together researchers working on optimization algorithms from both the mathematical programming community and the machine learning (ML) community, to facilitate interdisciplinary interactions and collaborations. Recently, optimization theory and methods (both old and new) have became increasingly important in various ML tasks, while emerging ML applications continue to inspire new optimization theory and methods. Therefore it is important for the two communities to establish close interactions and to communicate their recent findings. Our minisyposium intends to provide such a venue. The main topic of this symposium include the recent advances in zeroth/first/second-order methods, convex and non-convex optimization, stochastic optimization, distributed/parallel optimization and their applications in machine learning and data sciences, such as training neural networks, adaptive trial design and low rank matrix recovery. These are all topics under extensive recent research, in both the optimization and ML communities. The focus of this symposium will be on methods that have rigorously theoretical properties (such as convergence, rate of convergence, high-dimensional scaling properties, etc), while at the same time achieving superior practical performance in data-intensive applications. This is a great opportunity for researchers in this area to make lasting contributions.

Organizer: Mingyi Hong

Iowa State University, USA

Organizer: George Lan

University of Florida, USA

continued on next page

2:00-2:25 Serial and Parallel Coordinate Updates for Splitting Algorithms
Wotao Yin, University of California, Los Angeles, USA

2:30-2:55 Matrix Completion, Saddlepoints, and Gradient Descent
Jason Lee, University of Southern California, USA

3:00-3:25 Regularized Hpe-Type Methods for Solving Monotone Inclusions with Improved Pointwise Iteration-Complexity Bounds
Renato C. Monteiro, Georgia Institute of Technology, USA

3:30-3:55 Stochastic Reformulations of Linear Systems and Fast Stochastic Iterative Method
Peter Richtarik, University of Edinburgh, United Kingdom

Coffee Break

4:00 PM-4:30 PM

Room:Grand Ballroom CD - North Tower

Monday, May 22

MS31

Efficient Algorithms For Large Convex Optimization Problems - Part III of III

4:30 PM-6:30 PM

Room:Junior Ballroom A -Third Floor North Tower

For Part 2 see MS20

In our digital world -- with ever increasing problem sizes -- one has to abandon traditional methods, which are becoming prohibitively expensive. This gives an opportunity to explore new research directions, and design new algorithms, which have the potential to achieve faster convergence and each iteration is either relatively cheap or can be easily parallelized. One popular way how to produce cheap iterations is to use e.g. coordinate descent methods. Another popular way is to explore randomization. It turns out that in many applications randomized algorithms outperform their deterministic variants. Acceleration is another traditional approach of modifying existing algorithms to obtain optimal convergence speed.

Organizer: Martin Takac
Lehigh University, USA

Organizer: Chenxin Ma
Lehigh University, USA

4:30-4:55 Restarting Accelerated Gradient Methods with a Rough Strong Convexity Estimate
Zheng Qu, University of Hong Kong, China; Olivier Fercoq, Télécom ParisTech, France

5:00-5:25 Accelerating Stochastic Gradient Descent
Sham Kakade, University of Washington, USA

5:30-5:55 Adversarial Embedding for Compositional Stochastic Optimization and Reinforcement Learning
Niao He, University of Illinois at Urbana-Champaign, USA

6:00-6:25 Stochastic Optimization for Optimal Transport
Marco Cuturi, The Center for Research in Economics and Statistics, France

Monday, May 22

MS32

Optimization with PDEs: Theory and Numerics - Part III of III

4:30 PM-6:30 PM

Room:Junior Ballroom B -Third Floor North Tower

For Part 2 see MS21

Optimal control problems with partial differential equations are of huge interest from the theoretical point of view as well as in a variety of practical applications. This minisymposium will bring together researchers working on actual topics in PDE-constrained optimization. This includes for instance control in measure spaces and sparse controls, control problems for different classes of underlying PDEs including semilinear, complex-valued, and fractional equations as well as optimal experimental design problems, discretization concepts based on model reduction and finite element analysis, and the treatment of practical applications.

Organizer: Axel Kroener
Inria Saclay and CMAP Ecole Polytechnique, France

Organizer: Johannes Pfefferer
Technische Universität München, Germany

4:30-4:55 Binary Optimal Control of Semi Linear PDEs
Christoph Buchheim and *Christian Meyer*, Technische Universität Dortmund, Germany

5:00-5:25 Hybrid Optimal Control Problems for Partial Differential Equations
Sebastien Court, Karl Kunisch, and Laurent Pfeiffer, Universität Graz, Austria

5:30-5:55 Optimal Control of PDEs in a Complex Space Setting; Application to the Schrodinger Equation
M. Soledad Aronna, EMAp/FGV, Brazil; Frédéric Bonnans and *Axel Kroener*, Inria Saclay and CMAP Ecole Polytechnique, France

6:00-6:25 Optimal Control of a Regularized Phase Field Fracture Propagation Model
Ira Neitzel, Universität Bonn, Germany; Thomas Wick, Ecole Polytechnique, France; Winnifried Wollner, Technische Universität Darmstadt, Germany

Monday, May 22

MS33

Nonsmooth Optimization with Complex Constraints: Duality, Algorithms, and Applications - Part III of III

4:30 PM-6:30 PM

Room:Parksville - Third Floor North Tower

For Part 2 see MS24

This symposium brings together modeling, theory, and algorithms for large-scale nonsmooth (nonconvex) optimization. Practical effects of these developments are illustrated on several applications, including sparse and low rank optimization, nonconvex trimmed formulations for machine learning, and structure from motion.

Organizer: Aleksandr Aravkin
University of Washington, USA

Organizer: Dmitriy Drusvyatskiy
University of Washington, USA

4:30-4:55 A Novel Methods for Saddle Point Problems: Primal-Dual and Variational Inequality Approaches
Yura Malitsky, Taras Shevchenko University of Kyiv, Ukraine

5:00-5:25 Parallel Algorithms for Robust PCA Using Marginalization
Stephen Becker, University of Colorado Boulder, USA

5:30-5:55 Gauge and Perspective Duality
Kellie MacPhee, Aleksandr Aravkin, James V. Burke, and Dmitriy Drusvyatskiy, University of Washington, USA; Michael P. Friedlander, University of British Columbia, Canada

6:00-6:25 Sketchy Decisions: Convex Low-Rank Matrix Optimization with Optimal Storage
Madeleine R. Udell, Cornell University, USA

Monday, May 22

MS34

Advances in Dynamic Optimization - Part III of III

4:30 PM-6:30 PM

Room:Finback - Third Floor B Tower

For Part 2 see MS26

Dynamic optimization – – the problem of seeking optimality constrained by the trajectories of the dynamical system – – presents both persistent and new conceptual and computational challenges. In this sequence of minisymposia, we present new approaches, formulations, and computational methods for such problems. We will be interested in complexity reduction themes, such as the usage of decomposition, reduced modeling, and hierarchical structures; as well as new computational frameworks and platforms in which to carry out efficient calculations involving dynamic optimization.

Organizer: Mihai Anitescu
University of Chicago, USA

Organizer: Victor Zavala
University of Wisconsin, Madison, USA

4:30-4:55 Parameter Estimation for Nonlinear Hyperbolic PDE Using Transient Flow Observations
Kaarthik Sundar, Los Alamos National Laboratory, USA

5:00-5:25 Flexible Decision Variables in Reservoir Operation Using Dimension Reduction Approach
Nathan Gibson and Parnian Hosseini, Oregon State University, USA; Arturo Leon, University of Houston, USA

5:30-5:55 Multigrid Preconditioning for Space-Time Distributed Optimal Control of Parabolic Equations
Andrei Draganescu, University of Maryland, Baltimore County, USA

6:00-6:25 Recent Advances in Newton-Krylov Methods for NMPC
Andrew Knyazev, Mitsubishi Electric Research Laboratories, USA; Alexander Malyshev, University of Bergen, Norway

Monday, May 22

MS35

Optimization and Large-Scale Data Analysis - Part III of III

4:30 PM-6:30 PM

Room:Gulf Islands C - Lower Lobby North Tower

For Part 2 see MS30

In this minisymposium we bring together researchers working on optimization algorithms from both the mathematical programming community and the machine learning (ML) community, to facilitate interdisciplinary interactions and collaborations. Recently, optimization theory and methods (both old and new) have became increasingly important in various ML tasks, while emerging ML applications continue to inspire new optimization theory and methods. Therefore it is important for the two communities to establish close interactions and to communicate their recent findings. Our minisyposium intends to provide such a venue. The main topic of this symposium include the recent advances in zeroth/first/second-order methods, convex and non-convex optimization, stochastic optimization, distributed/parallel optimization and their applications in machine learning and data sciences, such as training neural networks, adaptive trial design and low rank matrix recovery. These are all topics under extensive recent research, in both the optimization and ML communities. The focus of this symposium will be on methods that have rigorously theoretical properties (such as convergence, rate of convergence, high-dimensional scaling properties, etc), while at the same time achieving superior practical performance in data-intensive applications. This is a great opportunity for researchers in this area to make lasting contributions.

Organizer: Mingyi Hong
Iowa State University, USA

Organizer: George Lan
University of Florida, USA

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4:30-4:55 Structural Properties of Affine Sparsity Constraints
Jong-Shi Pang, University of Southern California, USA; Hongbo Dong, Washington State University, USA; Miju Ahu, University of Southern California, USA

5:00-5:25 Distributed Big-Data Optimization via Batch Gradient Tracking
Gesualdo Scutari, Purdue University, USA

5:30-5:55 Stochastic Convex Optimization: Faster Local Growth Implies Faster Global Convergence
Tianbao Yang, University of Iowa, USA

6:00-6:25 Pathwise Coordinate Optimization for Nonconvex Sparse Learning: Algorithm and Theory
Tuo Zhao, Johns Hopkins University, USA

Monday, May 22

CP1

Applications in Medicine

4:30 PM-6:10 PM

Room:Grand Ballroom AB - North Tower

Chair: Michelle Boeck, KTH Royal Institute of Technology, Sweden

4:30-4:45 Robust Optimization in Adaptive Radiation Therapy Planning
Michelle Boeck and Anders Forsgren, KTH Royal Institute of Technology, Sweden; Kjell Eriksson and Bjorn Hardemark, RaySearch Laboratories, Sweden

4:50-5:05 Explicit Optimization of Plan Quality Measures in Intensity-Modulated Radiotherapy Treatment Planning
Lovisa Engberg, KTH Royal Institute of Technology, Sweden; Kjell Eriksson, RaySearch Laboratories, Sweden; Anders Forsgren, KTH Royal Institute of Technology, Sweden; Björn Hårdemark, RaySearch Laboratories, Sweden

5:10-5:25 Cluster Analysis of Biological Medicine
Ryan M. Evans and Anthony Kearsley, National Institute of Standards and Technology, USA

5:30-5:45 A Markov Decision Process Approach to Optimizing Cancer Therapy Using Multiple Modalities
Kelsey Maass and Minsun Kim, University of Washington, USA

5:50-6:05 A Parallel Implementation of the Surrogate Management Framework for Optimization in Cardiovascular Surgery
Aekaansh Verma, Stanford University, USA; Kwai L. Wong, University of Tennessee and Oak Ridge National Laboratory, USA; Alison Marsden, Stanford University, USA

Monday, May 22

CP2

Robust Optimization

4:30 PM-6:30 PM

Room:Pavilion Ballroom A - Third Floor North Tower

Chair: Ahmadreza Marandi, Tilburg University, The Netherlands

4:30-4:45 Robust Convex and Conic Quadratic Optimization with CONCAVE Uncertainty
Dick Den Hertog, Ahmadreza Marandi, and Bertrand Melenberg, Tilburg University, The Netherlands; Aharon Ben-Tal, Technion - Israel Institute of Technology, Israel

4:50-5:05 Robust Convex and Conic Quadratic Optimization with CONVEX Uncertainty
Ahmadreza Marandi, Tilburg University, The Netherlands; Aharon Ben-Tal, Technion - Israel Institute of Technology, Israel; Dick Den Hertog and Bertrand Melenberg, Tilburg University, The Netherlands

5:10-5:25 Applying Robust Optimization to Convex Nonlinear Regression
Dan Lu and John E. Mitchell, Rensselaer Polytechnic Institute, USA

5:30-5:45 Robust Optimization Approach for Multivariate Sampling Allocation Problems in Stratified Sampling
Mohammad Asim Nomani, Jan Pablo Burgard, Mirjam Dür, and Ralf Münnich, University of Trier, Germany

5:50-6:05 Distributed Adjustable Robust Optimization
Dimitri Papadimitriou, Bell Laboratories, Alcatel-Lucent, Belgium

6:10-6:25 Adjustable Robust Optimization via Fourier-Motzkin Elimination
Jianzhe Zhen and Dick Den Hertog, Tilburg University, The Netherlands; Melvyn Sim, National University of Singapore, Singapore

Monday, May 22

CP3

Optimal Control

4:30 PM-5:30 PM

Room:Pavilion Ballroom B - Third Floor North Tower

Chair: Hiroaki Mukaidani, Hiroshima University, Japan

4:30-4:45 A Distributed Jacobi Algorithm for Large-Scale Constrained Convex Optimization
Dang Doan, University of Freiburg, Germany

4:50-5:05 Fréchet Differentiability of the Boussinesq Flow with Respect to Domain Variations
Michael H. Fischer and Stefan Ulbrich, Technische Universität Darmstadt, Germany

5:10-5:25 Nash Equilibrium Strategy for Uncertain Markov Jump Linear Stochastic Systems with Multiple Decision Makers
Hiroaki Mukaidani, Hiroshima University, Japan

Monday, May 22

CP4

PDE-Constrained Optimization and Applications

4:30 PM-6:10 PM

Room:Pavilion Ballroom C - Third Floor North Tower

Chair: Patrick Belliveau, University of British Columbia, Canada

4:30-4:45 Adaptive Eigenspace Method for Inverse Scattering Problems in the Frequency Domain
Marcus J Grote, University of Basel, Switzerland; *Marie Graff-Kray*, University of British Columbia, Canada; Uri Nahum, University of Basel, Switzerland

4:50-5:05 Controlling the Footprint of Droplets via Surface Tension
Antoine Laurain, Humboldt University Berlin, Germany; Shawn W. Walker, Louisiana State University, USA

5:10-5:25 Nonparametric Adjoint-Based Inference for Stochastic Differential Equations
R. W. M. A. Madushani and Harish S. Bhat, University of California, Merced, USA

5:30-5:45 jInv - A Flexible Julia Package for Parallel PDE Parameter Estimation
Patrick Belliveau and Eldad Haber, University of British Columbia, Canada; Lars Ruthotto, Emory University, USA; Eran Treister, Ben Gurion University Negev, Israel

5:50-6:05 Adaptive, Inexact Optimization with Low-Rank Tensors for Optimal Control of PDEs under Uncertainty
Sebastian Garreis and Michael Ulbrich, Technische Universität München, Germany

Monday, May 22

CP5

Stochastic Optimization and Applications - Part I

4:30 PM-6:30 PM

Room:Pavilion Ballroom D - Third Floor North Tower

Chair: Soumyadip Ghosh, IBM Research, USA

4:30-4:45 On Stochastic Nonlinear Minimax Optimization
Soumyadip Ghosh and Mark Squillante, IBM Research, USA; Ebisa Wollega, Colorado State University, USA

4:50-5:05 Stochastic Algorithms for Minimizing Relatively Smooth Functions
Filip Hanzely and Peter Richtarik, University of Edinburgh, United Kingdom

5:10-5:25 Reconfigurable Optimization
Prateek R. Srivastava and Nediako Dimitrov, University of Texas at Austin, USA; David Alderson, Naval Postgraduate School, USA

5:30-5:45 Stochastic Methods for Stochastic Variational Inequalities
Philip Thompson, CMM, Universidad de Chile, Chile; Alfredo N. Iusem, IMPA, Rio de Janeiro, Brazil; Alejandro Jofré, Universidad de Chile, Chile; Roberto Oliveira, IMPA, Rio de Janeiro, Brazil

5:50-6:05 Structural Properties of Probability Constraints
Wim Van Ackooij, EDF, France; Rene Henrion, Weierstrass Institute for Applied Analysis and Stochastics, Berlin, Germany; Jérôme Malick, Universite Grenoble, France

6:10-6:25 Approximation of Stochastic Equilibrium Problems via Lopsided Convergence
Julio Deride, University of California, Davis, USA

Monday, May 22

CP6

Nonsmooth Optimization

4:30 PM-6:30 PM

Room:Junior Ballroom C -Third Floor North Tower

Chair: Sona Taheri, Federation University Australia, Australia

4:30-4:45 On the Relation Between the Cauchy and the Gradient Sampling Method

Lucas Eduardo Azevedo Simoes, University of Campinas, Brazil; Elias Salomao Helou, University of São Paulo, Brazil; Sandra Augusta Santos, University of Campinas, Brazil

4:50-5:05 Weak Subgradient Based Solution Algorithm in Nonconvex Unconstrained Optimization

Gulcin Dinc Yalcin and Refail Kasimbeyli, Anadolu University, Turkey

5:10-5:25 Optimality Conditions for Nonsmooth Constrained Optimization Problems

Lisa C. Hegerhorst, Leibniz Universität Hannover, Germany

5:30-5:45 Clustering in Large Data Sets with the Limited Memory Bundle Method

Napsu Karmitsa, University of Turku, Finland; Adil Baghirov and Sona Taheri, Federation University Australia, Australia

5:50-6:05 Nonsmooth DC Optimization Algorithm for Clusterwise Linear L1 Regression

Sona Taheri and Adil Baghirov, Federation University Australia, Australia

6:10-6:25 An SQP Trust-Region Algorithm for Constrained Optimization Without Derivatives

Anke Troeltzsch, German Aerospace Center (DLR), Germany

Monday, May 22

CP7

Engineering Applications - Part I

4:30 PM-6:30 PM

Room:Junior Ballroom D -Third Floor North Tower

Chair: Arun S. Moorthy, National Institute of Standards and Technology, USA

4:30-4:45 Design and Optimization of a Cylindrical Explosive

Logan E. Beaver and John Borg, Marquette University, USA; Geremy Kleiser, Eglin Air Force Base, USA

4:50-5:05 A Stochastic Programming Framework for Multi-Stakeholder Decision-Making and Conflict Resolution

Alexander W. Dowling, University of Wisconsin, Madison, USA

5:10-5:25 Optimal Power Flow Based on Holomorphic Embedded Load Flow

Andreas Grothey and Ian Wallace, University of Edinburgh, United Kingdom

5:30-5:45 Geometry and Topology Optimization of Sheet Metal Profiles by Using a Branch-and-Bound Framework

Benjamin M. Horn, Hendrik Lüthen, Marc Pfetsch, and Stefan Ulbrich, Technische Universität Darmstadt, Germany

5:50-6:05 Classification of Mass Spectra Using a Multi-Objective Control Approach

Arun S. Moorthy, Anthony Kearsley, and William E. Wallace, National Institute of Standards and Technology, USA

6:10-6:25 Pricing and Clearing Combinatorial Markets with Singleton and Swap Orders

Johannes C. Müller, FICO, Germany; Sebastian Pokutta, Georgia Institute of Technology, USA; Alexander Martin, Susanne Pape, and Andrea Peter, Universität Erlangen-Nürnberg, Germany; Thomas Winter, Eurex Frankfurt, Germany

Monday, May 22

CP8

Network Optimization and Applications

4:30 PM-6:10 PM

Room:Orca - Third Floor B Tower

Chair: Trisha Lawrence, University of Saskatchewan, Canada

4:30-4:45 Cybersecurity Using Interdiction

Murat Karatas and Nedialko Dimitrov, University of Texas at Austin, USA

4:50-5:05 Concavity and Bounds for the Stochastic Dynamic Programming Model on Social Networks

Trisha Lawrence, University of Saskatchewan, Canada

5:10-5:25 Solution Attractor of Local Search System for the Traveling Salesman Problem

Weiqi Li, University of Michigan-Flint, USA

5:30-5:45 A Robust Supply Chain Network Equilibrium Model and its Analysis

Yasushi Narushima and Tatsuya Hirano, Yokohama National University, Japan

5:50-6:05 Nonlinear Transient Optimization in Gas Networks

Jan Thiedau and Marc C. Steinbach, Leibniz Universität Hannover, Germany

Monday, May 22

CP9

Optimization Software

4:30 PM-6:10 PM

Room:Beluga - Third Floor B Tower

Chair: Olivier Huber, University of Wisconsin, Madison, USA

4:30-4:45 Geneva: Parametric Optimization in Distributed and Parallel Environments
Ruediger D. Berlich, Ariel Garcia, and Sven Gabriel, Gemfony Scientific, Germany

4:50-5:05 Crash-Starting the Dual Simplex Method
Ivet Galabova and Julian Hall, University of Edinburgh, United Kingdom

5:10-5:25 Update on Expression Representations and Automatic Differentiation for Nonlinear AMPL Models
David M. Gay, AMPL Optimization, Inc

5:30-5:45 An Open-Source High Performance Dual Simplex Solver
Julian Hall and Ivet Galabova, University of Edinburgh, United Kingdom; Qi Huangfu, FICO, United Kingdom

5:50-6:05 Model Enhancement via Annotations: Extension of EMP for Lagrangian Modifications
Olivier Huber and Michael C. Ferris, University of Wisconsin, Madison, USA

Monday, May 22

CP10

Nonlinear Optimization - Part I

4:30 PM-6:30 PM

Room:Azure - Third Floor South Tower

Chair: Peter G. Stechlinski, Massachusetts Institute of Technology, USA

4:30-4:45 A Second-Order Optimality Condition with First- and Second-Order Complementarity Associated to Global Convergence of Algorithms
Gabriel Haeser, Federal University of Sao Paulo, Brazil

4:50-5:05 Some Convergence Properties of Regularization and Penalization Schemes for MPCCs
Abdeslam Kadrani, Institut National de Statistique et d'Economie Appliquée, Morocco; Jean-Pierre Dussault, Universite de Sherbrooke, Canada; Mounir Haddou and Tangi Migot, Institut National des Sciences Appliquées de Rennes, France; *Emilie Joannopoulos*, Universite de Sherbrooke, Canada

5:10-5:25 On Weak Conjugacy, Augmented Lagrangians and Duality in Nonconvex Optimization
Refail Kasimbeyli, Anadolu University, Turkey

5:30-5:45 Mathematical Programms with Equilibrium Constraints: A Sequential Optimality Condition, New Constraint Qualifications and Algorithmic Consequences
Alberto Ramos, Federal University of Paraná, Brazil

5:50-6:05 Generalized Derivatives of Nonlinear Programs
Peter G. Stechlinski, Massachusetts Institute of Technology, USA; Kamil Khan, Argonne National Laboratory, USA; Paul I. Barton, Massachusetts Institute of Technology, USA

6:10-6:25 On a Conjecture in Second-Order Optimality Conditions
Daiana S. Viana, Universidade de Sao Paulo, Brazil; Roger Behling, Federal University of Santa Caterina, Brazil; Gabriel Haeser, Federal University of Sao Paulo, Brazil; Alberto Ramos, Federal University of Paraná, Brazil

Monday, May 22

CP11

Nonlinear Optimization and Applications

4:30 PM-6:30 PM

Room:Gulf Islands B - Lower Lobby North Tower

Chair: Alireza Sabouri, University of Calgary, Canada

4:30-4:45 Set-Valued Derivatives and Subdifferentials Based on Differences of Convex Sets
Robert Baier, University of Bayreuth, Germany

4:50-5:05 A Superlinearly Convergent Smoothing Newton Continuation Algorithm for Variational Inequalities Over Definable Sets
Chek Beng Chua, Nanyang Technological University, Singapore; Le Thi Khanh Hien, National University of Singapore, Singapore

5:10-5:25 Basis Function Selection in Approximate Dynamic Programming
Alireza Sabouri, University of Calgary, Canada

5:30-5:45 A Primal Majorized Newton-CG Augmented Lagrangian Method for Large-Scale Linearly Constrained Convex Programming
Chengjing Wang, Southwest Jiaotong University, China; Peipei Tang, Zhejiang University City College, China

5:50-6:05 Multi-Criteria Quadratic Programming Problems with Application to Portfolio Selection
Carisa K. W. Yu, Hang Seng Management College, Hong Kong

6:10-6:25 Extending the Applicability of the Global Search Method "DIRECT"
Richard G. Carter, GL Group, USA

Monday, May 22

PP1

Welcome Reception and Poster Session

6:30 PM-8:30 PM

Room:Grand Ballroom CD - North Tower

An Optimal Investment Strategy with Maximal Risk Aversion
Mohamed Badaoui, National Polytechnic Institute, Mexico

Compact Representation of the Full Broyden Class of Quasi-Newton Updates
Omar DeGuchy, University of California, Merced, USA; Jennifer Erway, Wake Forest University, USA; Roummel F. Marcia, University of California, Merced, USA

Working Breakdown in a Repairable Queue with Fixed Size Bulk Service and Variable Breakdown and Variable Repairable Rates
Gopal K. Gupta and A. Banerjee, Indian Institute of Technology, India

Second Order Riemannian Methods for Low-Rank Tensor Completion
Gennadij Heidel and Volker H. Schulz, University of Trier, Germany

Modeling and Optimization of New Feeding Systems in the Pig Industry: Linear and Bilinear Problems
Emilie Joannopoulos, Francois Dubeau, and Jean-Pierre Dussault, Universite de Sherbrooke, Canada; Mounir Haddou, INSA de Rennes, France

A Weighted Random Forest Algorithm to Improve Classification Performance
Weihui Li and Xiaxin Mei, Wentworth Institute of Technology, USA

Hybrid Method in Solving Large-Scale Alternating-Current Optimal Power Flows
Jie Liu, Lehigh University, USA; Alan Liddell, University of Notre Dame, USA; *Jakub Marecek*, IBM Research, Ireland; Martin Takac, Lehigh University, USA

Conic Program Certificates from ADMM/Douglas-Rachford Splitting
Yanli Liu, Ernest Ryu, and Wotao Yin, University of California, Los Angeles, USA

Stochastic Optimization Framework for a Fresh Fruit Supply Chain
Tri-Dung Nguyen, Uday Venkatadri, Tri Nguyen-Quang, and Claver Diallo, Dalhousie University, Canada

Hybrid Hu-Storey Method for Large-Scale Nonlinear Monotone Systems
Sanja Rapajic and Papp Zoltan, University of Novi Sad, Serbia

Bacterial Community Analysis via Convex Optimization
David Koslicki and *Hooman Zabeti*, Oregon State University, USA

PDE Constrained Optimal Control of Hydropower Systems
John Zaheer and Nathan Gibson, Oregon State University, USA

Tuesday, May 23

Registration

7:45 AM-3:30 PM

Room:Grand Ballroom Foyer - North Tower

Announcements

8:10 AM-8:15 AM

Room:Grand Ballroom AB - North Tower

IP3

Optimizing Today's Communication Networks

8:15 AM-9:00 AM

Room:Grand Ballroom AB - North Tower

Chair: Coralia Cartis, University of Oxford, United Kingdom

Optimization methods have long played a major role in the design and management of communication systems that we use today. In recent years, the communication networks have grown much larger in size and have to provide a multitude of services at increasingly higher rates. These changes have presented new challenges in the design and the management of communication networks. In this talk, we will illustrate the use of modern optimization methods in the provision of large scale heterogeneous communication networks to ensure energy efficiency and network scalability.

Zhi-Quan Luo
The Chinese University of Hong Kong, Hong Kong

Coffee Break

9:00 AM-9:30 AM

Room:Grand Ballroom CD - North Tower

Tuesday, May 23

MT2

Stochastic Optimization for Machine Learning

9:30 AM-11:30 AM

Room:Grand Ballroom AB - North Tower

Chair: Francis Bach, Inria and École Normale Supérieure, France

Chair: Mark Schmidt, University of British Columbia, Canada

Stochastic optimization lies at the heart of machine learning, and its cornerstone is stochastic gradient descent (SGD), a staple introduced over 60 years ago. Nevertheless, the last 5 years have seen an exciting new development: variance reduction (VR) for stochastic methods. These VR methods excel in settings where more than one pass through the training data is allowed, achieving convergence faster than SGD in theory as well as practice. These speedups underline the huge surge of interest in VR methods and fast-growing body of work on this topic. This tutorial brings covers the key principles and main developments behind VR methods for convex optimization with finite data sets. Moreover, the tutorial takes a step beyond convexity and finite-data to cover recent results for non-convex and infinite-data problems too, while discussing key open challenges.

Francis Bach
Inria and École Normale Supérieure, France

Mark Schmidt
University of British Columbia, Canada

Tuesday, May 23

MS36

Infinite Dimensional Nonsmooth Optimization

9:30 AM-11:30 AM

Room:Pavilion Ballroom A - Third Floor North Tower

Numerous models in various disciplines are described by nonsmooth, infinite dimensional systems. Examples include contact and friction problems in mechanics, plastification and damage, and, quite generally, systems featuring switching dynamics. Speakers in this minisymposium will discuss current research trends in this highly dynamic field. They will address the specific challenges coming from the combination of nonsmoothness and infinite dimension of their models, but also highlight the benefits of this perspective, such as mesh independent algorithms. Contributions are expected to span a wide range of aspects including generalized differentiability, optimality conditions, and algorithms, and to cover a diverse set of applications.

Organizer: Roland Herzog
Technische Universitat Chemnitz, Germany

Organizer: Christian Meyer
Technische Universität Dortmund, Germany

9:30-9:55 Optimal Control of Problems with Hysteresis

Martin Brokate, Technische Universität München, Germany

10:00-10:25 Optimal Control of Thermoviscoplastic Systems

Ailyn Stötzner and Roland Herzog, Technische Universitat Chemnitz, Germany; Christian Meyer, Technische Universität Dortmund, Germany

10:30-10:55 Optimal Control of Time Discretized Contact Problems

Georg Müller and Anton Schiela, University of Bayreuth, Germany

11:00-11:25 An Approach to the Differential Stability Analysis of Mosolov's Problem

Constantin Christof and Christian Meyer, Technische Universität Dortmund, Germany

Tuesday, May 23

MS37

Polynomial Optimization and Sums-of-Squares

9:30 AM-11:00 AM

Room:Pavilion Ballroom B - Third Floor North Tower

The goal of this minisymposium is to bring together researchers from algebraic geometry and computational optimization, to discuss the impact of recent advancements on the computational methods for optimization problems involving sum-of-squares and nonnegative polynomial cones, and to improve our understanding of the theoretical limits of computational approaches to these problems. Invited talks in the symposium will include novel algorithms for sums-of-squares polynomials that are more efficient than the standard methods, and novel algebraic and functional analysis techniques that can lead to improved algorithms on sparse polynomial optimization.

Organizer: David Papp
North Carolina State University, USA

9:30-9:55 Sums of Squares and Matrix Completion

Greg Blekherman and Rainer Sinn, Georgia Institute of Technology, USA; Mauricio Velasco, Universidad de los Andes, Colombia

10:00-10:25 Polynomials as Sums of Few Squares

Greg Blekherman, Georgia Institute of Technology, USA; Daniel Plaumann, Technische Universität Dortmund, Germany; Rainer Sinn, Georgia Institute of Technology, USA; *Cynthia Vinzant*, University of Michigan, USA

10:30-10:55 Polynomial Optimization with Sum-of-Squares Interpolants

David Papp, North Carolina State University, USA; Sercan Yildiz, Statistical and Applied Mathematical Sciences Institute, USA

Tuesday, May 23

MS38

PDE-Constrained Optimization with Reduced Order Models

9:30 AM-11:00 AM

Room:Pavilion Ballroom C - Third Floor North Tower

This minisymposium presents recent advances in PDE-Constrained optimization that are enabled by using reduced order models (ROMs) to accelerate solutions of the underlying PDEs. Reduced order models are broadly defined as techniques that lower the computational costs of the PDE solutions and include techniques such as adaptive mesh design, projection techniques, proper orthogonal decomposition (POD), Discrete Empirical Interpolation Method (DEIM), multiscale finite element methods, etc. Speakers will cover a wide range of applications such as inverse problems and optimal control.

Organizer: Lars Ruthotto

Emory University, USA

Organizer: Eldad Haber

University of British Columbia, Canada

9:30-9:55 Adaptive Multiscale Finite Element Methods for PDE Parameter Estimation

Lars Ruthotto and Samy Wu Fung, Emory University, USA

10:00-10:25 Deep Learning Meets Partial Differential Equations and Optimization

Eldad Haber, University of British Columbia, Canada

10:30-10:55 Data-Driven Model Reduction via CUR-Factored Hankel Approximation

Boris Kramer and Karen E. Willcox, Massachusetts Institute of Technology, USA; Alex A. Gorodetsky, Sandia National Laboratories, USA

Tuesday, May 23

MS39

Convexification Techniques in Optimization - Part I of II

9:30 AM-11:30 AM

Room:Pavilion Ballroom D - Third Floor North Tower

For Part 2 see MS54

Convexification techniques underlie many advances in combinatorial and polynomial optimization and broaden our ability to solve important and emerging applications. This session will present some most recent advances and bring discussions on fundamental theory and algorithmic approaches for solving structured nonconvex optimization problems via convexification tools. The talks will range from new structural results to general-purpose techniques addressing problems with nonconvex features involving polynomial functions, nonconvex quadratics, and integer variables.

Organizer: Fatma Kilinc-Karzan

Carnegie Mellon University, USA

Organizer: Andrea Lodi

École Polytechnique de Montréal, Canada

9:30-9:55 Latest Results on the Binary Approximation Method for Polynomial Optimization Problems

Daniel Bienstock, Columbia University, USA

10:00-10:25 Characterizations of Mixed Integer Convex Quadratic Representable Sets

Alberto Del Pia, University of Wisconsin, USA

10:30-10:55 Embedding Formulations For Unions Of Convex Sets

Juan Pablo Vielma, Massachusetts Institute of Technology, USA

11:00-11:25 Relaxations and Convex Hull Results for the Intersection of Elementary Nonconvex Quadratics and General Regular Cones

Sercan Yildiz, Statistical and Applied Mathematical Sciences Institute, USA; *Fatma Kilinc-Karzan*, Carnegie Mellon University, USA

Tuesday, May 23

MS40

Uncertainty in Optimization and Nash Games: Sampling-Based Algorithms

9:30 AM-11:30 AM

Room:Junior Ballroom A -Third Floor North Tower

In this minisymposium, we consider recent advances in a broad array of sampling-based schemes for the resolution of stochastic optimization and game-theoretic problems, with a particular emphasis on problems complicated by the complexity of the projection operations, possible nonconvexity in the objectives, and the presence of an evolving networks. U. V. Shanbhag will initiate the discussion on stochastic approximation schemes in the context of a finite sampling budget where the projection problems are complicated by significant computational complexity. R. Pasupathy will then consider how sampling can be employed within the context of line search techniques for contending with nonconvexity in stochastic nonconvex optimization. A. Nedich will then present new advances, particularly in the rate statements, in distributed optimization over possibly networks while J. Lei will conclude the symposium with a rate and complexity analysis of stochastic analogs of best-response schemes for stochastic Nash games, where traditionally, the focus has been on stochastic gradient schemes.

Organizer: Uday Shanbhag

Pennsylvania State University, USA

9:30-9:55 A Variable Sample-Size Stochastic Approximation Framework

Uday Shanbhag and Afrooz Jalilzadeh, Pennsylvania State University, USA

10:00-10:25 Distributed Optimization Over Networks: New Rate Results

Angelia Nedich, Arizona State University, USA; Alexander Olshevsky, University of Illinois at Urbana-Champaign, USA; Wei Shi, Boston University, USA

continued on next page

Tuesday, May 23

MS40

Uncertainty in Optimization and Nash Games: Sampling-Based Algorithms

9:30 AM-11:30 AM

continued

10:30-10:55 Synchronous and Asynchronous Inexact Proximal Best-Response Schemes for Stochastic Nash Games: Rate Analysis and Complexity Statements

Jinlong Lei and Uday Shanbhag, Pennsylvania State University, USA; Jong-Shi Pang and Suvrajeet Sen, University of Southern California, USA

11:00-11:25 The Adaptive Gradient Method for Optimization of Functions Observed with Deterministic Error

Fatemeh Hashemi, Virginia Tech, USA; Raghu Pasupathy, Purdue University, USA; Mike Taaffe, Virginia Tech, USA

Tuesday, May 23

MS41

Optimization Algorithms for High-Performance and Embedded Computing Systems - Part I of II

9:30 AM-11:30 AM

Room:Junior Ballroom B -Third Floor North Tower

For Part 2 see MS56

The objective of the session is to discuss interplays between algorithms, computing platforms, and software implementations. In particular, the contributions discuss scalability issues arising in the solution of large-scale stochastic programming problems on parallel computers as well as issues arising in the solution of optimization problems of embedded computing platforms with limited memory and power resources and computer speeds. Synergies between these disparate settings exist because high-trhoughput computing increasingly relies on the use of computing processors with limited memory resources and energy/ temperature management is a key issue.

Organizer: Victor Zavala

University of Wisconsin, Madison, USA

Organizer: Kibaek Kim

Argonne National Laboratory, USA

9:30-9:55 Scenario Decomposition for Stochastic 0-1 Optimization

Shabbir Ahmed, Georgia Institute of Technology, USA; *Deepak Rajan*, Lawrence Livermore National Laboratory, USA

10:00-10:25 A Parallelizable Augmented Lagrangian Method Applied to Large-Scale Non-Convex-Constrained Optimization Problems

Brian C. Dandurand, Argonne National Laboratory, USA; Natashia Boland, Georgia Institute of Technology, USA; Jeffrey Christiansen, Andrew Eberhard, and Fabricio Oliveira, RMIT University, Australia

continued in next column

10:30-10:55 An Augmented Lagrangian Filter Method for Real-Time Embedded Optimization

Nai-Yuan Chiang and Rui Huang, United Technologies Research Center, USA; Victor Zavala, University of Wisconsin, Madison, USA

11:00-11:25 An Efficient Dual Newton Strategy for Tree-Sparse Quadratic Programs

Dimitris Kouzoupis, University of Freiburg, Germany; Emil Klintberg, Chalmers University of Technology, Sweden; Gianluca Frison, Technical University of Denmark, Denmark; Sébastien Gros, Chalmers University of Technology, Sweden; Moritz Diehl, University of Freiburg, Germany

Tuesday, May 23

MS42

Recent Advances in Quasi-Newton Methods

9:30 AM-11:30 AM

Room:Junior Ballroom C -Third Floor North Tower

Decades after their invention, quasi-Newton methods are still state-of-the-art numerical algorithms in unconstrained optimization and widely adopted in numerical constrained optimization. They are especially attractive for problems with computationally expensive or unavailable Hessians since they improve on the convergence properties and numerical performance of gradient-based methods without explicitly requiring second-order derivatives. This minisymposium will focus on recent theoretical and computational advances in quasi-Newton methods for large scale optimization problems and systems of equations as well as their use in engineering applications (e.g., power grid, material design, signal processing) and data science.

Organizer: Cosmin G. Petra
Lawrence Livermore National Laboratory, USA

Organizer: Roummel F. Marcia
University of California, Merced, USA

9:30-9:55 Introduction to Riemannian BFGS Methods
Wen Huang, Rice University, USA

10:00-10:25 GRANSO: An Open-Source Software Package Employing a BFGS-SQP Method for Constrained, Nonsmooth, Nonconvex Optimization
Frank E. Curtis, Lehigh University, USA; *Tim Mitchell*, Max Planck Institute for Dynamics of Complex Systems, Germany; Michael L. Overton, Courant Institute of Mathematical Sciences, New York University, USA

10:30-10:55 Sketch and Project: A Tool for Designing Stochastic Quasi-Newton Methods and Stochastic Variance Reduced Gradient Methods
Robert M. Gower and Peter Richtarik, University of Edinburgh, United Kingdom; Francis Bach, Inria and École Normale Supérieure, France

11:00-11:25 Parallel quasi-Newton methods for PDE-constrained optimization
Cosmin G. Petra, Lawrence Livermore National Laboratory, USA

Tuesday, May 23

MS43

Relative Entropy Optimization and its Applications

9:30 AM-11:30 AM

Room:Junior Ballroom D -Third Floor North Tower

The relative entropy function is prominent in information theory and statistics as its favorable analytical properties are useful for proving a number of fundamental inequalities. In this minisymposium we draw attention to the *computational* properties of this jointly convex function. Convex programs specified in terms of relative entropy inequalities generalize linear, second-order, and geometric programs. The talks in this session range from explorations of the descriptive power of relative entropy convex programs to new application domains in which convex relaxations based on relative entropy are much more effective in contrast to previous approaches.

Organizer: Venkat Chandrasekaran
California Institute of Technology, USA

9:30-9:55 Relative Entropy Relaxations for Signomial Optimization
Parikshit Shah, Yahoo! Research, USA; Venkat Chandrasekaran, California Institute of Technology, USA

10:00-10:25 A Positivstellensatz for Sums of Nonnegative Circuit Polynomials
Timo de Wolff, Texas A&M University, USA; Mareike Dressler, Goethe Universität Frankfurt, Germany; Sadik Iliman, KPMG AG, Germany

10:30-10:55 Semidefinite Approximations of Matrix Logarithm
Hamza Fawzi, University of Cambridge, United Kingdom; James Saunderson, Monash University, Australia; Pablo A. Parrilo, Massachusetts Institute of Technology, USA

11:00-11:25 Optimal Resource Allocation to Control Epidemic Outbreaks in Networked Populations
Victor Preciado, University of Pennsylvania, USA

Tuesday, May 23

MS44

Stochastic and Large-Scale Optimization Methods - Part I of II

9:30 AM-11:30 AM

Room:Parksville - Third Floor North Tower

For Part 2 see MS59
In this minisyposium we bring together researchers working on optimization algorithms from both the mathematical programming community and the machine learning (ML) community, to facilitate interdisciplinary interactions and collaborations. Recently, optimization theory and methods (both old and new) have became increasingly important in various ML tasks, while emerging ML applications continue to inspire new optimization theory and methods. Therefore it is important for the two communities to establish close interactions and to communicate their recent findings. Our minisyposium intends to provide such a venue. The main topic of this symposium include the recent advances in zeroth/first/second-order methods, convex and non-convex optimization, stochastic optimization, distributed/parallel optimization and their applications in machine learning and data sciences, such as training neural networks, adaptive trial design and low rank matrix recovery. These are all topics under extensive recent research, in both the optimization and ML communities. The focus of this symposium will be on methods that have rigorously theoretical properties (such as convergence, rate of convergence, high-dimensional scaling properties, etc), while at the same time achieving superior practical performance in data-intensive applications. This is a great opportunity for researchers in this area to make lasting contributions.

Organizer: Mengdi Wang
Princeton University, USA

continued on next page

Tuesday, May 23

MS44

Stochastic and Large-Scale Optimization Methods - Part I of II

9:30 AM-11:30 AM

continued

9:30-9:55 Large Scale Nonconvex ADMM
Tom Luo, University of Minnesota, USA

10:00-10:25 Nonconvex Statisitcal Optimization: From Local Exploitation to Global Exploration
Zhaoran Wang, Princeton University, USA

10:30-10:55 Sparse Linear Programming for Optimal Adaptive Trial Design
Ethan X. Fang, Pennsylvania State University, USA

11:00-11:25 Exploring the Second Order Sparsity in Large Scale Optimization
Defeng Sun, National University of Singapore, Republic of Singapore

Tuesday, May 23

MS45

Nested Minimum Cuts on Parameterized Networks

9:30 AM-11:30 AM

Room:Orca - Third Floor B Tower

The max flow/min cut problem is one of the most fundamental problems in combinatorial optimization. When a source-sink network satisfies the so-called source-sink monotone property (Granot et al. 2012), the min cuts are nested and can be computed in the same asymptotic time as a single min cut by the so-called GGT algorithm due to the seminal work by Gallo, Grigoriadis, and Tarjan (1989). The nice structural and algorithmic properties of the nested min cuts have many applications in both theory and practice. This session aims to communicate the latest results on, and applications of, parametric min cut, and to bring more attention from the optimization community to this fruitful area. S. Thomas McCormick (UBC) will present a unified framework which provides sufficient conditions for the nested min cuts structure in network-type problems. Jannik Matuschke (TU Munich) will talk about an application of nested min cuts to rerouting flow in a network after an arc is deleted. Dorit Hochbaum (UC Berkley) will present a clustering algorithm for image processing. Her algorithm leverages the algorithmic property of nested min cuts. Yichuan Ding (UBC) uses the structural property of the nested min cuts to characterize the dynamic behavior of a bipartite queueing system under a general priority rule. This bipartite queueing system has applications in many real world problems, such as allocation of donor kidneys and public housing units.

continued in next column

Organizer: Yichuan Ding
University of British Columbia, Canada

Organizer: Yichuan Ding
University of British Columbia, Canada

Organizer: S. Thomas McCormick
Sauder School of Business, Canada

9:30-9:55 A Unified Framework for Determining the Structural Properties of Nested Min Cuts
S. Thomas McCormick, Sauder School of Business, Canada

10:00-10:25 Rerouting Flow in a Network
Jannik Matuschke, Technische Universität Berlin, Germany

10:30-10:55 Combinatorial Algorithms for Clustering, Image Segmentation and Data Mining
Dorit Hochbaum, University of California, Berkeley, USA

11:00-11:25 Nested Min Cuts and Bipartite Queueing System
Yichuan Ding, University of British Columbia, Canada

Tuesday, May 23

MS46

Variational Analysis and Modern Statistics

9:30 AM-11:30 AM

Room:Finback - Third Floor B Tower

Modern statistics is faced with a series of challenges as it addresses an expanding number of applications in machine learning, artificial intelligence, forecasting, cyber security, smart systems, social networks, and in developing the internet of things. Increasingly complex models, such as those in deep learning, nonparametric estimation, and large-scale statistics, rely on sophisticated mathematical foundations, especially variational analysis. In this Minisymposium, we will have four presentations in the interface between statistics and variational analysis including insightful surveys of open problems in statistics as well as technical papers on timely subjects such as shape-constrained regression, density estimation, maximum likelihood estimation, and infinite- dimensional variational analysis in nonparametric statistics. Leading statisticians will review recent advances from theoretical and computational points of view. In particular, the Minisymposium aims to expose the optimization community to the numerous challenges in modern statistics and offer an opportunity to engage with statisticians.

Organizer: Johannes O. Royset

Naval Postgraduate School, USA

9:30-9:55 Consistency in Nonparametric Estimation Using Variational Analysis

Johannes O. Royset, Naval Postgraduate School, USA

10:00-10:25 Estimation and Computation of Log-Concave Density Estimators

Charles Doss, University of Minnesota, USA

10:30-10:55 On Multivariate Convex Regression

Bodhisattva Sen, Columbia University, USA

11:00-11:25 On the Accuracy of the Kiefer-Wolfowitz MLE for Gaussian Mixtures

Aditya Guntuboyina, University of California, Berkeley, USA

Tuesday, May 23

MS47

Stability and Robustness in Gas Network Optimization

9:30 AM-11:30 AM

Room:Beluga - Third Floor B Tower

Modeling gas flow in pipeline networks leads into a variety of mathematical topics, depending on whether a steady-state or a transient setting is adopted, or uncertainty prone model components are present or not The purpose of the four talks rather is to illustrate these features by becoming specific about challenges than to aim at comprehension.

Organizer: Ruediger Schultz

Universität Duisburg-Essen, Germany

9:30-9:55 Control and Estimation Problems in Transient Gas Pipeline Flow

Anatoly Zlotnik, Los Alamos National Laboratory, USA

10:00-10:25 On the Robustification of Uncertain Physical Parameters in Gas Networks

Michael Stingl, Universität Erlangen-Nürnberg, Germany

10:30-10:55 Feasible Parameter Sets in Statinary Models of Gas Transportation

Ralf Gollmer and Matthias Claus, Universität Duisburg-Essen, Germany

11:00-11:25 Steady-State Models for Optimizing Gas Transportation: Analytical and Algebraic Perspectives

Ruediger Schultz, Universität Duisburg-Essen, Germany

Tuesday, May 23

MS48

Risk-Averse Optimization for Engineering Applications - Part I of II

9:30 AM-11:30 AM

Room:Azure - Third Floor South Tower

For Part 2 see MS63

Engineering optimization problems are often plagued with uncertainties. For such problems, determining optimal controls and designs that are insensitive to uncertainty is critical. This session focuses on stochastic optimization motivated by a range of engineering applications including power networks, petroleum engineering, and structural design. In particular, we target mathematical approaches for risk aversion and probabilistic computations with an emphasis on efficient numerical methods.

Organizer: Drew P. Kouri

Sandia National Laboratories, USA

Organizer: Stan Uryasev

University of Florida, USA

Organizer: Thomas M. Surowiec

Philipps-Universität Marburg, Germany

9:30-9:55 Solving Stochastic Variational Inequalities by Progressive Hedging

Terry Rockafellar, University of Washington, USA

10:00-10:25 Quasi-Monte Carlo and Sparse Grid Quadratures can be Efficient for Solving Two-Stage Stochastic Optimization Models

Werner Roemisch and Hernan Leovey, Humboldt University Berlin, Germany

10:30-10:55 Surrogate Models for Characterizing Tail Statistics of Systems Governed by PDEs

Stan Uryasev, University of Florida, USA

11:00-11:25 Robust Empirical Optimization is almost the same as Mean-Variance Optimization

Jun-ya Gotoh, Chuo University, Japan; Michael Kim, University of Toronto, Canada; Andrew Lim, National University of Singapore, Singapore

Tuesday, May 23

MS49

Nonconvex Optimization in Data Analysis - Part I of III

9:30 AM-11:30 AM

Room:Gulf Islands B - Lower Lobby North Tower

For Part 2 see MS64

Nonconvex optimization formulations are becoming increasingly popular and useful in data analysis and machine learning. They are typically more compact that convex optimization formulations, and often perform well at finding solutions of interest in the application context --- surprisingly well, given the paucity of convergence guarantees in the general nonconvex setting. This minisymposium brings together researchers who have developed algorithmic approaches and theoretical guarantees for nonconvex optimization. Talks will explore the fundamentals of algorithms for nonconvex optimization in a general setting, as well as specifics of such applications as matrix and tensor factorizations, deep learning, and graphical models. Connections to convex relaxations for these problems will also be discussed.

Organizer: Laura Balzano
University of Michigan, USA

Organizer: Stephen Wright
University of Wisconsin, Madison, USA

Organizer: Robert Nowak
University of Wisconsin, USA

Organizer: Rebecca Willett
University of Wisconsin, Madison, USA

9:30-9:55 Low-Rank Matrix Completion (LRMC) Using Nuclear Norm (NN) with Facial Reduction (FR)

Henry Wolkowicz, University of Waterloo, Canada

10:00-10:25 Fast Algorithms for Robust PCA via Gradient Descent

Constantine Caramanis, University of Texas at Austin, USA

10:30-10:55 Provably Robust Low-Rank Matrix Recovery via Median-Truncated Gradient Descent

Yuejie Chi, Ohio State University, USA

11:00-11:25 Matrix Problems with No Spurious Local Minima

Nathan Srebro, Toyota Technological Institute, USA; *Srinadh Bhojanapalli*, Toyota Technological Institute at Chicago, USA

continued in next column

Tuesday, May 23

MS50

Algorithms for Reinforcement Learning - Part I of II

9:30 AM-11:30 AM

Room:Gulf Islands C - Lower Lobby North Tower

For Part 2 see MS65

Reinforcement learning is an area of machine learning for creating autonomous agents that can learn long-term successful behavior through interaction with the environment. The modern theory and algorithms for reinforcement learning are heavily influenced by (approximate) dynamic programming and other areas of optimization. It is one of the main powering technologies behind recent breakthroughs in Artificial Intelligence, defeating world-champions in games, training for robotics, self-driving cars, and conversational agents. There are plenty of open problems in algorithms and theory, and this is a great opportunity for the optimization community to engage and make fundamental contributions to further advance the state of the arts. The goal of this minisymposium is to bring together researchers from both the machine learning and optimization communities, to facilitate interdisciplinary conversations and collaborations on optimization algorithms for reinforcement learning. In addition to a couple of senior scholars, our invited speakers consist of a group of dynamic young researchers working in both academia and industry. They will present some of the most recent advances in this area, including proximal pseudo-gradient algorithms, primal-dual algorithms enabled by saddle-point reformulations, robust optimization techniques for reinforcement learning, randomized sampling and optimization algorithms, and stochastic variance reduction methods for big-data applications.

continued on next page

Organizer: Lihong Li
Microsoft Research, USA

Organizer: Lin Xiao
Microsoft Research, USA

9:30-9:55 Overview of Reinforcement Learning Algorithms
Lihong Li, Microsoft Research, USA

10:00-10:25 Thompson Sampling for Reinforcement Learning
Shipra Agrawal, Columbia University, USA

10:30-10:55 Gradient, Semi-Gradient and Pseudo-Gradient Reinforcement Learning
Bo Liu, Auburn University, USA

11:00-11:25 Algorithms for Safe Reinforcement Learning
Philip Thomas, Carnegie Mellon University, USA

Lunch Break

11:30 AM-1:00 PM

Attendees on their own

SIOPT Editorial Board Meeting

11:30 AM-1:00 PM

Room:Granville – Fourth Floor South Tower

Tuesday, May 23

SP1

SIAG/OPT Prize Lecture: Proximal Minimization Algorithms for Nonconvex and Nonsmooth Problems

1:00 PM-1:45 PM

Room:Grand Ballroom AB - North Tower

Chair: To Be Determined

We introduce a self-contained convergence analysis framework for first order methods in the setting of nonconvex and nonsmooth optimization problems. Our approach builds on the powerful Kurdyka-Lojasiewcz property. It allows for analyzing, under mild assumptions, various classes of nonconvex and nonsmooth problems with semi-algebraic data, a property shared by many optimization models arising in various fundamental data science paradigms. We illustrate our results by deriving a new and simple proximal alternating linearized minimization algorithm (PALM). The versatility of PALM permits to exploit structures and data information relevant to important applications and paves the ways to the derivation of other interesting algorithmic variants.

Joint work with Jérôme Bolte and Marc Teboulle.

Shoham Sabach
Technion Israel Institute of Technology, Israel;

Coffee Break

1:45 PM-2:15 PM

Room:Grand Ballroom CD - North Tower

Tuesday, May 23

MS51

Algebraic Aspects of Semidefinite Programming

2:15 PM-4:15 PM

Room:Pavilion Ballroom A - Third Floor North Tower

Semidefinite programming-based methods have emerged as powerful tools in combinatorial optimization and polynomial optimization, as well as application areas ranging from control theory to statistics. Semidefinite programs enjoy rich algebraic structure. This structure can be exploited to find and simplify formulations, and understand properties of solutions. It also suggests generalizations of semidefinite programming, such as to nonarchimedian settings. This minisymposium highlights connections between algebraic aspects of semidefinite programming and ideas and questions in a range of areas, including algorithmic game theory, extremal combinatorics, and classical algebraic geometry.

Organizer: James Saunderson
Monash University, Australia

Organizer: Hamza Fawzi
University of Cambridge, United Kingdom

2:15-2:40 Lieb's Concavity Theorem, Matrix Geometric Means, and Semidefinite Optimization
James Saunderson, Monash University, Australia; Hamza Fawzi, University of Cambridge, United Kingdom

2:45-3:10 Solving Generic Nonarchimedean Semidefinite Programs Using Stochastic Game Algorithms
Xavier Allamigeon and Stephane Gaubert, Inria and CMAP, Ecole Polytechnique, France; *Mateusz Skomra*, INRIA Saclay and Ecole Polytechnique, France

3:15-3:40 Symmetric Sums of Squares over K-Subset Hypercubes
Annie Raymond, University of Washington, USA; James Saunderson, Monash University, Australia; Mohit Singh, Microsoft Research, USA; Rekha Thomas, University of Washington, USA

3:45-4:10 Do Sums of Squares Dream of Free Resolutions?
Mauricio Velasco, Universidad de los Andes, Colombia; Greg Blekherman and Rainer Sinn, Georgia Institute of Technology, USA

Tuesday, May 23

MS52

Topics in Infinite-Dimensional Optimization

2:15 PM-4:15 PM

Room:Pavilion Ballroom B - Third Floor North Tower

This minisymposium covers a variety of flavors of infinite-dimensional optimization problems, including countably-infinite and semi-infinite linear programs (LPs) and countable-state Markov decision problems (MDPs). We discuss both theoretical and algorithmic issues in infinite- dimensional optimization. For countably-infinite LPs (LPs with countably-infinite number of variables and constraints), the possibility of developing simplex-like algorithms is considered, including issues of existence and structure of basic solutions, pivot operations, degeneracy, and convergence properties and implementability of the resulting methods. Duality theory and sensitivity analysis results are discussed for semi-infinite LPs. For Robust Linear Programs (including semi-infinite problems with uncountably-infinite sets of constraints), stability and Lipschitz continuity with respect to changes in the uncertainty set are established. For robust counterparts of countable-state MDPs, a policy-iteration algorithm notable for using only finite computations in each iteration is proposed, and its convergence properties are established.

Organizer: Marina A. Epelman

University of Michigan, USA

Organizer: Christopher T. Ryan

University of Chicago, USA

2:15-2:40 Strong Duality and Sensitivity Analysis in Semi-Infinite Linear Programming

Amitabh Basu, Johns Hopkins University, USA; Kipp Martin and *Christopher T. Ryan*, University of Chicago, USA

2:45-3:10 New Results on the Simplex Method for Minimum Cost Flow Problems in Infinite Networks

Marina A. Epelman, University of Michigan, USA; Christopher T. Ryan, University of Chicago, USA; Robert L. Smith, University of Michigan, USA

3:15-3:40 Stability and Continuity in Robust Optimization by Mappings to Linear Semi-Infinite Optimization Problems

Timothy C.Y. Chan and *Philip Allen Mar*, University of Toronto, Canada

3:45-4:10 Policy Iteration for Robust Countable-State Markov Decision Processes

Saumya Sinha and Archis Ghate, University of Washington, USA

continued in next column

Tuesday, May 23

MS53

PDE-Constrained Optimization and Applications

2:15 PM-3:45 PM

Room:Pavilion Ballroom C - Third Floor North Tower

PDE-constrained optimization occurs naturally in applications such as optimal control, parameter inference, and optimal design (such as in shape optimization or topology optimization). In these applications, the PDE typically governs problem physics. Examples include PDEs governing diffusion, fluid dynamics, electromagnetics, or the deformation of a linearly elastic material under a given load. After discretizing the PDE, typically using a finite element method, the resulting optimization problem is a nonlinear program that also has function space structure. A significant challenge in this field is adapting nonlinear programming methods developed in the field of operations research to this problem class. Nonlinear programming methods from operations research typically use sparse direct methods to solve linear systems of equations arising as subproblems within quasi-Newton-type methods. However, the number of decision variables and constraints in PDE-constrained optimization problems (after discretization) can be so large that sparse direct methods are no longer practical. To address this challenge, this session will discuss computational methods, software, and applications of PDE-constrained optimization, focusing on novel methods and problem reformulations to solve large-scale problems.

Organizer: Geoffrey M. Oxberry

Lawrence Livermore National Laboratory, USA

continued on next page

Organizer: Sven Leyffer
Argonne National Laboratory, USA

2:15-2:40 Parallel-in-Time Methods for Large-Scale PDE-constrained Optimization
Denis Ridzal, Sandia National Laboratories, USA

2:45-3:10 PETSc and PDE-Constrained Optimization
Todd Munson, Argonne National Laboratory, USA

3:15-3:40 PDE-Constrained Shape Optimization with Fem-Tailored Discretization of Diffeomorphisms
Alberto Paganini, ETH Zürich, Switzerland; Patrick E. Farrell, University of Oxford, United Kingdom; Florian Wechsung, Oxford University, United Kingdom

Tuesday, May 23

MS54

Convexification Techniques in Optimization - Part II of II

2:15 PM-4:15 PM

Room:Pavilion Ballroom D - Third Floor North Tower

For Part 1 see MS39
Convexification techniques underlie many advances in combinatorial and polynomial optimization and broaden our ability to solve important and emerging applications. This session will present some most recent advances and bring discussions on fundamental theory and algorithmic approaches for solving structured nonconvex optimization problems via convexification tools. The talks will range from new structural results to general-purpose techniques addressing problems with nonconvex features involving polynomial functions, nonconvex quadratics, and integer variables.

Organizer: Fatma Kilinc-Karzan
Carnegie Mellon University, USA

Organizer: Andrea Lodi
École Polytechnique de Montréal, Canada

2:15-2:40 Solving Standard Quadratic Programming By Cutting Planes
Andrea Lodi, École Polytechnique de Montréal, Canada; Pierre Bonami, IBM, Spain; Jonas Schweiger and Andrea Tramontani, IBM, Italy

2:45-3:10 Optimization Methodologies for Truss Topology Design Problems
Tamas Terlaky, Mohammad Shahabsafa, Ali Mohammad Nezhad, and Luis Zuluaga, Lehigh University, USA; Sicheng He, John T. Hwang, and Joaquim R. R. A Martins, University of Michigan, USA

3:15-3:40 On Intersection of Two Mixing Sets with Applications to Joint Chance-Constrained Programs
Xiao Liu, Ohio State University, USA; Fatma Kilinc-Karzan, Carnegie Mellon University, USA; *Simge Kucukyavuz*, University of Washington, USA

3:45-4:10 Revisiting the Factorable Relaxation Scheme
Mohit Tawarmalani and Taotao He, Purdue University, USA

Tuesday, May 23

MS55

Optimization Methods Exploiting Error Bounds

2:15 PM-4:15 PM

Room:Junior Ballroom A -Third Floor North Tower

Error bound condition often provides an upper bound on the distance of a feasible solution to the optimal set using various measures of optimality such as the optimality gap of objective value. Many optimization algorithms can obtain an improved convergence rate, for example a linear convergence rate, under some error bound conditions. Despite many inspiring findings in literature, open questions regarding the relationship between an algorithm's convergence property and error bounds still remain, especially when the objective function is nonsmooth, nonconvex, or given as the expectation of a stochastic function. These challenging scenarios commonly appear in the applications of machine learning and statistics where nonsmooth or nonconvex lose/regularization functions are introduced and the error bound applied to the objective function is typically data-dependent. In this minisymposium, four talks will be given by researches in the area of convex optimization to present the new findings in this subject. The talks will focus on different algorithms, including proximal gradient method, deterministic/ stochastic subgradient method and forward-Douglas-Rachford splitting method. New insights on the design of algorithms to benefit from error bound conditions will be delivered to the audience to encourage future research in this direction.

Organizer: Qihang Lin
University of Iowa, USA

Organizer: Tianbao Yang
University of Iowa, USA

continued on next page

Tuesday, May 23

MS55

Optimization Methods Exploiting Error Bounds

2:15 PM-4:15 PM

continued

2:15-2:40 Restarted Sub-Gradient Method for Non-Smooth Optimization under Error Bound Conditions

Qihang Lin, Tianbao Yang, and Yi Xu, University of Iowa, USA; Yan Yan, University of Technology, Sydney, Australia

2:45-3:10 The Common-Directions Method for Regularized Empirical Risk Minimization

Po-Wei Wang, Carnegie Mellon University, USA; Ching-Pei Lee, University of Wisconsin, Madison, USA; Chih-Jen Lin, National Taiwan University, Taiwan

3:15-3:40 An Inertial Forward-Douglas-Rachford Splitting Method and Applications

Bang Cong Vu, EPFL, France; Volkan Cevher and Alp Yurtsever, École Polytechnique Fédérale de Lausanne, Switzerland

3:45-4:10 Further Properties of the Forward-Backward Envelope with Applications to Difference-of-Convex Programming

Tianxiang Liu and Ting Kei Pong, Hong Kong Polytechnic University, China

Tuesday, May 23

MS56

Optimization Algorithms for High-Performance and Embedded Computing Systems - Part II of II

2:15 PM-4:15 PM

Room:Junior Ballroom B -Third Floor North Tower

For Part 1 see MS41

The objective of the session is to discuss interplays between algorithms, computing platforms, and software implementations. In particular, the contributions discuss scalability issues arising in the solution of optimization problems on large parallel computer clusters as well as issues arising in the solution of problems of embedded computing platforms with limited memory, processing speeds, and power resources. Synergies between these settings exist because high-throughput computing increasingly relies on the use of cheap computing processors with constrained resources. At the same time, decomposition techniques traditionally used in large-scale applications can be used to perform more efficient memory and power management.

Organizer: Victor Zavala

University of Wisconsin, Madison, USA

Organizer: Kibaek Kim

Argonne National Laboratory, USA

2:15-2:40 Comparison between ug(PIPS-SBB, MPI) and Parallel PIPS-SBB on Large Scale Distributed Memory Computing Environment

Yuji Shinano, Zuse Institute Berlin, Germany; Lluis Miquel Munguia, Georgia Institute of Technology, USA; Geoffrey M. Oxberry and Deepak Rajan, Lawrence Livermore National Laboratory, USA

2:45-3:10 Algorithms for Large-Scale Mixed Integer Programming

Ted Ralphs, Lehigh University, USA

3:15-3:40 Parallel Temporal Decomposition for Long-Term Production Cost Model in Power Grid

Kibaek Kim, Argonne National Laboratory, USA

3:45-4:10 Nonlinear Model Predictive Control on a Heterogeneous Computing Platform

Bulat Khusainov, Eric C. Kerrigan, Andrea Suardi, and George Constantinides, Imperial College London, United Kingdom

Tuesday, May 23

MS57

Recent Advances in Nonlinear Programming Algorithms

2:15 PM-4:15 PM

Room:Junior Ballroom C -Third Floor North Tower

The minisymposium focuses on computational techniques for solving nonlinear programming problems. Both active set methods and regularization techniques are presented.

Organizer: William Hager

University of Florida, USA

Organizer: Hongchao Zhang

Louisiana State University, USA

2:15-2:40 Primal-Dual Interior Methods for Nonlinear Optimization

Philip E. Gill, University of California, San Diego, USA; Vyacheslav Kungurtsev, ; Daniel Robinson, Johns Hopkins University, USA

2:45-3:10 Cubic Regularization For Symmetric Rank-1 and Nonlinear Conjugate Gradient Methods

Hande Y. Benson, Drexel University, USA; David Shanno, Rutgers University, USA

3:15-3:40 Quadratic Regularization with Cubic Descent for Unconstrained Optimization

Ernesto G. Birgin, University of Sao Paulo, Brazil; Jose Mario Martinez, IMECC-UNICAMP, Brazil

3:45-4:10 Implementation of an Active Set Algorithm for Nonlinear Optimization with Polyhedral Constraints

James D. Diffenderfer and *William Hager*, University of Florida, USA; Hongchao Zhang, Louisiana State University, USA

Tuesday, May 23

MS58

Nonconvex Optimization for Machine Learning

2:15 PM-4:15 PM

Room:Junior Ballroom D -Third Floor North Tower

Recently, people noticed that many nonconvex optimization problems in machine learning can be solved efficiently to high-quality solutions. The success has triggered lots of interests in pursing the underlying reasons and much progress has been made in the past few years. Some effort has been spent on understanding the special structure that enables efficient computation, which already leads to better understanding of a fundamental subject matrix factorization in linear algebra. There are also results that explore general conditions such as ridable property or strict saddle property that guarantees an algorithm to avoid saddle points. Much of the recent interest in non-convex optimization is due to deep learning, in which the problem exhibits much more complicated structure that is yet to be explored. This minisymposium aims to bring researchers from diverse areas such as optimization, computer science, electrical engineering and applied math to discuss recent advances on nonconvex optimization, mostly on the theory but also on practical applications. We hope to draw attention from the optimization society on this rapidly growing subarea, and inspire more foundational research in this subarea. One important task of optimization is to determine what kind of problems are tractable, and we wish the research along this line may contribute to the general task.

Organizer: Ruoyu Sun

University of Illinois at Urbana-Champaign, USA

2:15-2:40 When Are Nonconvex Optimization Problems Not Scary?

Ju Sun, Stanford University, USA; Qing Qu and John Wright, Columbia University, USA

2:45-3:10 Advances in Nonconvex Optimization for Deep Learning

Yann Dauphin, Facebook, USA

3:15-3:40 Topology and Geometry of Deep Rectified Network Optimization Landscapes

Joan Bruna, Courant Institute of Mathematical Sciences, New York University, USA; Daniel Freeman, University of California, Berkeley, USA

3:45-4:10 On the Rate of Convergence for Online Principal Component Estimation and Tensor Decomposition

Chris Junchi Li, Princeton University, USA

continued in next column

Tuesday, May 23

MS59

Stochastic and Large-Scale Optimization Methods - Part II of II

2:15 PM-4:15 PM

Room:Parksville - Third Floor North Tower

For Part 1 see MS44

In this minisyposium we bring together researchers working on optimization algorithms from both the mathematical programming community and the machine learning (ML) community, to facilitate interdisciplinary interactions and collaborations. Recently, optimization theory and methods (both old and new) have became increasingly important in various ML tasks, while emerging ML applications continue to inspire new optimization theory and methods. Therefore it is important for the two communities to establish close interactions and to communicate their recent findings. Our minisyposium intends to provide such a venue. The main topic of this symposium include the recent advances in zeroth/first/second-order methods, convex and non-convex optimization, stochastic optimization, distributed/parallel optimization and their applications in machine learning and data sciences, such as training neural networks, adaptive trial design and low rank matrix recovery. These are all topics under extensive recent research, in both the optimization and ML communities. The focus of this symposium will be on methods that have rigorously theoretical properties (such as convergence, rate of convergence, high-dimensional scaling properties, etc), while at the same time achieving superior practical performance in data-intensive applications. This is a great opportunity for researchers in this area to make lasting contributions.

Organizer: Mengdi Wang

Princeton University, USA

continued on next page

Tuesday, May 23

MS59

Stochastic and Large-Scale Optimization Methods - Part II of II

continued

2:15-2:40 Hyperparameter Tuning of Machine Learning Algorithms Using Stochastic Derivative Free Optimization
Katya Scheinberg, IBM T.J. Watson Research Center, USA

2:45-3:10 On the Efficient Computation of a Generalized Jacobian of the Projector Over the Birkhoff Polytope
Xudong Li, National University of Singapore, Singapore; Defeng Sun and Kim-Chuan Toh, National University of Singapore, Republic of Singapore

3:15-3:40 Inexact Proximal Stochastic Gradient Method for Convex Composite Optimization
Xiao Wang, University of Chinese Academy of Sciences, China; Shuxiong Wang, Chinese Academy of Sciences, China; Hongchao Zhang, Louisiana State University, USA

3:45-4:10 Newton-Type Methods Under Inexact Information
Saeed Ghadimi, Princeton University, USA; Tong Zhang, Rutgers University, USA; Han Liu, Princeton University, USA

Tuesday, May 23

MS60

Discrete Methods for Applied Mixed Integer Nonlinear Programming

2:15 PM-4:15 PM

Room:Orca - Third Floor B Tower

Discrete Methods are an important part for solving MINLPs. The minisymposium describes approaches to solve the difficult mixed-integer nonlinear programming problems that arise in the applications. We showcase complexity results, reductions to MIPs, bound tightening procedures, and geometric methods. A special focus are here applications from the planning and operation of gas networks and related problems.

Organizer: Lars Schewe
Universität Erlangen-Nürnberg, Germany

2:15-2:40 Complexity of MINLP from Gas Network Optimization
Lars Schewe, Universität Erlangen-Nürnberg, Germany; Martin Groß, Technische Universität Berlin, Germany; Marc Pfetsch, Technische Universität Darmstadt, Germany; Martin Skutella, Technische Universität Berlin, Germany; Martin Schmidt, Universität Erlangen-Nürnberg, Germany

2:45-3:10 Global Optimization of Ideal Multi-component Distillation Columns
Dennis Michaels and Nick Mertens, Technische Universität Dortmund, Germany; Achim Kienle, Universität Magdeburg, Germany; Christian Kunde, Unaffiliated

3:15-3:40 MILP Relaxations for Instationary Gas Network Optimization Problems
Robert Burlacu, Universität Erlangen-Nürnberg, Germany

3:45-4:10 Approximate Convex Decomposition in Gas Network Optimization
Tom Walther and Benjamin Hiller, Zuse Institute Berlin, Germany

Tuesday, May 23

MS61

Complementarity Problems and Applications

2:15 PM-4:15 PM

Room:Finback - Third Floor B Tower

Complementarity is ubiquitous in the natural and social sciences. It is a fundamental principle underlying equilibrium. In a primal-dual description of a system it means that either the primal or the corresponding dual component of the solution vector must vanish. There are many problems that can be naturally modeled as complementarity problems. Applications of complementarity problems are prevalent, especially in economics and engineering. Over the years, research on complementarity has provided new methodologies, enhanced our understanding of algorithms, and permitted novel applications. A major source of complementarity problems arises from the optimality conditions of general constrained optimization problems. In particular, linear programming (LP) and convex quadratic programming can be written as linear complementarity problems (LCP). The linear complementarity problem has played an important unifying role in operations research since its introduction more than four decades ago. For example the interior point methods that were initially developed for LP were immediately extended to LCP. The minisymposium will address various aspects of the theory and practice of complementarity problems.

Organizer: Florian A. Potra
University of Maryland, Baltimore County, USA

continued on next page

2:15-2:40 The Case for Competition: Efficient Computation of Equilibria
Michael C. Ferris and Youngdae Kim, University of Wisconsin, Madison, USA

2:45-3:10 A Full-Newton Step Interior Point Method for Sufficient LCP
Goran Lesaja, Georgia Southern University, USA; Florian A. Potra, University of Maryland, Baltimore County, USA

3:15-3:40 Inexact Interior Point Methods for Complementarity Problems
Benedetta Morini, Universita' di Firenze, Italy; Valeria Simoncini, Universita' di Bologna, Italy

3:45-4:10 Weighted Complementarity Problems and Applications
Florian A. Potra, University of Maryland, Baltimore County, USA

Tuesday, May 23

MS62

Matrix Optimization and Its Applications

2:15 PM-4:15 PM

Room:Beluga - Third Floor B Tower

In the last few years, driven by various applications, such as signal processing and machine learning, matrix optimization is receiving growing interest and is becoming a hot topic worldwide. This minisymposium should address the main concerns in matrix optimization, including the theory, algorithm and challenges when dealing with practical problems. The speakers will talk about some particular matrix optimization problems and the interesting applications in modern data analysis.

Organizer: Qingna Li
Beijing Institute of Technology, China

2:15-2:40 A Generalized Alternating Direction Method of Multipliers with Semi-Proximal Terms for Convex Composite Conic Programming
Yunhai Xiao, Henan University, China; Liang Chen, Hunan University, China; Donghui Li, South China Normal University, China

2:45-3:10 Sparse Recovery via Partial Regularization
Zhaosong Lu and *Xiaorui Li*, Simon Fraser University, Canada

3:15-3:40 The Sparsest Solutions to *Z*-Tensor Complementarity Problems
Ziyan Luo, Beijing Jiaotong University, China

3:45-4:10 Euclidean Distance Matrix Optimization Model for Ordinal Embedding
Qingna Li, Beijing Institute of Technology, China; Houduo Qi, University of Southampton, United Kingdom

Tuesday, May 23

MS63

Risk-Averse Optimization for Engineering Applications - Part II of II

2:15 PM-3:45 PM

Room:Azure - Third Floor South Tower

For Part 1 see MS48
Engineering optimization problems are often plagued with uncertainties. For such problems, determining optimal controls and designs that are insensitive to uncertainty is critical. This session focuses on stochastic optimization motivated by a range of engineering applications including power networks, petroleum engineering, and structural design. In particular, we target mathematical approaches for risk aversion and probabilistic computations with an emphasis on efficient numerical methods.

Organizer: Drew P. Kouri
Sandia National Laboratories, USA

Organizer: Stan Uryasev
University of Florida, USA

Organizer: Thomas M. Surowiec
Philipps-Universität Marburg, Germany

2:15-2:40 The Application of Stochastic Optimization in Chemical Engineering Process
Zhaohui Tong and Hanxi Bao, University of Florida, USA; Guanghui Lan, Georgia Institute of Technology, USA

2:45-3:10 Statistical Inversion and Risk Averse Control for Additive Manufacturing Processes
Bart G. Van Bloemen Waanders, Sandia National Laboratories, USA

3:15-3:40 Risky Robust Optimization in Machine Learning and Support Vector Machines
Matthew Norton, University of Florida, USA

Tuesday, May 23

MS64

Nonconvex Optimization in Data Analysis - Part II of III

2:15 PM-4:15 PM

Room:Gulf Islands B - Lower Lobby North Tower

For Part 1 see MS49
For Part 3 see MS80

Nonconvex optimization formulations are becoming increasingly popular and useful in data analysis and machine learning. They are typically more compact that convex optimization formulations, and often perform well at finding solutions of interest in the application context --- surprisingly well, given the paucity of convergence guarantees in the general nonconvex setting. This minisymposium brings together researchers who have developed algorithmic approaches and theoretical guarantees for nonconvex optimization. Talks will explore the fundamentals of algorithms for nonconvex optimization in a general setting, as well as specifics of such applications as matrix and tensor factorizations, deep learning, and graphical models. Connections to convex relaxations for these problems will also be discussed.

Organizer: Laura Balzano
University of Michigan, USA

Organizer: Stephen Wright
University of Wisconsin, Madison, USA

Organizer: Robert Nowak
University of Wisconsin, USA

Organizer: Rebecca Willett
University of Wisconsin, Madison, USA

2:15-2:40 Nonconvex Low-Rank Estimation: Robustness and Linear Convergence

Yudong Chen, University of California, Berkeley, USA

2:45-3:10 Faster Projection-Free Convex Optimization with Structured Matrices

Dan Garber, Technion - Israel Institute of Technology, Israel

3:15-3:40 Dropping Convexity for Faster Semidefinite Optimization

Sujay Sanghavi, University of Texas at Austin, USA

3:45-4:10 Nonconvex Optimization and Nonlinear Models for Matrix Completion

Rebecca Willett, University of Wisconsin, Madison, USA

continued in next column

Tuesday, May 23

MS65

Algorithms for Reinforcement Learning - Part II of II

2:15 PM-4:15 PM

Room:Gulf Islands C - Lower Lobby North Tower

For Part 1 see MS50

Reinforcement learning is an area of machine learning for creating autonomous agents that can learn long-term successful behavior through interaction with the environment. The modern theory and algorithms for reinforcement learning are heavily influenced by (approximate) dynamic programming and other areas of optimization. It is one of the main powering technologies behind recent breakthroughs in Artificial Intelligence, defeating world-champions in games, training for robotics, self-driving cars, and conversational agents. There are plenty of open problems in algorithms and theory, and this is a great opportunity for the optimization community to engage and make fundamental contributions to further advance the state of the arts. The goal of this minisymposium is to bring together researchers from both the machine learning and optimization communities, to facilitate interdisciplinary conversations and collaborations on optimization algorithms for reinforcement learning. In addition to a couple of senior scholars, our invited speakers consist of a group of dynamic young researchers working in both academia and industry. They will present some of the most recent advances in this area, including proximal pseudo-gradient algorithms, primal-dual algorithms enabled by saddle-point reformulations, robust optimization techniques for reinforcement learning, randomized sampling and optimization algorithms, and stochastic variance reduction methods for big-data applications.

Organizer: Lihong Li
Microsoft Research, USA

continued on next page

Organizer: Lin Xiao
Microsoft Research, USA

2:15-2:40 A Generalized Reduced Linear Program for Markov Decision Processes
Chandrashekar Lakshmi Narayanan, University of Alberta, Canada; Shalabh Bhatnagar, Indian Institute of Science, Bangalore, India; Csaba Szepesvari, University of Alberta, Canada

2:45-3:10 Primal-Dual Reinforcement Learning
Yichen Chen and Mengdi Wang, Princeton University, USA

3:15-3:40 Stochastic Variance Reduction Methods for Policy Evaluation
Simon Du, Carnegie Mellon University, USA; *Jianshu Chen*, Lihong Li, Lin Xiao, and Dengyong Zhou, Microsoft Research, USA

3:45-4:10 Robust Optimization for Data-Limited Reinforcement Learning
Marek Petrik, University of New Hampshire, USA

Intermission
4:15 PM-4:30 PM

SIAG/OPT Business Meeting

4:30 PM-5:15 PM

Room:Grand Ballroom AB - North Tower

Complimentary beer and wine will be served.

Wednesday, May 24

Registration
7:45 AM-5:00 PM

Room:Grand Ballroom Foyer - North Tower

Announcements
8:10 AM-8:15 AM

Room:Grand Ballroom AB - North Tower

IP4
Subgradient Methods
8:15 AM-9:00 AM

Room:Grand Ballroom AB - North Tower

Chair: Anthony Man-Cho So, Chinese University of Hong Kong, Hong Kong

Subgradient methods are the most basic of algorithms in convex optimization, applicable quite generally and having simple convergence proofs, modulo assumptions such as orthogonal projections onto convex sets being readily computable. The fundamentals regarding subgradient methods have changed little in decades, perhaps in part due a supposition by researchers that not much else can be said for algorithms relying on hardly any problem structure other than convexity and Lipschitz continuity. We explain that, to the contrary, further advances are possible. We display an elementary algorithmic device which removes the need for Lipschitz continuity, and that replaces orthogonal projections with line searches. Additionally, we give focus to using subgradient methods for the most elemental of general optimization problems, computing a feasible point.

James M. Renegar
Cornell University, USA

Wednesday, May 24

Coffee Break

9:00 AM-9:30 AM

Room:Grand Ballroom CD - North Tower

MS66
Robustness and Dynamics in Optimization - Part I of III
9:30 AM-11:30 AM

Room:Grand Ballroom AB - North Tower

For Part 2 see MS82

The majority of optimization methods are iterative procedures that successively solve simple approximations to a global formulation. The most canonical example is gradient descent, which minimizes a quadratic approximation to a nonlinear function at every iteration. But even more complicated algorithms like accelerated mirror descent can be viewed from this perspective. Any such iterative scheme is a dynamical system, and proving the convergence of such a method is equivalent to proving that the system is stable in the sense that all trajectories must converge to the same stationary point. This minisymposium will examine the benefits of this identification of optimization algorithms as dynamical systems. The goal is to investigate how tools from dynamical systems can be applied to analyze optimization algorithms and to design new procedures. Topics to be discussed will include how to use tools of stability analysis from control theory, what notions of robustness can be applied to optimization problems and methods, which connections tie algorithmic and statistical robustness together, and how tools from optimization and statistics can be applied to analyze dynamical systems themselves.

Organizer: Benjamin Recht
University of California, Berkeley, USA

Organizer: Pablo A. Parrilo
Massachusetts Institute of Technology, USA

continued on next page

Wednesday, May 24

MS66

Robustness and Dynamics in Optimization - Part I of III

9:30 AM-11:30 AM

continued

9:30-9:55 Low-Recurrence Width Polynomial Families in Linear Algebra and Optimization
Christopher Re, Stanford University, USA

10:00-10:25 Randomization Vs. Acceleration
Pablo A. Parrilo, Massachusetts Institute of Technology, USA

10:30-10:55 Automating the Analysis and Design of Large-Scale Optimization Algorithms
Laurent Lessard, University of Wisconsin, Madison, USA

11:00-11:25 Smoothing for Improved Worst-Case Competitive Ratio in Online Optimization
Maryam Fazel, University of Washington, USA

Wednesday, May 24

MS67

Novel Applications for Second-Order Cone Programming

9:30 AM-11:30 AM

Room:Pavilion Ballroom A - Third Floor North Tower

The range of second-order programming (SOCP) problems arising from practical problems are expanding due to a favorable balance between the flexibility of SOCP formulation and computational efficiency. In particular, mixed-integer SOCP (MI- SOCP) has attracted the attention of optimization researchers as a part of mix- integer conic programming problems. In this session, we introduce new SOCP applications (P-spline, power efficient networks, and tree breeding). We also discuss numerical methods to solve their SOCP problems. The fist talks uses SOCP for b-splines. Given noisy data, the underlying function can be approximated by penalized b-splines. A prior information of the shape of the function is modeled as constraints to the splines. The cubic constrained p-spline model is casted as an SOCP problem, and solved by SOCP solvers. The second talk will focus on a hot topic in SOCP, power efficient networks. This talk particularly takes advantages of MI-SOCP formulation to model estimated models that may include noisy data. The focus of the third and fourth talk is an optimal contribution problem arising from tree breeding. In a tree breeding problem, genetic diversity is described by SOCP, and optimization methods are becoming an indispensable tool.

Organizer: Makoto Yamashita
Tokyo Institute of Technology, Japan

9:30-9:55 Constrained Penalized Spline Estimation by Second-Order Cone Programming
Yu Xia, Lakehead University, Canada; Farid Alizadeh, Rutgers University, USA

10:00-10:25 Application of SOCP in Power Efficient Networks
Bimal C. Das, Eiji Oki, and Masakazu Muramatsu, University of Electro-Communications, Japan

10:30-10:55 A Lifted-Polyhedral-Programming Approach for Optimal Contribution Problems
Sena Safarina and Makoto Yamashita, Tokyo Institute of Technology, Japan

11:00-11:25 A Steep-Ascend Method for MI-SOCP Arising from Tree Breeding
Makoto Yamashita, Tokyo Institute of Technology, Japan; Tim Mullin, Forestry Research Institute of Sweden, Sweden; Sena Safarina, Tokyo Institute of Technology, Japan

continued in next column

Wednesday, May 24

MS68

Geometry, Duality, and Complexity in Convex Optimization - Part I of II

9:30 AM-11:30 AM

Room:Pavilion Ballroom B - Third Floor North Tower

For Part 2 see MS84

The minisymposium will address questions of the following flavor: Duality and Complexity: conic linear programs model a wide variety of practical optimizaion problems. However, they often behave pathologically: the primal and dual optimal values may differ or they may not be attained. How do we recognize by a theoretical, or practical algorithm if a conic programming instance is pathological, say if there is a duality gap? How do we solve such pathological instances? How can we bring them into a form, so the pathological behavior becomes trivial to recognize? Geometry: what are the possible dimensions of faces of general closed, convex sets? Do all increasing integer sequences arise as the dimensions of faces of some closed convex set?

Organizer: Gabor Pataki

University of North Carolina at Chapel Hill, USA

9:30-9:55 On Positive Duality Gaps in Semidefinite Programming

Gabor Pataki, University of North Carolina at Chapel Hill, USA

10:00-10:25 Dimension Reduction for SDP

Frank Permenter and Pablo A. Parrilo, Massachusetts Institute of Technology, USA

10:30-10:55 Conic Infimum and Supremum and Some Applications

Farid Alizadeh, Rutgers University, USA

11:00-11:25 On Facial Structure of Convex Sets

Vera Roshchina, University of Ballarat, Australia

Wednesday, May 24

MS69

Computation, Learning and Uncertainty in PDE Constrained Optimization Models - Part I of II

9:30 AM-11:30 AM

Room:Pavilion Ballroom C - Third Floor North Tower

For Part 2 see MS85

Optimization of models that are constrained by differential equations appear in a wide variety of computational science and engineering applications. Applications include the control of fluid flow modeled by the Navier-Stokes equations, quantum control, and image analysis to name but a few. The aim of this minisymposium is to address both computational and theoretical issues related to this class of problems. We discuss new and important issues related to optimization with PDEs. In particular, we look into the sparsity of these models and discuss how to take advantage of it in order to enable global optimization of large scale models. Uncertainty and learning pose new and exciting challenges in this area and we focus on both numerical and theoretical issues in this domain.

Organizer: Panos Parpas

Imperial College London, United Kingdom

9:30-9:55 Semidefinite Programming Relaxations and Multigrid Methods in Optimal Control

Panos Parpas, Imperial College London, United Kingdom

10:00-10:25 Deep Learning Meets Differential Equations

Eldad Haber, University of British Columbia, Canada

10:30-10:55 Exploiting Active Subspaces in Nonconvex Optimization of Physics-Based Models

Paul Constantine, Colorado School of Mines, USA

11:00-11:25 Fast Solvers for Optimization Problems Constrained by PDEs with Uncertain Inputs

Akwum Onwunta, Max Planck Institute, Magdeburg, Germany; Peter Benner, Max-Planck-Institute for Dynamics of Complex Technical Systems, Germany; Sergey Dolgov, University of Bath, United Kingdom; Martin Stoll, Max Planck Institute, Magdeburg, Germany

continued in next column

Wednesday, May 24

MS70

First-Order Methods and Applications - Part I of III

9:30 AM-11:30 AM

Room:Pavilion Ballroom D - Third Floor North Tower

For Part 2 see MS86

In the last years, first-order optimization methods have gained a great amount of interest, because their low memory and computational cost per iteration makes these methods suitable for large-scale problems, especially when low/medium accuracy is required in the solution. Nowadays, a wide variety of first-order methods are available, which have shown their effectiveness in many applications (e.g., in the areas of signal and image processing, machine learning and data analysis) and the research in this field is very active and fruitful. The aim of this minisymposium is to present and discuss recent advances in first-order optimization methods, focusing on both theory and applications.

Organizer: Daniela di Serafino

Università degli Studi della Campania Luigi Vanvitelli, Italy

9:30-9:55 Stochastic Variance Reduction Methods for Saddle-Point Problems

Francis Bach, Inria and École Normale Supérieure, France; Balamurugan Palaniappan, INRIA Paris, France

10:00-10:25 Duality Based Iterative Regularization Techniques for Inverse Problems

Guillaume Garrigos, Istituto Italiano di Tecnologia, Italy; Lorenzo Rosasco, Instituto Italiano di Technologia, Italy and Massachusetts Institute of Technology, USA; *Silvia Villa*, Politecnico di Milano, Italy

10:30-10:55 Stochastic Forward-Douglas-Rachford Splitting for Monotone Inclusions

Volkan Cevher, École Polytechnique Fédérale de Lausanne, Switzerland; Bang Cong Vu, EPFL, France; *Alp Yurtsever*, École Polytechnique Fédérale de Lausanne, Switzerland

11:00-11:25 On a Scaled ε-Subgradient Method with Adaptive Stepsize Rule

Silvia Bonettini, Universita' di Ferrara, Italy; *Alessandro Benfenati*, Université Paris-Est Marne-la-Vallée, France; Valeria Ruggiero, Università degli Studi di Ferrara, Italy

continued in next column

Wednesday, May 24

MS71

Smoothing and Regularization Techniques in Optimization - Part I of II

9:30 AM-11:00 AM

Room:Junior Ballroom A -Third Floor North Tower

For Part 2 see MS87

Description not available.

Organizer: Tim Hoheisel

McGill University, Canada

9:30-9:55 A New Class of Matrix Support Functionals with Applications

Tim Hoheisel, McGill University, Canada

10:00-10:25 Estimating Clarke Subgradients of Non-Regular Integrands by Smoothing

James V. Burke, University of Washington, USA

10:30-10:55 Convergence of a Scholtes-Type Relaxation Method for Optimization Problems with Cardinality Constraints

Alexandra Schwartz, Technische Universität Darmstadt, Germany; Michal Cervinka and Martin Branda, Czech Academy of Sciences, Czech Republic and Charles University, Prague; Max Bucher, Technische Universität Darmstadt, Germany

Wednesday, May 24

MS72

Advances in Methods for Derivative-Free Optimization - Part I of III

9:30 AM-11:30 AM

Room:Junior Ballroom B -Third Floor North Tower

For Part 2 see MS88

The area of derivative-free optimization concerns optimization problems for which some component (of the objective or constraint functions) prevents access to derivative information. This three-part minisymposium will survey recent advancements in methods for solving this challenging class of problems. These advances include randomized algorithms, algorithms for stochastic optimization, multi-objective algorithms, and algorithms for problems with discrete variables. In each case, theoretical advances are made and a class of real-word problems is made more readily solvable.

Organizer: Stefan Wild

Argonne National Laboratory, USA

Organizer: Sebastien le Digabel

Polytechnique Montreal, Canada

9:30-9:55 Some Convergence Rate Results for Derivative-Based and Derivative-Free Stochastic Optimization

Raghu Pasupathy, Virginia Tech, USA

10:00-10:25 A Gaussian Process Trust-Region Method for Derivative-Free Nonlinear Constrained Stochastic Optimization

Youssef M. Marzouk and Florian Augustin, Massachusetts Institute of Technology, USA

10:30-10:55 Direct Search based on Probabilistic Feasible Descent for Bound and Linearly Constrained Problems

Serge Gratton, ENSEEIHT, Toulouse, France; C*lément W. Royer*, University of Wisconsin, Madison, USA; Luis N. Vicente and Zaikun Zhang, Universidade de Coimbra, Portugal

11:00-11:25 DFO/STORM Approaches to Machine Learning Settings

Matt Menickelly, Lehigh University, USA

Wednesday, May 24

MS73

Algorithms at the Intersection of Nonlinear, Stochastic, and Mixed-Integer Optimization - Part I of II

9:30 AM-11:30 AM

Room:Junior Ballroom C -Third Floor North Tower

For Part 2 see MS89

This minisymposium consists of two sessions. The talks in the first session relate to theoretical advances and algorithms for solving problems that can actually be characterized within multiple subfields of mathematical optimization. For example, these cover nonlinear chance-constrained problems using mixed-integer optimization techniques and Benders decomposition methods for solving optimization problems with complementarity constraints and binary variables. The talks in the second session are focused on recent advances in algorithms for nonlinear optimization, often focusing on nonconvex and possibly constrained problems. The talks discuss advances related to scalability, worst-case performance complexity, and challenges faced in the underlying linear algebra subroutines.

Organizer: Frank E. Curtis

Lehigh University, USA

Organizer: Daniel Robinson

Johns Hopkins University, USA

Organizer: Andreas Waechter

Northwestern University, USA

9:30-9:55 Solving chance-constrained problems using a kernel VaR estimator

Andreas Waechter and Alejandra Pena-Ordieres, Northwestern University, USA

10:00-10:25 New Solution Approaches for the Maximum Reliability Stochastic Network Interdiction Problem

Eli Towle and *James Luedtke*, University of Wisconsin, Madison, USA

10:30-10:55 Logical Benders Decomposition for Quadratic Programs with Complementarity Constraints and Binary Variables

Francisco Jara-Moroni and Andreas Waechter, Northwestern University, USA; Jong-Shi Pang, University of Southern California, USA; John E. Mitchell, Rensselaer Polytechnic Institute, USA

11:00-11:25 Stochastic Nonlinear Programming for Wind Turbine Control

Yankai Cao, University of Wisconsin, Madison, USA; Fernando D'Amato, General Electric, USA; Victor Zavala, University of Wisconsin, Madison, USA

continued in next column

Wednesday, May 24

MS74

Nonlinear Optimization: Scalability and Tractability of Methods - Part I of III

9:30 AM-11:30 AM

Room:Junior Ballroom D -Third Floor North Tower

For Part 2 see MS90

This minisymposium brings together some of the latest research in nonlinear optimization, with emphasis on dimensionality reduction, complexity of methods and their practical efficiency. Session I is dedicated to stochastic methods and analysis, with applications in machine learning and noisy data fitting. Session II considers first- and higher-order methods for deterministic optimization and their complexity analyses. Session III looks at various ways to scale up/reduce the cost of methods for nonlinear optimization.

Organizer: Coralia Cartis

University of Oxford, United Kingdom

9:30-9:55 Beyond SGD: Faster Stochastic Methods for Nonconvex Optimization

Suvrit Sra, Massachusetts Institute of Technology, USA; Sashank Reddi, Carnegie Mellon University, USA

10:00-10:25 Stochastic Derivative Free Optimization for Hyperparameter Tuning in Machine Learning Problems

Hiva Ghanbari and Katya Scheinberg, Lehigh University, USA

10:30-10:55 A Levenberg-Marquardt Method for Large-Scale Noisy Nonlinear Least Squares Problems

Stefania Bellavia, Universita' di Firenze, Italy; Serge Gratton, ENSEEIHT, Toulouse, France; *Elisa Riccietti*, University of Florence, Italy

11:00-11:25 Exact Worst-Case Performance of First-order Methods: Recent Developments

Adrien Taylor, Julien Hendrickx, and Francois Glineur, Université Catholique de Louvain, Belgium

Wednesday, May 24

MS75

Optimizing Big Data: Acceleration, Randomization, and Parallelism - Part I of III

9:30 AM-11:30 AM

Room:Parksville - Third Floor North Tower

For Part 2 see MS91

The minisymposium aims to bring together the recent advances in big data optimization from various perspectives, including acceleration, randomization, and parallelization. This minisymposium has three parts.

Organizer: Niao He

University of Illinois at Urbana-Champaign, USA

Organizer: Ji Liu

University of Rochester, USA

Organizer: Ming Yan

Michigan State University, USA

9:30-9:55 Primal-Dual Algorithms for the Sum of Three Operators

Ming Yan, Michigan State University, USA

10:00-10:25 Improving the Optimized Gradient Method for Large-Scale Convex Optimization

Donghwan Kim and Jeffrey Fessler, University of Michigan, USA

10:30-10:55 Accelerated Primal-Dual Method for Affinely Constrained Problems

Yangyang Xu, University of Alabama, USA

11:00-11:25 A SMART Stochastic Algorithm for Nonconvex Optimization with Applications to Robust Machine Learning

Damek Davis, Cornell University, USA

Wednesday, May 24

MS76

Convexifications in Mixed Integer Nonlinear Optimization

9:30 AM-11:30 AM

Room:Orca - Third Floor B Tower

This minisymposium deals with convexification methods for mixed integer nonlinear optimization (MINLP) problems. MINLPs have many applications in engineering, particularly chemical, electrical, and industrial engineering, and have gained tremendous attention in the last decade both from researchers and practitioners. In spite of their popularity in the optimization community and the ever increasing number of papers on them, this problem class remains challenging and there is a continuing need to develop more sophisticated exact algorithms and analyze the performance of these methods. Strong convex relaxations are a vital component of solving MINLPs exactly to global optimality. Inspired by the computational tractability of large-scale linear programs and medium-scale conic programs, polyhedral and conic relaxations are two common choices for developing convex relaxations of nonconvex NLPs. Integer variables, if present, can be used to further strengthen these relaxations. A total of 4 talks is being proposed. Two of these talks are about conic relaxations whereas the other two are about polyhedral relaxations. Three of the four talks analyze convexifications for mixed-integer bilinear, multilinear, and some general polynomial optimization problems, whereas the fourth one takes a disjunctive programming approach to mixed-integer semidefinite optimization.

Organizer: Akshay Gupte

Clemson University, USA

continued on next page

9:30-9:55 A Copositive Approach for Two-Stage Adjustable Robust Optimization with Uncertain Right-Hand Sides

Guanglin Xu and *Samuel Burer*, University of Iowa, USA

10:00-10:25 Low-Complexity Relaxations and Convex Hulls of Disjunctions on the Positive Semidefinite Cone and Other Regular Cones

Sercan Yildiz, Statistical and Applied Mathematical Sciences Institute, USA; Fatma Kilinc-Karzan, Carnegie Mellon University, USA

10:30-10:55 The Multilinear Polytope for Gamma-acyclic Hypergraphs

Aida Khajavirad, IBM T.J. Watson Research Center, USA; Alberto Del Pia, University of Wisconsin, USA

11:00-11:25 Approximation Guarantees for Monomial Convexification in Polynomial Optimization

Akshay Gupte, Warren Adams, and Yibo Xu, Clemson University, USA

Wednesday, May 24

MS77

Nonsmooth and Multiobjective Optimization with Applications - Part I of III

9:30 AM-11:30 AM

Room:Finback - Third Floor B Tower

For Part 2 see MS93

This minisymposium focuses on the recent developments in the field of nonsmooth and multiobjective optimization and their wide-ranging applications. For simple multiobjective optimization problems with only a few variables, some of the algorithms are now available. However, large-scale multiobjective optimization problems are quite challenging and cannot be solved satisfactorily with the available methods. Such issues, involving new numerical approaches, for multicriteria optimization problems will be the topic of the minisymposium. A relevant example is furnished by the heterogeneous multiobjective problems where one objective function is known analytically and easy to evaluate, while the other requires a time-consuming numerical simulation. Classical scalarization approaches do not take this heterogeneity into account, and consequently, there is a need for an adequate algorithm. Taking uncertainty into account by a robust approach is a subject of paramount interest but so far there are no general purpose algorithms for such problems. Numerous problems of practical interests lead to bilevel optimization problems where multiobjective problems appear at the lower level. However, such problems offer serious challenges for defining optimality in case of a non-optimistic approach, as the lower level problem no longer has a unique solution. Set-valued approaches offer a better understanding of these problems.

Organizer: Gabriele Eichfelder
Technische Universität Ilmenau, Germany

Organizer: Akhtar A. Khan
Rochester Institute of Technology, USA

9:30-9:55 Global Multi-Objective Optimization and an Application to Robust Optimization

Gabriele Eichfelder and Julia Niebling, Technische Universität Ilmenau, Germany

10:00-10:25 Multicriteria Tradeoff Analysis for Optimization under Uncertainty

Alexander Engau, University of Colorado, Denver, USA

10:30-10:55 Indifference Pricing via Convex Vector Optimization

Firdevs Ulus, Bilkent University, Turkey; Birgit Rudloff, Vienna University of Economics and Business, Austria

11:00-11:25 Vector Optimization Methods for Solving Matrix Completion Problems

Christopher Schneider, Friedrich Schiller Universität Jena, Germany

continued in next column

Wednesday, May 24

MS78

Majorization/Minimization Algorithms in Statistics and Optimization - Part I of II

9:30 AM-11:30 AM

Room:Beluga - Third Floor B Tower

For Part 2 see MS94

Recent years have witnessed the convergence of the fields of optimization and statistics. This minisymposium aims to further catalyze this movement by bringing researcher together who work in one of these fields with strong interests in the other field. For this minisymposium, the common topic will be the analysis and application for algorithms of majorization/minimization (MM) type. This is a very generic class of methods and contains as a special case the expectation-maximization (EM) methods which are widely used in statistics and electrical engineering. The methods also go under the name of optimization transfer or methods of surrogate functions. Kenneth Lange's recent book MM Optimization Algorithms published by SIAM (http://bookstore.siam.org/ot147/) provides an excellent overview of field. Of particular interest in this minisymposium will be (i) challenging applications in statistics, imaging sciences, and inverse problems and (ii) theoretical insight in the methods and improvements, both from the optimization and statistical point of view. The minisymposium starts with an overview talk on MM methods. Following talks feature improvements of the general principle and applications to specific problems. To highlight the breadth and reach of the MM principle, our session concludes with a talk on new developments in the theory of deep learning with connections to the MM principle.

continued in next column

Organizer: Eric Chi
North Carolina State University, USA

Organizer: Dirk Lorenz
Technische Universitaet Braunschweig, Germany

Organizer: Hua Zhou
University of California, Los Angeles, USA

9:30-9:55 An Overview of MM Algorithms

Kenneth Lange, University of California, Los Angeles, USA

10:00-10:25 MM Algorithms For Variance Components Models

Hua Zhou, University of California, Los Angeles, USA

10:30-10:55 The MM Principle for Split Feasibility Problems

Jason Xu, University of California, Los Angeles, USA

11:00-11:25 MM Algorithms for Mixture Modeling and Robust, Structured Regression

Eric Chi, North Carolina State University, USA

Wednesday, May 24

MS79

Distributionally Robust Optimization: Theory and Applications

9:30 AM-11:30 AM

Room:Azure - Third Floor South Tower

Distributionally robust optimization (DRO) opens a paradigm for decision-making problem under uncertainty where the uncertainty is governed by a probability distribution that is not known exactly. The distribution is assumed to belong to an ambiguity set consisting of all distributions that are consistent with the prior information of the underlying distribution. A simple yet popular way to characterize the ambiguity set is to use the moment information of the distributions. Another way is to build an ambiguity set that contains all unimodal distributions that satisfy some given support constraints. An alternative is to define the ambiguity set as a ball in the space of probability distributions by using a probability distance function such as the Wasserstein metric. DRO problems with these ambiguity sets have many applications in operations management including production planning, supply chain management, logistics, and inventory control. One of the most interesting direction of DRO is to identify conditions where the DRO problems can be reformulated to tractable counterparts. Another direction is to provide tight approximations for difficult DRO problems. Also, how to apply DRO into real world applications is a popular topic in the DRO community. The proposed minisymposium will focus on DRO problems over different types of ambiguity sets. The minisymposium will also focus on interesting applications of DRO problems.

Organizer: Guanglin Xu
University of Iowa, USA

Organizer: Qihang Lin
Carnegie Mellon University, USA

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9:30-9:55 Appointment Scheduling under Schedule-Dependent Patient No-Show Behavior
Chung-Piaw Teo, National University of Singapore, Singapore; Qingxia Kong, Erasmus Universiteit, Netherlands; Shan Li, City University of New York, USA; Nan Liu, Columbia University, USA; Zhenzhen Yan, National University of Singapore, Singapore

10:00-10:25 Distribution-Free Robust Optimization with Shape Constraints
Jiang Bo, Shanghai University of Finance and Economics, China; Xi Chen, New York University, USA; Simai He, Shanghai University of Finance and Economics, China; Christopher T. Ryan, University of Chicago, USA; *Teng Zhang*, Stanford University, USA

10:30-10:55 Conic Programming Reformulations of Two-Stage Distributionally Robust Linear Programs over Wasserstein Balls
Grani A. Hanasusanto, University of Texas at Austin, USA; Daniel Kuhn, École Polytechnique Fédérale de Lausanne, Switzerland

11:00-11:25 A Data-Driven Distributionally Robust Bound on the Expected Optimal Value of Uncertain Mixed 0-1 Linear Programming
Guanglin Xu and Samuel Burer, University of Iowa, USA

Wednesday, May 24

MS80

Nonconvex Optimization in Data Analysis - Part III of III

9:30 AM-11:30 AM

Room:Gulf Islands B - Lower Lobby North Tower

For Part 2 see MS64
Nonconvex optimization formulations are becoming increasingly popular and useful in data analysis and machine learning. They are typically more compact that convex optimization formulations, and often perform well at finding solutions of interest in the application context --- surprisingly well, given the paucity of convergence guarantees in the general nonconvex setting. This minisymposium brings together researchers who have developed algorithmic approaches and theoretical guarantees for nonconvex optimization. Talks will explore the fundamentals of algorithms for nonconvex optimization in a general setting, as well as specifics of such applications as matrix and tensor factorizations, deep learning, and graphical models. Connections to convex relaxations for these problems will also be discussed.

Organizer: Laura Balzano
University of Michigan, USA

Organizer: Stephen Wright
University of Wisconsin, Madison, USA

Organizer: Robert Nowak
University of Wisconsin, USA

Organizer: Rebecca Willett
University of Wisconsin, Madison, USA

9:30-9:55 Title Not Available at Time of Publication
Stephen Tu, University of California, Berkeley, USA

10:00-10:25 Theory for Local Optima in Nonconvex Regression Problems
Po-Ling Loh, University of Wisconsin, Madison, USA

10:30-10:55 Nonconvex Statisitcal Optimization: Global Exploration Versus Local Exploitation
Han Liu, Princeton University, USA

11:00-11:25 Guarantees for Subspace Learning by Incremental Gradient Descent on the Grassmannian
Laura Balzano, University of Michigan, USA

Wednesday, May 24

MS81

Making Machine Learning work with Big Datasets and Complicated Objectives - Part I of II

9:30 AM-11:30 AM

Room:Gulf Islands C - Lower Lobby North Tower

For Part 2 see MS97
Machine learning is now part of our daily lives. We use systems built by machine learning algorithm for spam filtering, product recommendation, speech recognition, scientific discovery, and now self-driving cars. The recent advances in machine learning have largely been due to the use of very large datasets and increasingly complicated models. While most machine learning models are fit using numerical optimization, these large datasets and complicated models put a lot of stress on our standard tools for numerical optimization. These sessions will focus on progress in developing algorithms that allow us to apply machine learning methods to huge datasets with complex objective functions. The first part will focus on algorithms for taking advantage of problem structures and will discuss methods for dealing with large data sets and dealing with objectives that may be non- smooth or non-deterministic. The second part will focus on parallel and distributed representations. These are needed in order to handle our largest datasets, but lead to new issues such as synchronization and communication complexity.

Organizer: Martin Takac
Lehigh University, USA

Organizer: Mark Schmidt
University of British Columbia, Canada

9:30-9:55 Converging on the Ultimate Optimization Algorithm for Machine Learning
Mark Schmidt, University of British Columbia, Canada

continued on next page

Wednesday, May 24

MS81

Making Machine Learning work with Big Datasets and Complicated Objectives - Part I of II

9:30 AM-11:30 AM

continued

10:00-10:25 Fast Convergence of Newton-Type Methods on High-Dimensional Problems

Yuekai Sun, University of Michigan, USA

10:30-10:55 The Langevin MCMC: Theory and Methods

Eric Moulines, Ecole Polytechnique, France; Alain Durmus, Telecom Paris, France; Nicolas Brosse, Ecole Polytechnique, France

11:00-11:25 Novel Analysis of Stochastic Gradient Algorithm

Lam Nguyen, Katya Scheinberg, and Martin Takac, Lehigh University, USA

Lunch Break

11:30 AM-1:00 PM

Attendees on their own

Wednesday, May 24

IP5

Using Second-order Information in Training Large-scale Machine Learning Models

1:00 PM-1:45 PM

Room:Grand Ballroom AB - North Tower

Chair: Michael L. Overton, Courant Institute of Mathematical Sciences, New York University, USA

We will give a broad overview of the recent developments in using deterministic and stochastic second-order information to speed up optimization methods for problems arising in machine learning. Specifically, we will show how such methods tend to perform well in convex setting but often fail to provide improvement over simple methods, such as stochastic gradient descent, when applied to large-scale nonconvex deep learning models. We will discuss the difficulties faced by quasi-Newton methods that rely on stochastic first order information and Hessian-Free methods that use stochastic second order information.

Katya Scheinberg

Lehigh University, USA

Intermission

1:45 PM-2:00 PM

Wednesday, May 24

MS82

Robustness and Dynamics in Optimization - Part II of III

2:00 PM-4:00 PM

Room:Grand Ballroom AB - North Tower

For Part 1 see MS66
For Part 3 see MS98

The majority of optimization methods are iterative procedures that successively solve simple approximations to a global formulation. The most canonical example is gradient descent, which minimizes a quadratic approximation to a nonlinear function at every iteration. But even more complicated algorithms like accelerated mirror descent can be viewed from this perspective. Any such iterative scheme is a dynamical system, and proving the convergence of such a method is equivalent to proving that the system is stable in the sense that all trajectories must converge to the same stationary point. This minisymposium will examine the benefits of this identification of optimization algorithms as dynamical systems. The goal is to investigate how tools from dynamical systems can be applied to analyze optimization algorithms and to design new procedures. Topics to be discussed will include how to use tools of stability analysis from control theory, what notions of robustness can be applied to optimization problems and methods, which connections tie algorithmic and statistical robustness together, and how tools from optimization and statistics can be applied to analyze dynamical systems themselves.

Organizer: Benjamin Recht

University of California, Berkeley, USA

Organizer: Pablo A. Parrilo

Massachusetts Institute of Technology, USA

continued on next page

2:00-2:25 Gradient Descent Learns Linear Systems
Moritz Hardt, Google, Inc., USA; Tengyu Ma, Princeton University, USA; Benjamin Recht, University of California, Berkeley, USA

2:30-2:55 Efficient Methods for Online Node Classification in a Network
Alexander Rakhlin, University of Pennsylvania, USA

3:00-3:25 Relative Entropy Optimization and Dynamical Systems
Venkat Chandrasekaran, California Institute of Technology, USA; Parikshit Shah, Yahoo! Research, USA

3:30-3:55 Randomized Approximation of Feed-Forward Network Using Compositional Kernels
Amit Daniely, Roy Frostig, and Vineet Gupta, Google, Inc., USA; *Yoram Singer*, Princeton University, USA

Wednesday, May 24

MS83

Conic Programming: Theoretical Aspects and Applications

2:00 PM-4:00 PM

Room:Pavilion Ballroom A - Third Floor North Tower

This minisymposium will focus on recent advances in optimization problems over conic constraints. In particular, we will consider some special cases of conic optimization problems: the linear conic, the nonlinear semidefinite, and the nonlinear second-order cone programming problems. The talks will cover methods, applications and theoretical aspects for these problems.

Organizer: Ellen H. Fukuda
Kyoto University, Japan

2:00-2:25 Sequential Injective Algorithm for Weakly Univalent Vector Equation and Its Application to Mixed Second-Order Cone Complementarity Problem
Shunsuke Hayashi, Tohoku University, Japan

2:30-2:55 An Extension of Chubanov's Algorithm to Symmetric Cones
Bruno Lourenco, Seikei University, Japan; Tomonari Kitahara, Tokyo Institute of Technology, Japan; Masakazu Muramatsu, University of Electro-Communications, Japan; Takashi Tsuchiya, National Graduate Institute for Policy Studies, Japan

3:00-3:25 On the Construction of Exact Augmented Lagrangian Functions for Nonlinear Semidefinite Optimization
Ellen H. Fukuda, Kyoto University, Japan; Bruno Lourenco, Seikei University, Japan

3:30-3:55 Sub-Homogeneous Optimization Problems and its Applications
Shota Yamanaka and Nobuo Yamashita, Kyoto University, Japan

Wednesday, May 24

MS84

Geometry, Duality, and Complexity in Convex Optimization - Part II of II

2:00 PM-4:00 PM

Room:Pavilion Ballroom B - Third Floor North Tower

For Part 1 see MS68
The minisymposium would address questions of the following flavor: Duality and Complexity: conic linear programs model a wide variety of practical optimizaion problems. However, they often behave pathologically: the primal and dual optimal values may differ or they may not be attained. How do we recognize by a theoretical, or practical algorithm if a conic programming instance is pathological, say if there is a duality gap? How do we solve such pathological instances? How can we bring them into a form, so the pathological behavior becomes trivial to recognize? Geometry: what are the possible dimensions of faces of general closed, convex sets? Do all increasing integer sequences arise as the dimensions of faces of some closed convex set?

Organizer: Gabor Pataki
University of North Carolina at Chapel Hill, USA

2:00-2:25 Partial Polyhedrality and Facial Reduction
Masakazu Muramatsu, University of Electro-Communications, Japan; Bruno Lourenco, Seikei University, Japan; Takashi Tsuchiya, National Graduate Institute for Policy Studies, Japan

2:30-2:55 Low-Order Complexity Results for SOS/SDP Methods in Real Algebra
Motakuri Ramana, United Airlines, USA

3:00-3:25 On An Algorithm for Conic Linear Program
Takashi Tsuchiya, National Graduate Institute for Policy Studies, Japan; Tomonari Kitahara, Tokyo Institute of Technology, Japan

3:30-3:55 Power Cones in Second-Order Cone Form and Dual Recovery
Henrik Friberg, MOSEK ApS, Denmark

Wednesday, May 24

MS85

Computation, Learning and Uncertainty in PDE Constrained Optimization Models - Part II of II

2:00 PM-3:30 PM

Room:Pavilion Ballroom C - Third Floor North Tower

For Part 1 see MS69

Optimization of models that are constrained by differential equations appear in a wide variety of computational science and engineering applications. Applications include the control of fluid flow modeled by the Navier-Stokes equations, quantum control, and image analysis to name but a few. The aim of this minisymposium is to address both computational and theoretical issues related to this class of problems. We discuss new and important issues related to optimization with PDEs. In particular, we look into the sparsity of these models and discuss how to take advantage of it in order to enable global optimization of large scale models. Uncertainty and learning pose new and exciting challenges in this area and we focus on both numerical and theoretical issues in this domain.

Organizer: Panos Parpas

Imperial College London, United Kingdom

2:00-2:25 A Multigrid Algorithm for SDP Relaxations of Sparse Polynomial Problems Arising in PDE Optimization

Juan Campos Salazar, Imperial College London, United Kingdom

2:30-2:55 Numerical and Theoretical Aspects of Shape Optimization for Fluid-Structure Interaction

Johannes Haubner and Michael Ulbrich, Technische Universität München, Germany

3:00-3:25 Primal-Dual Interior-Point Multigrid Method for Topology Optimization

Michal Kocvara, University of Birmingham, United Kingdom

Wednesday, May 24

MS86

First-Order Methods and Applications - Part II of III

2:00 PM-4:00 PM

Room:Pavilion Ballroom D - Third Floor North Tower

For Part 1 see MS70
For Part 3 see MS99

In the last years, first-order optimization methods have gained a great amount of interest, because their low memory and computational cost per iteration makes these methods suitable for large-scale problems, especially when low/medium accuracy is required in the solution. Nowadays, a wide variety of first-order methods are available, which have shown their effectiveness in many applications (e.g., in the areas of signal and image processing, machine learning and data analysis) and the research in this field is very active and fruitful. The aim of this minisymposium is to present and discuss recent advances in first-order optimization methods, focusing on both theory and applications.

Organizer: Daniela di Serafino

Università degli Studi della Campania Luigi Vanvitelli, Italy

2:00-2:25 Convex Relaxation Without Lifting: Solving Large Semidefinite Programs without all the Pain

Tom Goldstein, University of Maryland, USA

2:30-2:55 New Active Set Frank-Wolfe Variants for Minimization over the Simplex and the ℓ 1 Ball

Andrea Cristofari, *Marianna De Santis*, and Stefano Lucidi, Università di Roma "La Sapienza", Italy; Francesco Rinaldi, University of Padova, Italy

3:00-3:25 Fast Algorithms for Non-Convex and Non-Smooth Euler's Elastica Regularization Problems

Maryam Yashtini, Georgia Institute of Technology, USA

3:30-3:55 Application of Recent First-Order Methods to DIC Microscopy

Simone Rebegoldi, Universita di Modena e Reggio Emilia, Italy; Lola Bautista, Universidad Industrial de Santander, Colombia; Laure Blanc-Féraud, Inria Sophia Antipolis, France; Marco Prato and Luca Zanni, Universita di Modena e Reggio Emilia, Italy; Arturo Plata, Universidad Industrial de Santander, Colombia

Wednesday, May 24

MS87

Smoothing and Regularization Techniques in Optimization - Part II of II

2:00 PM-3:30 PM

Room:Junior Ballroom A -Third Floor North Tower

Organizer: Tim Hoheisel

McGill University, Canada

2:00-2:25 Local Behaviour of Proximal Splitting Methods: Identification, Linear and Finite Convergence

Jalal Fadili, Université de Caen, France

2:30-2:55 Fast Proximal L1-Banach Descent Methods

Marwa El Halabi, EPFL, France

3:00-3:25 Almost Nonexpansive Operators

Matthew K. Tam, University of Goettingen, Germany

Wednesday, May 24

MS88

Advances in Methods for Derivative-Free Optimization - Part II of III

2:00 PM-4:00 PM

Room:Junior Ballroom B -Third Floor North Tower

For Part 1 see MS72
For Part 3 see MS100

The area of derivative-free optimization concerns optimization problems for which some component (of the objective or constraint functions) prevents access to derivative information. This three-part minisymposium will survey recent advancements in methods for solving this challenging class of problems. These advances include randomized algorithms, algorithms for stochastic optimization, multi-objective algorithms, and algorithms for problems with discrete variables. In each case, theoretical advances are made and a class of real-word problems is made more readily solvable.

Organizer: Stefan Wild

Argonne National Laboratory, USA

Organizer: Sebastien le Digabel

Polytechnique Montreal, Canada

2:00-2:25 A New Derivative-Free Linesearch Method for Solving Integer Programming Problems

Giampaolo Liuzzi, CNR, Italy; Stefano Lucidi, Università di Roma "La Sapienza", Italy; *Francesco Rinaldi*, University of Padova, Italy

2:30-2:55 A Trust Region Method for Solving Derivative-Free Problems with Binary and Continuous Variables

Andrew R. Conn, IBM T.J. Watson Research Center, USA; Claudia D'Ambrosio, CNRS, France; Leo Liberti, Ecole Polytechnique, France; Delphine Sinoquet, IFP Energies nouvelles, France

3:00-3:25 Order-Based Error for Managing Ensembles of Surrogates in Derivative-Free Optimization

Sebastien Le Digabel, École Polytechnique de Montréal, Canada; Bastien Talgorn, GERAD, Canada; Charles Audet, École Polytechnique de Montréal, Canada; Michael Kokkolaras, McGill University, Canada

3:30-3:55 A New Derivative-Free Model-Based Method for Unconstrained Nonsmooth Optimization

Giampaolo Liuzzi, CNR, Italy; *Stefano Lucidi*, Università di Roma "La Sapienza", Italy; Francesco Rinaldi, University of Padova, Italy; Luis Nunes Vicente, Universidade de Coimbra, Portugal

continued in next column

Wednesday, May 24

MS89

Algorithms at the Intersection of Nonlinear, Stochastic, and Mixed-Integer Optimization - Part II of II

2:00 PM-4:00 PM

Room:Junior Ballroom C -Third Floor North Tower

For Part 1 see MS73

This minisymposium consists of two sessions. The talks in the first session relate to theoretical advances and algorithms for solving problems that can actually be characterized within multiple subfields of mathematical optimization. For example, these cover nonlinear chance-constrained problems using mixed-integer optimization techniques and Benders decomposition methods for solving optimization problems with complementarity constraints and binary variables. The talks in the second session are focused on recent advances in algorithms for nonlinear optimization, often focusing on nonconvex and possibly constrained problems. The talks discuss advances related to scalability, worst-case performance complexity, and challenges faced in the underlying linear algebra subroutines.

Organizer: Frank E. Curtis

Lehigh University, USA

Organizer: Daniel Robinson

Johns Hopkins University, USA

Organizer: Andreas Waechter

Northwestern University, USA

2:00-2:25 R-Linear Convergence of Limited Memory Steepest Descent

Frank E. Curtis, Lehigh University, USA; Wei Guo, Lehigh University, USA

continued on next page

Wednesday, May 24

MS89

Algorithms at the Intersection of Nonlinear, Stochastic, and Mixed-Integer Optimization - Part II of II

2:00 PM-4:00 PM

continued

2:30-2:55 Worst-Case Iteration Complexity of a Trust Region Algorithm for Equality Constrained Optimization
Frank E. Curtis, Lehigh University, USA; Daniel Robinson, Johns Hopkins University, USA; *Mohammadreza Samadi*, Lehigh University, USA

3:00-3:25 A Space Transformation Framework for Nonlinear Optimization
Zaikun Zhang and Luis Nunes Vicente, Universidade de Coimbra, Portugal; Serge Gratton, ENSEEIHT, Toulouse, France

3:30-3:55 Linear Algebra Issues in Nonlinear Optimization
Dominique Orban, École Polytechnique de Montréal, Canada

Wednesday, May 24

MS90

Nonlinear Optimization: Scalability and Tractability of Methods - Part II of III

2:00 PM-4:00 PM

Room:Junior Ballroom D -Third Floor North Tower

For Part 1 see MS74
For Part 3 see MS101
This minisymposium brings together some of the latest research in nonlinear optimization, with emphasis on dimensionality reduction, complexity of methods and their practical efficiency. Session I is dedicated to stochastic methods and analysis, with applications in machine learning and noisy data fitting. Session II considers first- and higher-order methods for deterministic optimization and their complexity analyses. Session III looks at various ways to scale up/reduce the cost of methods for nonlinear optimization.

Organizer: Coralia Cartis
University of Oxford, United Kingdom

2:00-2:25 Monotone Properties of the Barzilai-Borwein Method
Yaxiang Yuan, Chinese Academy of Sciences, China

2:30-2:55 Minimal Constraints Qualification that Ensure Convergence to KKT Points
Roberto Andreani, DMA-IMECC-UNICAMP, Brazil; José Mario Martínez, University of Campinas, Brazil; Alberto Ramos, Federal University of Paraná, Brazil; *Paulo J. S. Silva*, University of Campinas, Brazil

3:00-3:25 A Line-Search Approach Deriving by Adaptive Regularization Framework Using cubics, with a Worst-Case Iteration Complexity of O(e-3/2)
Youssef Diouane, Institut Supérieur de l'Aéronautique et de l'Espace, France; El houcine Bergou, INRA, Jouy-en-Josas, France; Serge Gratton, ENSEEIHT, Toulouse, France

3:30-3:55 Universal Regularization Methods: Varying the Power, the Smoothness and the Accuracy
Coralia Cartis, University of Oxford, United Kingdom; Nick Gould, Rutherford Appleton Laboratory, United Kingdom; Philippe L. Toint, University of Namur, Belgium

Wednesday, May 24

MS91

Optimizing Big Data: Acceleration, Randomization, and Parallelism - Part II of III

2:00 PM-4:00 PM

Room:Parksville - Third Floor North Tower

For Part 1 see MS75
For Part 3 see MS102
The minisymposium aims to bring together the recent advances in big data optimization from various perspectives, including acceleration, randomization, and parallelization. This minisymposium has three parts.

Organizer: Niao He
University of Illinois at Urbana-Champaign, USA

Organizer: Ji Liu
University of Rochester, USA

Organizer: Ming Yan
Michigan State University, USA

2:00-2:25 A Comprehensive Linear Speedup Analysis for Asynchronous Stochastic Parallel Optimization from Zeroth-Order to First-Order
Ji Liu, University of Rochester, USA

2:30-2:55 Decentralized Stochastic and Online Optimization
Soomin Lee, Georgia Institute of Technology, USA

3:00-3:25 A Distributed Optimization Method for Large-Scale Sparse Support Vector Machines with an Application to Healthcare Problems
Theodora Brisimi, Alex Olshevsky, Ioannis Paschalidis, and Wei Shi, Boston University, USA

3:30-3:55 Decentralized Consensus Optimization on Networks with Delayed and Stochastic Gradients
Xiaojing Ye and Benjamin Sirb, Georgia State University, USA

Wednesday, May 24

MS92

Continuous Techniques for MINLPs with Differential Equations in Gas Transport

2:00 PM-4:00 PM

Room:Orca - Third Floor B Tower

Rigorous modeling of efficient transport of natural gas through pipeline networks leads to mixed-integer nonlinear optimization problems involving ODEs in the stationary or even PDEs in the transient case. This is a very hard class of optimization models and problem-tailored methods have to be developed to solve instances of practical interest. The minisymposium is devoted to local optimization techniques that do not necessarily provide guarantees for global optimality but are fast and deliver local solution of good quality.

Organizer: Martin Schmidt
Universität Erlangen-Nürnberg, Germany

2:00-2:25 Penalty Alternating Direction Methods for Mixed-Integer Nonlinar Optimization
Martin Schmidt, Bjoern Geissler, Antonio Morsi, and Lars Schewe, Universität Erlangen-Nürnberg, Germany

2:30-2:55 Reformulating Discrete Aspects in Operative Planning of Gas and Water Networks
Marc C. Steinbach, Leibniz Universität Hannover, Germany

3:00-3:25 MIP-Based Instantaneous Control of Mixed-Integer PDE-Constrained Gas Transport Problems
Mathias Sirvent, Martin Gugat, Günter Leugering, Alexander Martin, Martin Schmidt, and David Wintergerst, Universität Erlangen-Nürnberg, Germany

3:30-3:55 Adaptive Convex Relaxations for Mixed-Integer Optimization of Gas Pipeline Dynamics
Harsha Nagarajan and Anatoly Zlotnik, Los Alamos National Laboratory, USA; Fei Wu and Ramteen Sioshansi, Ohio State University, USA

Wednesday, May 24

MS93

Nonsmooth and Multiobjective Optimization with Applications - Part II of III

2:00 PM-3:30 PM

Room:Finback - Third Floor B Tower

For Part 1 see MS77
For Part 3 see MS103

This minisymposium focuses on the recent developments in the field of nonsmooth and multiobjective optimization and their wide-ranging applications. For simple multiobjective optimization problems with only a few variables, some of the algorithms are now available. However, large-scale multiobjective optimization problems are quite challenging and cannot be solved satisfactorily with the available methods. Such issues, involving new numerical approaches, for multicriteria optimization problems will be the topic of the minisymposium. A relevant example is furnished by the heterogeneous multiobjective problems where one objective function is known analytically and easy to evaluate, while the other requires a time-consuming numerical simulation. Classical scalarization approaches do not take this heterogeneity into account, and consequently, there is a need for an adequate algorithm. Taking uncertainty into account by a robust approach is a subject of paramount interest but so far there are no general purpose algorithms for such problems. Numerous problems of practical interests lead to bilevel optimization problems where multiobjective problems appear at the lower level. However, such problems offer serious challenges for defining optimality in case of a non-optimistic approach, as the lower level problem no longer has a unique solution. Set-valued approaches offer a better understanding of these problems.

Organizer: Gabriele Eichfelder
Technische Universität Ilmenau, Germany

Organizer: Akhtar A. Khan
Rochester Institute of Technology, USA

2:00-2:25 An Implicit Filtering Algorithm for Derivative Free Multiobjective Optimization
Guido Cocchi, Universita degli Studi di Firenze, Italy; Giampaolo Liuzzi, Instituto di Analisi dei Sistemi ed Informatica - CNR, Italy; *Alessandra Papini*, University of Florence, Italy; Marco Sciandrone, Università degli Studi di Firenze, Italy

2:30-2:55 An Iterative Approach for Multiobjective Optimization Problems with Heterogeneous Functions
Jana Thomann, Technical University of Ilmenau, Germany

3:00-3:25 Relationships Between Constrained and Unconstrained Multi-Objective Optimization and Application in Location Theory
Christian Guenther, Martin-Luther-University Halle-Wittenberg, Germany; Christiane Tammer, University of Halle-Wittenberg, Germany

continued in next column

Wednesday, May 24

MS94

Majorization/Minimization Algorithms in Statistics and Optimization - Part II of II

2:00 PM-4:00 PM

Room:Beluga - Third Floor B Tower

For Part 1 see MS78

Recent years have witnessed the convergence of the fields of optimization and statistics. This minisymposium aims to further catalyze this movement by bringing researcher together who work in one of these fields with strong interests in the other field. For this minisymposium, the common topic will be the analysis and application for algorithms of majorization/minimization (MM) type. This is a very generic class of methods and contains as a special case the expectation-maximization (EM) methods which are widely used in statistics and electrical engineering. The methods also go under the name of optimization transfer or methods of surrogate functions. Kenneth Lange's recent book MM Optimization Algorithms published by SIAM (http://bookstore.siam.org/ot147/) provides an excellent overview of field. Of particular interest in this minisymposium will be (i) challenging applications in statistics, imaging sciences, and inverse problems and (ii) theoretical insight in the methods and improvements, both from the optimization and statistical point of view. The minisymposium starts with an overview talk on MM methods. Following talks feature improvements of the general principle and applications to specific problems. To highlight the breadth and reach of the MM principle, our session concludes with a talk on new developments in the theory of deep learning with connections to the MM principle.

continued in next column

Organizer: Eric Chi
North Carolina State University, USA

Organizer: Dirk Lorenz
Technische Universitaet Braunschweig, Germany

Organizer: Hua Zhou
University of California, Los Angeles, USA

2:00-2:25 A Family of Stochastic Surrogate Optimization Algorithms
Julien Mairal, Inria Grenoble, France

2:30-2:55 Probabilistic Image Models and Extensions of the Perona-Malik Filter
Dirk Lorenz, Technische Universitaet Braunschweig, Germany; Lars Mescheder, Max Planck Institute, Germany

3:00-3:25 Expectation-Maximization Algorithms for Partially Observed Continuous-Time Markov Processes
Vladimir Minin, University of Washington, USA

3:30-3:55 New Analytical and Stochastic Results on Understanding Deep Convolutional Neural Network
Fang Han, University of Washington, USA

Wednesday, May 24

MS95

Optimization and Quantum Chemistry

2:00 PM-4:00 PM

Room:Azure - Third Floor South Tower

Optimization has been ubiquitous in describing various models in Quantum Chemistry, for example, electronic structure calculation, many-electron quantum mechanics, Bose-Einstein condensates and etc. It is interesting to see that linear and nonlinear eigenvalue optimization, semi-definite programming and optimization with orthogonality constraints as well many other important fields in optimization play more and more important roles in quantum chemistry. This session will present a few recent advance on the interplay between these two fields.

Organizer: Zaiwen Wen
Peking University, China

Organizer: Chao Yang
Lawrence Berkeley National Laboratory, USA

2:00-2:25 A Newton-Krylov Method for Solving Coupled Cluster Equations
Chao Yang, Lawrence Berkeley National Laboratory, USA; Jiri Brabec, Czech Academy of Sciences, Czech Republic; Karol Kolwalski, Pacific Northwest National Laboratory, USA

2:30-2:55 Reducing the Cost of the Fock Exchange Operator
Lin Lin, University of California, Berkeley and Lawrence Berkeley National Laboratory, USA

3:00-3:25 Electronic Structure Calculation using Semidefinite Programs
Zaiwen Wen, Peking University, China

3:30-3:55 Global Optimization with Orthogonality Constraints via Stochastic Diffusion on Manifolds
Rongjie Lai, Rensselaer Polytechnic Institute, USA; Zaiwen Wen, honglin yuan, and xiaoyi gu, Peking University, China

Wednesday, May 24

MS96

Large Scale Optimization in Big Data

2:00 PM-4:00 PM

Room:Gulf Islands B - Lower Lobby North Tower

This minisymposium highlights recent developments in new algorithms for solving large-scale problems arising in Big Data. The new algorithms discussed in this minisymposium are highly computationally efficient, and are also backed up by strong theoretical guarantees.

Organizer: Ethan X. Fang

Princeton University, USA

2:00-2:25 New Results for Sparse Methods for Logistic Regression and Related Classification Problems

Robert M. Freund, Massachusetts Institute of Technology, USA; Paul Grigas, University of California, Berkeley, USA; Rahul Mazumder, Massachusetts Institute of Technology, USA

2:30-2:55 Fast Algorithms for Large Scale Generalized Distance Weighted Discrimination

Kim-Chuan Toh and Defeng Sun, National University of Singapore, Republic of Singapore; Xin-Yee Lam, National University of Singapore, Singapore; J.S. Marron, University of North Carolina, USA

3:00-3:25 Random Permutations Fix a Worst Case for Cyclic Coordinate Descent

Stephen Wright and Ching-Pei Lee, University of Wisconsin, Madison, USA

3:30-3:55 Stochastic First-Order Methods in Data Analysis and Reinforcement Learning

Mengdi Wang, Princeton University, USA

Wednesday, May 24

MS97

Making Machine Learning work with Big Datasets and Complicated Objectives - Part II of II

2:00 PM-4:00 PM

Room:Gulf Islands C - Lower Lobby North Tower

For Part 1 see MS81

Machine learning is now part of our daily lives. We use systems built by machine learning algorithm for spam filtering, product recommendation, speech recognition, scientific discovery, and now self-driving cars. The recent advances in machine learning have largely been due to the use of very large datasets and increasingly complicated models. While most machine learning models are fit using numerical optimization, these large datasets and complicated models put a lot of stress on our standard tools for numerical optimization. These sessions will focus on progress in developing algorithms that allow us to apply machine learning methods to huge datasets with complex objective functions. The first part will focus on algorithms for taking advantage of problem structures and will discuss methods for dealing with large data sets and dealing with objectives that may be non- smooth or non-deterministic. The second part will focus on parallel and distributed representations. These are needed in order to handle our largest datasets, but lead to new issues such as synchronization and communication complexity.

Organizer: Martin Takac

Lehigh University, USA

Organizer: Mark Schmidt

University of British Columbia, Canada

2:00-2:25 Speeding-Up Large-Scale Machine Learning Using Graphs and Codes

Dimitris Papailiopoulos, University of Wisconsin, Madison, USA

2:30-2:55 AIDE: Fast and Communication Efficient Distributed Optimization

Sashank Reddi, Carnegie Mellon University, USA; *Jakub Konecny* and Peter Richtarik, University of Edinburgh, United Kingdom; Barnabas Poczos, Carnegie Mellon University, USA; Alex Smola, Yahoo! Research, USA

3:00-3:25 A General Framework for Communication-Efficient Distributed Optimization

Virginia Smith, University of California, Berkeley, USA

3:30-3:55 Communication Avoiding Primal and Dual Block Coordinate Descent Methods

Aditya Devarakonda, Kimon Fountoulakis, James Demmel, and Michael Mahoney, University of California, Berkeley, USA

Coffee Break

4:00 PM-4:30 PM

Room:Grand Ballroom CD - North Tower

continued in next column

Wednesday, May 24

MS98

Robustness and Dynamics in Optimization - Part III of III

4:30 PM-6:30 PM

Room:Grand Ballroom AB - North Tower

For Part 2 see MS82

The majority of optimization methods are iterative procedures that successively solve simple approximations to a global formulation. The most canonical example is gradient descent, which minimizes a quadratic approximation to a nonlinear function at every iteration. But even more complicated algorithms like accelerated mirror descent can be viewed from this perspective. Any such iterative scheme is a dynamical system, and proving the convergence of such a method is equivalent to proving that the system is stable in the sense that all trajectories must converge to the same stationary point. This minisymposium will examine the benefits of this identification of optimization algorithms as dynamical systems. The goal is to investigate how tools from dynamical systems can be applied to analyze optimization algorithms and to design new procedures. Topics to be discussed will include how to use tools of stability analysis from control theory, what notions of robustness can be applied to optimization problems and methods, which connections tie algorithmic and statistical robustness together, and how tools from optimization and statistics can be applied to analyze dynamical systems themselves.

Organizer: Benjamin Recht

University of California, Berkeley, USA

Organizer: Pablo A. Parrilo

Massachusetts Institute of Technology, USA

4:30-4:55 Iterative Optimization Methods: From Robustness to Regularization

Lorenzo Rosasco, Instituto Italiano di Technologia, Italy and Massachusetts Institute of Technology, USA

5:00-5:25 Perturbed Iterates Analysis for Stochastic Optimization

Horia Mania and Xinghao Pan, University of California, Berkeley, USA; Dimitris Papailiopoulos, University of Wisconsin, Madison, USA; Benjamin Recht, Kannan Ramchandran, and Michael Jordan, University of California, Berkeley, USA

5:30-5:55 Implicit Regularization Through Optimization

Nati Srebro, Toyota Technological Institute at Chicago, USA

6:00-6:25 Robustness Mechanisms for Statistical Generalization in Large-Capacity Models

Benjamin Recht, University of California, Berkeley, USA

continued in next column

Wednesday, May 24

MS99

First-Order Methods and Applications - Part III of III

4:30 PM-6:00 PM

Room:Pavilion Ballroom D - Third Floor North Tower

For Part 2 see MS86

In the last years, first-order optimization methods have gained a great amount of interest, because their low memory and computational cost per iteration makes these methods suitable for large-scale problems, especially when low/medium accuracy is required in the solution. Nowadays, a wide variety of first-order methods are available, which have shown their effectiveness in many applications (e.g., in the areas of signal and image processing, machine learning and data analysis) and the research in this field is very active and fruitful. The aim of this minisymposium is to present and discuss recent advances in first-order optimization methods, focusing on both theory and applications.

Organizer: Daniela di Serafino

Università degli Studi della Campania Luigi Vanvitelli, Italy

4:30-4:55 A First-Order Primal-Dual Algorithm with Bregman Distance Functions

Thomas Pock, Graz University of Technology, Austria; Antonin Chambolle, Ecole Polytechnique, France

5:00-5:25 Acceleration of Randomized Block Coordinate Descent Methods via Identification Function

Ronaldo Lopes, Paulo J. S. Silva, and Sandra A. Santos, University of Campinas, Brazil

5:30-5:55 A Two-Phase Gradient Method for Singly Linearly Constrained Quadratic Programming Problems with Lower and Upper Bounds

Daniela di Serafino, Università degli Studi della Campania Luigi Vanvitelli, Italy; Gerardo Toraldo, Università degli Studi di Napoli Federico II, Italy; Marco Viola, Università di Roma “La Sapienza”, Italy

Wednesday, May 24

MS100

Advances in Methods for Derivative-Free Optimization - Part III of III

4:30 PM-6:30 PM

Room:Junior Ballroom B -Third Floor North Tower

For Part 2 see MS88

The area of derivative-free optimization concerns optimization problems for which some component (of the objective or constraint functions) prevents access to derivative information. This three-part minisymposium will survey recent advancements in methods for solving this challenging class of problems. These advances include randomized algorithms, algorithms for stochastic optimization, multi-objective algorithms, and algorithms for problems with discrete variables. In each case, theoretical advances are made and a class of real-word problems is made more readily solvable.

Organizer: Stefan Wild

Argonne National Laboratory, USA

Organizer: Sebastien le Digabel

Polytechnique Montreal, Canada

4:30-4:55 Derivative-Free Methods for Hyperparameter Optimization of Neural Networks

Giacomo Nannicini, Carnegie Mellon University, USA

5:00-5:25 A Hybrid Framework for Constrained Derivative-Free Optimization Combining Accelerated Random Search with a Trust Region Approach

Rommel G. Regis, Saint Joseph's University, USA

5:30-5:55 Bayesian Optimization under Mixed Constraints with a Slack-Variable Augmented Lagrangian

Stefan Wild, Argonne National Laboratory, USA

6:00-6:25 Pareto Fronts with Gaussian Process Conditional Simulations

Mickaél Binois, University of Chicago, USA; Victor Picheny, Inria, France

Wednesday, May 24

MS101

Nonlinear Optimization: Scalability and Tractability of Methods - Part III of III

4:30 PM-6:00 PM

Room:Junior Ballroom D -Third Floor North Tower

For Part 2 see MS90

This minisymposium brings together some of the latest research in nonlinear optimization, with emphasis on dimensionality reduction, complexity of methods and their practical efficiency. Session I is dedicated to stochastic methods and analysis, with applications in machine learning and noisy data fitting. Session II considers first- and higher-order methods for deterministic optimization and their complexity analyses. Session III looks at various ways to scale up/reduce the cost of methods for nonlinear optimization.

Organizer: Coralia Cartis

University of Oxford, United Kingdom

4:30-4:55 Scaling Up Gauss-Newton Methods for Expensive Least-Squares Problems

Jaroslav Fowkes and Coralia Cartis, University of Oxford, United Kingdom

5:00-5:25 New Approaches for Global Optimization Methods

Adilet Otemissov, The Alan Turing Institute for Data Science, United Kingdom; Coralia Cartis, University of Oxford, United Kingdom

5:30-5:55 Estimation Performance and Convergence Rate of the Generalized Power Method for Phase Synchronization

Man Chung Yue, Huikang Liu, and Anthony Man-Cho So, Chinese University of Hong Kong, Hong Kong

Wednesday, May 24

MS102

Optimizing Big Data: Acceleration, Randomization, and Parallelism - Part III of III

4:30 PM-6:30 PM

Room:Parksville - Third Floor North Tower

For Part 2 see MS91

The minisymposium aims to bring together the recent advances in big data optimization from various perspectives, including acceleration, randomization, and parallelization. This minisymposium has three parts.

Organizer: Niao He

University of Illinois at Urbana-Champaign, USA

Organizer: Ji Liu

University of Rochester, USA

Organizer: Ming Yan

Michigan State University, USA

4:30-4:55 QuickeNing: A Generic Quasi-Newton Algorithm for Faster Gradient-Based Optimization

Hongzhou Lin, Inria, France; Julien Mairal, Inria Grenoble, France; Zaid Harcahoui, University of Washington, USA

5:00-5:25 Accelerating Optimization under Uncertainty via Online Convex Optimization

Nam Ho-Nguyen and Fatma Kilinc-Karzan, Carnegie Mellon University, USA

5:30-5:55 Faster Convergence Rates for Subgradient Methods under an Error Bound Condition

Patrick Johnstone and Pierre Moulin, University of Illinois at Urbana-Champaign, USA

6:00-6:25 Convergence of Asynchronous Algorithms with Unbounded Delay

Robert R. Hannah, University of California, Los Angeles, USA

Wednesday, May 24

MS103

Nonsmooth and Multiobjective Optimization with Applications - Part III of III

4:30 PM-6:30 PM

Room:Finback - Third Floor B Tower

For Part 2 see MS93

This minisymposium focuses on the recent developments in the field of nonsmooth and multiobjective optimization and their wide-ranging applications. For simple multiobjective optimization problems with only a few variables, some of the algorithms are now available. However, large-scale multiobjective optimization problems are quite challenging and cannot be solved satisfactorily with the available methods. Such issues, involving new numerical approaches, for multicriteria optimization problems will be the topic of the minisymposium. A relevant example is furnished by the heterogeneous multiobjective problems where one objective function is known analytically and easy to evaluate, while the other requires a time-consuming numerical simulation. Classical scalarization approaches do not take this heterogeneity into account, and consequently, there is a need for an adequate algorithm. Taking uncertainty into account by a robust approach is a subject of paramount interest but so far there are no general purpose algorithms for such problems. Numerous problems of practical interests lead to bilevel optimization problems where multiobjective problems appear at the lower level. However, such problems offer serious challenges for defining optimality in case of a non-optimistic approach, as the lower level problem no longer has a unique solution. Set-valued approaches offer a better understanding of these problems.

continued in next column

Organizer: Gabriele Eichfelder
Technische Universität Ilmenau, Germany

Organizer: Akhtar A. Khan
Rochester Institute of Technology, USA

4:30-4:55 Stable Identification in Ill-Posed Variational Problems
Akhtar Khan, Rochester Institute of Technology, USA

5:00-5:25 Pontryagin Maximum Principle for Optimal Control on Banach Manifolds
Robert Kipka, Kent State University, USA; Yuri Ledyaev, Western Michigan University, USA

5:30-5:55 Necessary Optimality Conditions for Some Nonconvex Facility Location Problems
Marcus Hillmann, Martin-Luther-University Halle-Wittenberg, Germany

6:00-6:25 Nonsmooth Optimization Framework for Elastography Inverse Problem of Tumor Identification
Baasansuren Jadamba, Rochester Institute of Technology, USA

Wednesday, May 24

CP12

Stochastic Optimization and Applications - Part II

4:30 PM-6:10 PM

Room:Pavilion Ballroom A - Third Floor North Tower

Chair: Sitki Gulten, Stockton University, USA

4:30-4:45 Density Estimation with Total Variation Penalized Maximum Likelihood Estimation
Robert Bassett and James Sharpnack, University of California, Davis, USA

4:50-5:05 Differential Evolution for Solving Maximum Clique Problem
Hui Fang and Makoto Yamashita, Tokyo Institute of Technology, Japan

5:10-5:25 High-Frequency Trading in Risk-Averse Portfolio Optimization with Higher-Order Risk Measures
Sitki Gulten, Stockton University, USA

5:30-5:45 Efficient Methods for Several Classes of Ambiguous Stochastic Programming Problems under Mean-Mad Information
Krzysztof Postek, Tilburg University, The Netherlands; Ward Romeijnders, University of Groningen, Netherlands; Dick Den Hertog, Tilburg University, The Netherlands; Maarten van Der Vlerk, University of Groningen, Netherlands

5:50-6:05 Improving Consistency in Intertemporal Decisions via Stochastic Optimization and Conditioning Coordination
Jorge R. Vera, Universidad Catolica de Chile, Chile; Alfonso Lobos, University of California, Berkeley, USA; Ana Batista, Pontificia Universidad Católica de Chile, Chile

Wednesday, May 24

CP13

Sparse Optimization

4:30 PM-6:30 PM

Room:Pavilion Ballroom B - Third Floor North Tower

Chair: Brendan P. Ames, University of Alabama, USA

4:30-4:45 Splitting Methods in Penalized Zero-Variance Discriminant Analysis
Brendan P. Ames, University of Alabama, USA

4:50-5:05 Fast Monte Carlo Algorithms for Tensors: Approximating Tensor Multiplication and Decomposition
Michailidis George, University of Florida, USA; Davoud Ataee Tarzanagh, University of Engineering and Technology, Pakistan and Vietnam National University at Hanoi, Vietnam

5:10-5:25 Online Convolutional Dictionary Learning
Jialin Liu, University of California, Los Angeles, USA; Cristina Garcia-Cardona and Brendt Wohlberg, Los Alamos National Laboratory, USA; Wotao Yin, University of California, Los Angeles, USA

5:30-5:45 Sparsity-Constrained Gaussian Graphical Models
Dzung Phan, IBM T.J. Watson Research Center, USA; Matt Menickelly, Lehigh University, USA

5:50-6:05 Numerical Identification of Sparse Chemical Reaction Networks
Thorsten Raasch, University of Mainz, Germany

6:10-6:25 Proximal DC Algorithm for Sparse Optimization
Akiko Takeda, The Institute of Statistical Mathematics, Japan; Jun-ya Gotoh, Chuo University, Japan; Katsuya Tono, University of Tokyo, Japan

Wednesday, May 24

CP14

Engineering Applications

4:30 PM-6:30 PM

Room:Pavilion Ballroom C - Third Floor North Tower

Chair: Yuriy Zinchenko, University of Calgary, Canada

4:30-4:45 A Semidefinite Programming Approach for Energy Network Planning
Bissan Ghaddar, University of Waterloo, Canada

4:50-5:05 Acyclic Orientations and Nonlinear Flow Problems
Benjamin Hiller, Zuse Institute Berlin, Germany

5:10-5:25 Simultaneous Truss Topology - and Static Output Feedback Controller Design via Nonlinear Semidefinite Programming
Anja Kuttich, Technische Universitaet Darmstadt, Germany; Stefan Ulbrich, Technische Universität Darmstadt, Germany

5:30-5:45 Stochastic Planning of Environmentally Friendly Telecommunication Networks Using Column Generation
Joe Naoum-Sawaya, IBM Research, Ireland

5:50-6:05 Gradient Multicut: A Second Derivative Potts Model for Image Segmentation Using MILP
Ruobing Shen, Universität Heidelberg, Germany; Stéphane Canu, Normandie Université, France; Gerhard Reinelt, Universität Heidelberg, Germany

6:10-6:25 Disjoint K-Path Min-Sum Approach Towards Robust Power Network Design
Yuriy Zinchenko, University of Calgary, Canada; Haotian Song, New York University, USA

Wednesday, May 24

CP15

Conic Optimization

4:30 PM-6:30 PM

Room:Junior Ballroom A -Third Floor North Tower

Chair: Didier Henrion, LAAS-CNRS, Toulouse, France

4:30-4:45 Copositive Optimization on Infinite Graphs
Claudia Adams, Mirjam Dür, and Leonhard Frerick, University of Trier, Germany

4:50-5:05 The Cone of Positive Type Measures on a Compact Group
Evan Decorte, McGill University, Canada

5:10-5:25 A Factorization Method for Completely Positive Matrices
Mirjam Duer and Patrick Groetzner, University of Trier, Germany

5:30-5:45 Convergence Rates of the Moment-Sum-of-Squares Hierarchy for Volume Approximation of Semialgebraic Sets
Didier Henrion, LAAS-CNRS, Toulouse, France; Milan Korda, University of California, Santa Barbara, USA

5:50-6:05 A Bound on the Carath\'{e}odory Number
Masaru Ito, Nihon University, Japan; Bruno Lourenco, Seikei University, Japan

6:10-6:25 Conic Program Certificates from ADMM/Douglas-Rachford Splitting
Yanli Liu, Ernest Ryu, and Wotao Yin, University of California, Los Angeles, USA

Wednesday, May 24

CP16

Convex Optimization

4:30 PM-6:10 PM

Room:Junior Ballroom C -Third Floor North Tower

Chair: Ruoyu Sun, University of Illinois at Urbana-Champaign, USA

4:30-4:45 Worst-Case Complexity Analysis of Convex Nonlinear Programming

Rohollah Garmanjani, University of Coimbra, Portugal

4:50-5:05 Alternating Projection on Convex Sets and Manifolds

Patrick Groetzner and Mirjam Dür, University of Trier, Germany

5:10-5:25 A Two-Phase Algorithm for Large-Scale Qplogdet Optimization Problem

Tang Peipei, Zhejiang University City College, China; Wang Chengjing, Southwest Jiaotong University, China

5:30-5:45 Large Gaps Between Gauss-Seidel Type Methods and Randomized Versions

Ruoyu Sun, University of Illinois at Urbana-Champaign, USA

5:50-6:05 Fully Adaptive Admm for Deterministic and Stochastic Non-Smooth Optimization

Yi Xu, Mingrui Liu, Qihang Lin, and Tianbao Yang, University of Iowa, USA

Wednesday, May 24

CP17

Nonlinear Optimization - Part II

4:30 PM-6:30 PM

Room:Orca - Third Floor B Tower

Chair: James D. Diffenderfer, University of Florida, USA

4:30-4:45 SQP Method for Constrained Vector Optimization Problem

Md Abu T. Ansary and *Geetanjali Panda*, Indian Institute of Technology Kharagpur, India

4:50-5:05 Solving Two-Stage Adaptive Nonlinear Models via Dual Formulations

Frans de Ruiter and Dick Den Hertog, Tilburg University, The Netherlands

5:10-5:25 An Algorithm with Infeasibility Detection for Linearly Constrained Optimization Problems

James D. Diffenderfer and William Hager, University of Florida, USA

5:30-5:45 Convex Relaxations with Second Order Cone Constraints for Nonconvex Quadratically Constrained Quadratic Programming

Rujun Jiang and Duan Li, Chinese University of Hong Kong, Hong Kong

5:50-6:05 Differentiable McCormick Relaxations for Deterministic Global Optimization

Kamil Khan, Argonne National Laboratory, USA; Harry Watson and Paul I. Barton, Massachusetts Institute of Technology, USA

6:10-6:25 On the Fruitful Use of Damped Techniques Within Nonlinear Conjugate Gradient Methods

Massimo Roma, Universita di Roma "La Sapienza," Italy; Mehiddin Al-Baali, Sultan Qaboos University, Oman; Andrea Caliciotti, Sapienza – Università di Roma, Italy; Giovanni Fasano, Università Ca' Foscari di Venezia, Italy

Wednesday, May 24

CP18

Integer and Combinatorial Optimization - Part I

4:30 PM-6:10 PM

Room:Beluga - Third Floor B Tower

Chair: Geoffrey M. Oxberry, Lawrence Livermore National Laboratory, USA

4:30-4:45 Efficient Combinatorial Optimization for Graph Partitioning Using Quantum Annealing

Georg Hahn, Imperial College London, United Kingdom; Hristo Djidjev, Los Alamos National Laboratory, USA; Guillaume Rizk, Inria, France; Guillaume Chapuis, Los Alamos National Laboratory, USA

4:50-5:05 Combinatorial Optimization in Survey Statistics

Dennis Kreber, Ulf Friedrich, Jan Burgard, and Sven De Vries, Universität Trier, Germany

5:10-5:25 A New Approach for Solving Nonlinear Mixed Integer DC Programs Based on a Continuous Relaxation Without Integrality Gap and Smoothing Technique

Takayuki Okuno, Kyoto University, Japan; Yoshiko Ikebe, Tokyo University of Science, Japan

5:30-5:45 PIPS-SBB: A Distributed-Memory Linear-Programming-Based Branch-and-Bound Solver for Stochastic Mixed-Integer Programs

Geoffrey M. Oxberry, Lawrence Livermore National Laboratory, USA; Lluis-Miquel Munguia, Georgia Institute of Technology, USA; Cosmin G. Petra, Pedro Sotorrio, Thomas Edmunds, and Deepak Rajan, Lawrence Livermore National Laboratory, USA

5:50-6:05 Binary Variable Decompositions via ADMM in Mixed Integer Programs

Michael Rotkowitz and Alborz Alavian, University of Maryland, College Park, USA

Wednesday, May 24

CP19

Nonlinear Optimization - Part III

4:30 PM-6:30 PM

Room:Azure - Third Floor South Tower

Chair: Jean-Pierre Dussault, Universite de Sherbrooke, Canada

4:30-4:45 On Shape-Changing Trust-Region Subproblems

Johannes J. Brust, University of California, Merced, USA; Oleg Burdakov, Linköping University, Sweden; Jennifer Erway, Wake Forest University, USA; Roummel F. Marcia, University of California, Merced, USA; Ya-Xiang Yuan, Chinese Academy of Sciences, China

4:50-5:05 Scalable Adaptative Cubic Regularization Methods

Jean-Pierre Dussault, Universite de Sherbrooke, Canada; Dominique Orban, École Polytechnique de Montréal, Canada

5:10-5:25 A Characterization of Symmetric Quasi-Newton Update Matrices for Quadratic Problems

David Ek and Anders Forsgren, KTH Royal Institute of Technology, Sweden

5:30-5:45 A Solver for Nonconvex Bound-Constrained Quadratic Optimization

Hassan Mohy-Ud-Din, Yale University, USA

5:50-6:05 Global Convergence of Memoryless Quasi-Newton Methods Based on Broyden Family for Unconstrained Optimization

Shummin Nakayama, Tokyo University of Science, Japan; Yasushi Narushima, Yokohama National University, Japan; Hiroshi Yabe, Tokyo University of Science, Japan

6:10-6:25 Necessary Optimality Conditions and Exact Penalization for Non-Lipschitz Nonlinear Programs

Jane Ye, University of Victoria, Canada; Lei Guo, Shanghai Jiao Tong University, China

Wednesday, May 24

CP20

Integer and Combinatorial Optimization - Part II

4:30 PM-5:50 PM

Room:Gulf Islands B - Lower Lobby North Tower

Chair: Areesh Mittal, University of Texas at Austin, USA

4:30-4:45 Solving Integer Programming Problems via Numerical Complex Integration

Ulf Friedrich, Universität Trier, Germany

4:50-5:05 Changing Graph Structure for Performing Fast, Approximate Inference in Graphical Models

Areesh Mittal, University of Texas at Austin, USA

5:10-5:25 Intersection Cuts for Convex Mixed Integer Programs from Translated Cones

Umakanta Pattanayak and Vishnu Narayanan, Indian Institute of Technology-Bombay, India

5:30-5:45 An Approximation Algorithm for the Partial Covering 0-1 Integer Program

Yotaro Takazawa, Shinji Mizuno, and Tomonari Kitahara, Tokyo Institute of Technology, Japan

Wednesday, May 24

CP21

Polynomial Optimization

4:30 PM-5:50 PM

Room:Gulf Islands C - Lower Lobby North Tower

Chair: Matthew Peet, Arizona State University, USA

4:30-4:45 On the Minimization of the k-th Singular Value of a Matrix

Alborz Alavian and Michael Rotkowitz, University of Maryland, College Park, USA

4:50-5:05 Completely Positive and Positive Semidefinite Tensor Relaxations for Polynomial Optimization

Xiaolong Kuang and Luis Zuluaga, Lehigh University, USA

5:10-5:25 A Stable Lagrangian-DNN Relaxation Algorithm for Polynomial Optimization Problems

Naoki Ito, University of Tokyo, Japan; Sunyoung Kim, Ewha W. University, Korea; Masakazu Kojima, Chuo University, Japan; Akiko Takeda, The Institute of Statistical Mathematics, Japan; Kim-Chuan Toh, National University of Singapore, Republic of Singapore

5:30-5:45 Combining SOS and Moment Relaxations with Branch and Bound to Extract Solutions to Global Polynomial Optimization Problems

Hesameddin Mohammadi and *Matthew Peet*, Arizona State University, USA

Thursday, May 25

Registration
7:45 AM-2:45 PM

Room:Grand Ballroom Foyer - North Tower

Closing Remarks
8:10 AM-8:15 AM

Room:Grand Ballroom AB - North Tower

IP6
Using Local Measurements to Infer Global Network Properties
8:15 AM-9:00 AM

Room:Grand Ballroom AB - North Tower

Chair: Samuel Burer, University of Iowa, USA

Networks are widely used to model relational data in many applications such as social sciences, biology, finance, and marketing. Analyses of these networks can reveal scientific insights, but formulations lead to NP-Hard problems. Heuristics are commonly used without guarantees on solution quality, as even some polynomial–time algorithms become impractical due to the sheer sizes of the problems. To achieve scalability, our works has focused on trying to infer global network properties based on distributions of local patterns, such as triangles or 4-cliques. Such local measurements are scalable and provide uniquely measurable properties of the graph. This talk will show examples of our approach to network modeling and analysis.

Ali Pinar
Sandia National Laboratories, USA

Coffee Break
9:00 AM-9:30 AM

Room:Grand Ballroom CD - North Tower

Thursday, May 25

MS104
Convex Optimization and Quadratic Programming
9:30 AM-11:30 AM

Room:Grand Ballroom AB - North Tower

This minisymposium addresses recent results on approximating various quadratic optimization problems by using convex optimization. The first two presentations are concerned with computational aspects of solving convex relaxations by dynamically adding cutting planes of different kinds in an effective manner. The other two presentations propose novel approaches to derive efficient convex relaxations for quadratic optimization problems.

Organizer: Renata Sotirov
Tilburg University, The Netherlands

Organizer: Miguel F. Anjos
GERAD & Polytechnique Montreal, Canada

9:30-9:55 Computational Study of Some Valid Inequalities for *k*-Way Graph Partitioning
Vilmar Rodrigues de Sousa and Miguel F. Anjos, GERAD & Polytechnique Montreal, Canada; Sebastien Le Digabel, École Polytechnique de Montréal, Canada

10:00-10:25 Numerical Experiments on Dynamically Choosing Cutting Models and Scalings in Bundle Methods
Christoph Helmberg, Technische Universität, Chemnitz, Germany

10:30-10:55 On Solving the Quadratic Shortest Path Problem
Hao Hu, Tilburg University, The Netherlands

11:00-11:25 Graph Bisection Revisited
Renata Sotirov, Tilburg University, The Netherlands

Thursday, May 25

MS105
Conic Optimization and Quantum Information Theory - Part I of II
9:30 AM-11:30 AM

Room:Pavilion Ballroom A - Third Floor North Tower

For Part 2 see MS120

The driving force behind the emerging field of quantum computing is the realization that quantum effects can be utilized to design protocols for various information processing tasks, that may significantly outperform their classical counterparts. This minisymposium focuses on optimization techniques that have proven useful in the field of quantum information theory. Its scope is two-fold. First, we study linear conic formulations for the correlations that can be realized by performing local measurements on a bipartite quantum system, and for quantum analogues of various classical graph parameters. Second, we investigate optimization techniques that can be used to quantify the advantage of quantum protocols over their classical counterparts, including polynomial and semidefinite optimization and matrix factorizations.

Organizer: Antonios Varvitsiotis
Nanyang Technical University, Singapore

Organizer: Monique Laurent
Tilburg University, The Netherlands

9:30-9:55 Quantum Correlations: Conic Formulations, Dimension Bounds and Matrix Factorizations
Antonios Varvitsiotis, Nanyang Technical University, Singapore

10:00-10:25 Quantum and Non-Signalling Graph Isomorphisms
David Roberson, Nanyang Technological University, Singapore

10:30-10:55 Some Problems Concerned with Graph Decompositions
Simone Severini, University College London, United Kingdom

11:00-11:25 From Clifford Algebras and Rigidity Theory to Large Completely Positive Semidefinite Rank
Sander Gribling, David de Laat, and Monique Laurent, Centrum voor Wiskunde en Informatica, The Netherlands

Thursday, May 25

MS106

Nonlinear Optimization: Methods and Applications - Part I of II

9:30 AM-11:30 AM

Room:Pavilion Ballroom B - Third Floor North Tower

For Part 2 see MS121

This minisymposium consists of two sessions (8 talks) on numerical methods for nonlinear optimizaiton, matrix optimization, tensor optimization and their applications. In particular, some recent advances on parallel algorithms, special convex optimization problems, orthogonal constraint problems, total least squares, monotonic regression, trust region algorithms, subspace methods, and gradient type methods will be presented in the two sessions. Some applications of optimization techniques, such as parameter estimation, variable selection and image processing, will also be addressed in this minisymposium.

Organizer: Yaxiang Yuan

Chinese Academy of Sciences, China

Organizer: Xin Liu

Chinese Academy of Sciences, China

9:30-9:55 Distributed Algorithms for Orthogonal Constrained Optimization Problem

Xin Liu, Bin Gao, and Ya-Xiang Yuan, Chinese Academy of Sciences, China

10:00-10:25 Parallel Subspace Correction Method for Strongly Convex Problem

Qian Dong and Xin Liu, Chinese Academy of Sciences, China; Zaiwen Wen, Peking University, China; Ya-Xiang Yuan, Chinese Academy of Sciences, China

10:30-10:55 New Gradient Methods Improving Yuan's Step-Size

Cong Sun, Beijing University of Posts and Telecommunications, China; Jinpeng Liu, Beihang University, China

11:00-11:25 Total Least Squares with Tikhonov Regularization: Hidden Convexity and Efficient Global Algorithms

Meijia Yang, *Yong Xia*, and Jiulin Wang, Beihang University, China; Jiming Peng, University of Houston, USA

Thursday, May 25

MS107

PDE-Constrained Optimization Under Uncertainty

9:30 AM-11:30 AM

Room:Pavilion Ballroom C - Third Floor North Tower

The treatment and minimization of uncertainties in design and control tasks is indispensable to address, characterize and minimize the impact of limited knowledge or uncertainty in parameters in complex physical processes. Enabling uncertainty quantification in this framework increases the confidence in numerical simulations and ensures a robust performance and reliability of the computed designs and controls in a real-world setting. However, introducing uncertainties in optimization and control problems leads to highly complex optimization tasks, which are computationally demanding. In this minisymposium, we will discuss novel strategies to reduce the overall costs of the optimization and uncertainty quantification, thus, making robust design feasible in even complex, computationally intensive real-world applications. Dimension reduction techniques, such as low-dimensional Taylor approximations, sparse-grid sampling techniques, in combination with efficient optimization strategies will be presented. Applications include all areas of engineering, environmental, physical and biological systems.

Organizer: Claudia Schillings

Humboldt University Berlin, Germany

Organizer: Nicolas R. Gauger

Technische Universität Kaiserslautern, Germany

9:30-9:55 Robustness Measures for Robust Design with Multiple Objectives

Lisa Kusch, Technische Universität Kaiserslautern, Germany; Lionel Mathelin, CNRS, France; Nicolas R. Gauger, Technische Universität Kaiserslautern, Germany

10:00-10:25 Robust Gradient-Based Shape Optimization for CFD Applications

João Duarte Carrilho Miranda, Francesco Contino, and Chris Lacor, Vrije Universiteit Brussel, Belgium

10:30-10:55 Taylor Approximation for PDE-Constrained Optimal Control Problems under High-Dimensional Uncertainty

Peng Chen, Omar Ghattas, and Umberto Villa, University of Texas at Austin, USA

11:00-11:25 Optimal Sensor Placement Subject to Efficiency and Robustness Constraints

Carlos N. Rautenberg, Humboldt University Berlin, Germany

continued in next column

Thursday, May 25

MS108

New Results for First-Order Methods for Convex Optimization

9:30 AM-11:30 AM

Room:Pavilion Ballroom D - Third Floor North Tower

The use and analysis of first-order methods in convex optimization has gained a considerable amount of attention in recent years due to the relevance of applications (regression, boosting/classification, image construction, etc.), the requirement for only moderately high accuracy solutions, the necessity for such simple methods for huge-scale problems, and the appeal of structural implications (sparsity, low-rank) induced by the models and the methods themselves. The research herein includes new results regarding the theory, computation, and application of first-order methods.

Organizer: Robert M. Freund

Massachusetts Institute of Technology, USA

9:30-9:55 Relatively-Smooth and Relatively-Continuous Convex Optimization by First-Order Methods, and Applications

Haihao Lu and Robert M. Freund, Massachusetts Institute of Technology, USA; Yurii Nesterov, Universite Catholique de Louvain, Belgium

10:00-10:25 Sample Complexity Analysis for Low-Order Optimization Algorithms

Shuzhong Zhang, University of Minnesota, USA

10:30-10:55 Dual Extrapolation for Solving Variational Inequalities with a Linear Optimization Oracle

Paul Grigas, University of California, Berkeley, USA; Yurii Nesterov, Universite Catholique de Louvain, Belgium

11:00-11:25 Detecting Communities by Voting Model

Yurii Nesterov, Universite Catholique de Louvain, Belgium

Thursday, May 25

MS109

Optimization in Disease Treatment

9:30 AM-11:00 AM

Room:Junior Ballroom A -Third Floor North Tower

The scope of this minisymposium is on applying optimization theory and algorithms to solve challenging and important disease treatment problems in practice. The problems include treatment schedule design for cancer, drug dosage design based on each patient's response, and decisions on allocating resources in treating Hepatitis C patients. Each talk introduces new optimization models and algorithms tailored for the models. The models include optimization problems with ordinary-differential-equation constraints, stochastic dynamic program, and the bandit model.

Organizer: Qie He

University of Minnesota, USA

9:30-9:55 Optimized Treatment Schedules for Chronic Myeloid Leukemia

Qie He, University of Minnesota, USA

10:00-10:25 Response-Guided Dosing

Jakob Kotas, University of Portland, USA; Archis Ghate, University of Washington, USA

10:30-10:55 Prioritizing Hepatitis C Treatment Decisions in U.S. Prisons

Turgay Ayer, Can Zhang, and Anthony Bonifonte, Georgia Institute of Technology, USA; Anne Spaulding, Emory University, USA; Jagpreet Chhatwal, Harvard University, USA

Thursday, May 25

MS110

Nonsmooth Derivative-Free Optimization

9:30 AM-11:30 AM

Room:Junior Ballroom B -Third Floor North Tower

This session in derivative-free optimization will present algorithms and problems for optimizing functions when derivatives are unavailable and the function has some known structure to be exploited.

Organizer: Jeffrey Larson

Argonne National Laboratory, USA

9:30-9:55 A Derivative-Free Vu-Algorithm for Convex Finite-Max Functions

Chayne Planiden, University of British Columbia, Canada

10:00-10:25 Mesh Adaptive Direct Search Algorithms for Multifidelity Optimization Problems

Mark Abramson, Brigham Young University, USA

10:30-10:55 Hybrid Derivative-Free Methods for Composite Nonsmooth Optimization

Geovani N. Grapiglia, Federal University of Paraná, Brazil

11:00-11:25 Manifold Sampling for Piecewise Linear Nonconvex Optimization

Jeffrey Larson, Kamil Khan, and Stefan Wild, Argonne National Laboratory, USA

Thursday, May 25

MS111

Optimization with Balance Laws on Graphs

9:30 AM-11:30 AM

Room:Junior Ballroom C -Third Floor North Tower

Conservation and balance laws defined on discrete graphs are used to model physical flows such as traffic, water or gas in network structures. This minisymposium addresses the optimization of such dynamical systems. An emphasize is put on linking methods from graph theory, numerical methods for PDEs, and nonlinear optimization techniques to bridge the mathematical gaps in view of the demands from applications in this field.

Organizer: Falk M. Hante
Universität Erlangen-Nürnberg, Germany

Organizer: Michael Hintermüller
Humboldt University Berlin, Germany

9:30-9:55 Total Variation Diminishing Runge-Kutta Methods for the Optimal Control of Conservation Laws: Stability and Order-Conditions
Soheil Hajian, Humboldt University Berlin, Germany; Michael Hintermueller, Weierstrass Institute for Applied Analysis and Stochastics, Germany

10:00-10:25 Chance Constrained Optimization on Gas Networks Governed by the Isothermal Euler Equations
David Wintergerst, Universität Erlangen-Nürnberg, Germany

10:30-10:55 Optimal Control of Hyperbolic Balance Laws with State Constraints
Johann Schmitt and Stefan Ulbrich, Technische Universität Darmstadt, Germany

11:00-11:25 Control and Estimation of Traffic Flow on Networks
Simoni Michele, University of Texas at Austin, USA; Edward Canepa, King Abdullah University of Science & Technology (KAUST), Saudi Arabia; *Christian Claudel*, University of Texas at Austin, USA

Thursday, May 25

MS112

Non-Convex Optimization for Low Complexity Models: Theory and Applications - Part I of II

9:30 AM-11:30 AM

Room:Junior Ballroom D -Third Floor North Tower

For Part 2 see MS127

Low complexity models arise from a wide range of applications in signal processing and data analysis. Typical examples include sparse signal recovery, low rank matrix/tensor reconstruction and dictionary learning. There is a growing interest of studying non-convex optimization methods for those low complexity signal and data reconstruction problems. Compared with the conventional convex approaches, non-convex approaches are usually more efficient, particularly for high dimensional problems. Recently, there has been a large body of work on guarantee analysis of non-convex optimization for low complexity models, based on local convergence analysis, saddle point analysis or other particular problem structures. We are going to gather together the leading experts on this topic and discuss recent breakthroughs, potential applications and future directions.

Organizer: Jian-Feng Cai
Hong Kong University of Science and Technology, Hong Kong

Organizer: Ke Wei
University of California, Davis, USA

9:30-9:55 Nonconvex Recovery of Low-Complexity Models
John Wright, Columbia University, USA; Ju Sun, Stanford University, USA; Qing Qu and Yuqian Zhang, Columbia University, USA

10:00-10:25 Guarantees of Riemannian Optimization for Low Rank Matrix Reconstruction
Ke Wei, University of California, Davis, USA; Jian-Feng Cai, Hong Kong University of Science and Technology, Hong Kong; Tony Chan and Shingyu Leung, Hong Kong University of Science and Technology, Hong Kong

10:30-10:55 Rapid, Robust, and Reliable Blind Deconvolution via Nonconvex Optimization
Xiaodong Li, *Shuyang Ling*, Thomas Strohmer, and Ke Wei, University of California, Davis, USA

11:00-11:25 Breaking Sample Complexity Barriers via Nonconvex Optimization?
Mahdi Soltanolkotabi, University of Southern California, USA

continued in next column

Thursday, May 25

MS113

Multistage Stochastic Programming Algorithms and Bounding Methods

9:30 AM-11:30 AM

Room:Parksville - Third Floor North Tower

The session is mainly about multistage stochastic programming (MSP) which is a framework for sequential decision making under uncertainty. It has numerous applications on energy, finance, production planning, healthcare and many others. Developing solution algorithms for MSPs is an active research area. Significant progress has been made in developing tailored algorithms to solve special classes of MSPs, especially for two-stage models. Moreover, there are some recent approaches aiming to derive statistical bounds for MSPs in order to reduce the computational effort. The session includes four talks presenting various approaches to solve or approximate multistage stochastic programs. More specifically, as methodologies, some advances in stochastic dual dynamic programming, lagrangian duality, progressive hedging, cutting planes, sample average approximation and decision rules are used. The talks also present multistage stochastic programming models on different applications as examples such as power generation and portfolio optimization.

Organizer: Merve Bodur

University of Toronto, Canada

9:30-9:55 A Sequential Sampling Algorithm for Stochastic Multistage Programs

Harsha Gangammanavar, Southern Methodist University, USA

10:00-10:25 Nested Decomposition of Multistage Stochastic Integer Programs with Binary State Variables

Shabbir Ahmed and *Andy Sun*, Georgia Institute of Technology, USA

10:30-10:55 Progressive Hedging Like Methods for Computing Lagrangian Dual Bounds in Stochastic Mixed-Integer Programming

Andrew C. Eberhard, Australian Mathematical Sciences Institute, Australia; Natashia Boland, University of Newcastle, Australia; Brian C. Dandurand, Argonne National Laboratory, USA; Jeff Linderoth and James Luedtke, University of Wisconsin, Madison, USA; Fabricio Oliveira and Jeffrey Christiansen, RMIT University, Australia

11:00-11:25 Two-Stage Linear Decision Rules for Multi-Stage Stochastic Programming

Merve Bodur, University of Toronto, Canada; James Luedtke, University of Wisconsin, Madison, USA

continued in next column

Thursday, May 25

MS114

Mixed-Integer PDE-Constrained Optimization - Part I of II

9:30 AM-11:30 AM

Room:Orca - Third Floor B Tower

For Part 2 see MS129

Many complex design applications involve both discrete or integer design variables as well as complex physical models described by partial differential equations (PDEs). We provide an introduction to this challenging class of optimization problems, and then present a range of applications and solution approaches that cleverly combine discrete optimization approaches with scalable solvers for the PDEs.

Organizer: Sven Leyffer

Argonne National Laboratory, USA

Organizer: Geoffrey M. Oxberry

Lawrence Livermore National Laboratory, USA

9:30-9:55 Introduction to Mixed-Integer PDE Constrained Optimization

Sven Leyffer, Argonne National Laboratory, USA

10:00-10:25 Gradient Descent Methods for Mixed-Integer PDE-Constrained Optimization

Falk M. Hante, Universität Erlangen-Nürnberg, Germany

10:30-10:55 Mixed-Integer Linear Programming for a PDE-Constrained Dynamic Network Flow

Fabian Gnegel and Armin Fügenschuh, Helmut-Schmidt-Universitaet Hamburg, Germany; Marcus Stiemer and Michael Dudzinski, Helmut-Schmidt-University of Federal Armed Forces Hamburg, Germany

11:00-11:25 Mixed-Integer PDE-Constrained Optimization for Gas Networks

Mirko Hahn, Argonne National Laboratory, USA

Thursday, May 25

MS115

Numerical Variational Analysis - Part I of II

9:30 AM-11:30 AM

Room:Finback - Third Floor B Tower

For Part 2 see MS130

This minisymposium focuses on research that uses computational techniques to build variational analysis objects. This could be as part of a larger optimization algorithm, or as a standalone goal. Applications in algorithm design, visualization, and error analysis will all be discussed.

Organizer: Warren Hare

University of British Columbia, Canada

Organizer: Yves Lucet

University of British Columbia, Canada

9:30-9:55 From Least Squares Solutions of Linear Inequality Systems to Convex Least Squares Problems

Jean-Baptiste Hiriart-Urruty, University of Toulouse, France

10:00-10:25 VU Decomposition and Partial Smoothness for Sublinear Functions

Shuai Liu, Claudia A. Sagastizabal, and Mikhail V. Solodov, IMPA-Instituto de Matematica Pura e Aplicada, Brazil

10:30-10:55 A Unified Approach to Error Bounds for Structured Convex Optimization Problems

Zirui Zhou, Simon Fraser University, Canada

11:00-11:25 Compositions of Convex Functions and Fully Linear Models

Warren Hare, University of British Columbia, Canada

Thursday, May 25

MS116

Nonconvex Optimization Problems in Learning

9:30 AM-11:30 AM

Room:Beluga - Third Floor B Tower

Addressing nonconvexity in learning problems via complementarity theory: Models and Algorithms Problem of interest: Over the last 10-15 years, there has been immense interest in the development of tools and techniques for a broad class of learning problems. While convex formulations have often sufficed, addressing nonconvexity remains a crucial challenge. This minisymposium will consider models, relaxations, and algorithms to contend with this challenge. Current directions: J. Mitchell and his coauthors were amongst the first to consider modeling the L0 minimization problem via complementarity-based approaches with a view towards obtaining global solutions. Similar approaches have been considered by A. Schwartz and C. Kanzow. Scope: In this minisymposium, we examine how nonconvexity may be addressed with a particular emphasis on complementarity-based approaches. Y. Xie (together with U. V. Shanbhag) present an ADMM scheme for the L0 minimization problem in which each subproblem is globally resolves by recognizing the hidden convexity. Ben Chaiken (together with S. Davanloo) also examine relaxations of the complementarity-based formulations of the ‘0 problem. J. Mitchell also employs a complementarity framework in considering the problem of rank minimization while J. Shen (together with X. Wang) consider dictionary learning and sparse coding problems, both of which result in challenging nonconvex problems.

Organizer: Jinglai Shen

University of Maryland, Baltimore County, USA

9:30-9:55 Rank Minimization using a Complementarity Approach

John E. Mitchell, Rensselaer Polytechnic Institute, USA; Xin Shen, Monsanto, USA

10:00-10:25 Relaxations of the Complementarity-Based Formulations of the L0 Problem

Sam Davanloo and *Ben Chaiken*, Ohio State University, USA

10:30-10:55 On the Global Resolution

$\mathcal{L}$0-Norm Minimization Problems via ADMM Schemes

Yue Xie and Uday Shanbhag, Pennsylvania State University, USA

11:00-11:25 Algorithms for Dictionary Learning and Sparse Coding Problems

Jinglai Shen, University of Maryland, Baltimore County, USA; Xiao Wang, Purdue University, USA

continued in next column

Thursday, May 25

MS117

Relationship Between Optimization and Quantum Computation - Part I of II

9:30 AM-11:30 AM

Room:Azure - Third Floor South Tower

For Part 2 see MS132

Quantum computation is an emerging technology seeking computational power stemming from natural phenomenon as described by quantum mechanics. While the building blocks of classical computers are bits that take one of the two definite values of 0 or 1, a quantum computer uses qubits that behave like both 0 and 1 simultaneously using the superposition principle. As a result, n qubits can have properties of up to 2^n possible different classical states. Quantum algorithms can employ principles such as superposition, entanglement, and tunnelling to solve hard problems significantly faster than classical computers. The most celebrated quantum algorithm is, perhaps, Shor's algorithm for factoring an integer in polynomial time. The two main paradigms in quantum computation are gate modelling and adiabatic quantum computation which are known to be equivalent. Building the hardware architecture of quantum computers is progressing rapidly and currently there exists a commercial quantum annealer with over a thousand qubits. In this minisymposium, researchers from various fields address how quantum computation tackles hard optimization problems, as well as how optimization techniques are utilized to represent and solve problems arising in quantum computation and information theory.

Organizer: Sahar Karimi
1QBit, Canada

Organizer: Jamie Sikora
National University of Singapore, Singapore

9:30-9:55 Optimization: Quantum vs Classical

Helmut G. Katzgraber, Texas A&M University, USA

10:00-10:25 Solving a Quadratic Problem on a Bounded Integer Domain Using a Quantum Annealer

Sahar Karimi, 1QBit, Canada

10:30-10:55 Building a Performance Model for Quantum Annealing

Catherine McGeoch, D-Wave Systems, Inc., Canada

11:00-11:25 Leveraging Quantum Computing for Optimizing Data Analysis

Immanuel Trummer, Cornell University, USA

continued in next column

Thursday, May 25

MS118

Proximal Techniques for High-Dimensional Statistics - Part I of II

9:30 AM-11:30 AM

Room:Gulf Islands B - Lower Lobby North Tower

For Part 2 see MS133

In recent years, proximal techniques have become a cornerstone in modeling and solving scientific problems across many disciplines. One of the arguably most prolific application areas is high-dimensional statistics where many inference tasks are now routinely formulated as composite, non-smooth, convex optimization problems. The composite functions often comprise non-smooth regularization functions that capture structural assumptions about the statistical problem and for which proximity operators are readily available. The resulting optimization problems are then amenable to modern proximal splitting algorithms. In the proposed minisymposium we intend to further strengthen the close connection between proximal techniques and high-dimensional statistics by bringing together a diverse group of researchers from the fields of optimization and statistics who (i) develop proximal tools for novel statistical applications, (ii) improve the efficiency of existing proximal algorithms for statistical inference, or (iii) create new proximal schemes for large-scale estimation problems. The key objective of the minisymposium is to cross-fertilize both fields of optimization and statistics by exploring current strengths and limitations of proximal techniques in high-dimensional statistics and by establishing novel collaborations among the participating researchers at the fruitful interface between convex analysis, statistical inference, and non-smooth optimization.

continued on next page

Organizer: Patrick L. Combettes
North Carolina State University, USA

Organizer: Christian L. Mueller
Simons Foundation, USA

9:30-9:55 Hierarchical Convex Optimization and Proximal Splitting for High-Dimensional Statistics
Isao Yamada, Tokyo Institute of Technology, Japan

10:00-10:25 Estimating Large Covariance Matrices Using Proximity Operators
Jacob Bien, Cornell University, USA

10:30-10:55 A New Perspective on Stochastic 0th and 1st Order Proximal Methods
Vianney Perchet, ENS Paris Saclay, France

11:00-11:25 Proximal Methods for Penalized Concomitant M-Estimators
Christian L. Mueller, Simons Foundation, USA; Patrick L. Combettes, North Carolina State University, USA

Thursday, May 25

MS119

Modern Frank-Wolfe Optimization and Applications - Part I of II

9:30 AM-11:30 AM

Room:Gulf Islands C - Lower Lobby North Tower

For Part 2 see MS134

This minisymposium covers recent advances in Frank-Wolfe optimization (a.k.a. Conditional Gradient methods), a first-order method having gained a lot of traction in the last years both in theory and applications, thanks to its ability to cheaply exploit the structured constraint sets appearing in machine learning and signal processing. The theme brings together several research directions under this umbrella, including recent improvements of the theoretical understanding of these methods, such as linear convergence rates with new complexity constants, but also generalized algorithms covering larger problem classes and the most recent new applications for such techniques.

Organizer: Simon Lacoste-Julien
University of Montreal, Canada

Organizer: Martin Jaggi
EPFL, Switzerland

9:30-9:55 Recent Advances in Frank-Wolfe Optimization
Simon Lacoste-Julien, University of Montreal, Canada

10:00-10:25 Polytope Conditioning and Linear Convergence of the Frank-Wolfe Algorithm
Javier Pena and Daniel Rodriguez, Carnegie Mellon University, USA

10:30-10:55 Decomposition-Invariant Linearly Convergent Conditional Gradient Algorithm for Structured Polytopes
Dan Garber, Toyota Technological Institute at Chicago, USA; *Ofer Meshi*, Google, Inc., USA

11:00-11:25 Sketchy Decisions: Convex Optimization with Optimal Storage
Volkan Cevher, Alp Yurtsever, and Quoc Tran Dinh, École Polytechnique Fédérale de Lausanne, Switzerland; Madeleine R. Udell, Cornell University, USA; Joel Tropp, California Institute of Technology, USA

Thursday, May 25

Lunch Break

11:30 AM-1:00 PM

Attendees on their own

IP7

Recent Progress on Dual Decomposition for Stochastic Integer Programming

1:00 PM-1:45 PM

Room:Grand Ballroom AB - North Tower

Chair: Stefan Wild, Argonne National Laboratory, USA

We will discuss two methods for efficiently computing the value of the Lagrangian Dual of a Stochastic Integer Program (SIP). First, we discuss a primal-dual algorithm, the well-known progressive hedging method, but unlike previous progressive hedging approaches for SIP, our algorithm can be shown to converge to the optimal Lagrangian dual value. The key improvement in the new algorithm is an inner loop of optimized linearization steps, similar to those taken in the classical Frank-Wolfe method. Second, we will discuss recent our work in improving the performance of classical stochastic (sub)gradient methods for SIP. Enhancements include both sub-sampling and asynchronous versions that run effectively on large-scale, distributed, heterogeneous computing platforms. Joint work with Natashia Boland, Jeffrey Christiansen, Andrew Eberhard, Fabricio Oliveira, Brian C. Dandurand, Cong Han Lim, James Luedtke and Stephen J. Wright.

Jeffrey Linderoth
University of Wisconsin, Madison, USA

Coffee Break

1:45 PM-2:15 PM

Room:Grand Ballroom CD - North Tower

Thursday, May 25

MS120

Conic Optimization and Quantum Information Theory - Part II of II

2:15 PM-4:15 PM

Room:Pavilion Ballroom A - Third Floor North Tower

For Part 1 see MS105

The driving force behind the emerging field of quantum computing is the realization that quantum effects can be utilized to design protocols for various information processing tasks, that may significantly outperform their classical counterparts. This minisymposium focuses on optimization techniques that have proven useful in the field of quantum information theory. Its scope is two-fold. First, we study linear conic formulations for the correlations that can be realized by performing local measurements on a bipartite quantum system, and for quantum analogues of various classical graph parameters. Second, we investigate optimization techniques that can be used to quantify the advantage of quantum protocols over their classical counterparts, including polynomial and semidefinite optimization and matrix factorizations.

Organizer: Antonios Varvitsiotis

Nanyang Technical University, Singapore

Organizer: Monique Laurent

Tilburg University, The Netherlands

2:15-2:40 Convex Separation from Convex Optimization for Large-Scale Problems

Miguel Navascues, Austrian Academy of Sciences, Austria

2:45-3:10 Quantum Channels, Spectrahedra and a Tracial Hahn-Banach Theorem

Igor Klep, University of Auckland, New Zealand

3:15-3:40 Using Noncommutative Polynomial Optimization for Matrix Factorization Ranks

Sander Gribling, *David de Laat*, and Monique Laurent, Centrum voor Wiskunde en Informatica, The Netherlands

3:45-4:10 Quantum Bilinear Optimization

Mario Berta, California Institute of Technology, USA

Thursday, May 25

MS121

Nonlinear Optimization: Methods and Applications - Part II of II

2:15 PM-4:15 PM

Room:Pavilion Ballroom B - Third Floor North Tower

For Part 1 see MS106

This minisymposium consists of two sessions (8 talks) on numerical methods for nonlinear optimizaiton, matrix optimization, tensor optimization and their applications. In particular, some recent advances on parallel algorithms, special convex optimization problems, orthogonal constraint problems, total least squares, monotonic regression, trust region algorithms, subspace methods, and gradient type methods will be presented in the two sessions. Some applications of optimization techniques, such as parameter estimation, variable selection and image processing, will also be addressed in this minisymposium.

Organizer: Yaxiang Yuan

Chinese Academy of Sciences, China

Organizer: Xin Liu

Chinese Academy of Sciences, China

2:15-2:40 A Dual Active-Set Algorithm for Regularized Monotonic Regression

Oleg Burdakov and Oleg Sysoev, Linköping University, Sweden

2:45-3:10 Parameter Estimation and Variable Selection for Big Systems of High-Dimensional Linear Ordinary Differential Equations

Leqin Wu, Jinan University, China; Ya-Xiang Yuan, Chinese Academy of Sciences, China; Xing Qiu, University of Rochester, USA; Hulin Wu, University of Texas, Houston, USA

3:15-3:40 A TV-SCAD Approach for Image Deblurring with Impulsive Noise

Junfeng Yang, Nanjing University, China

3:45-4:10 Completely Positive Binary Tensors

Jinyan Fan, Shanghai Jiaotong University, China; Jiawang Nie, University of California, San Diego, USA; *Anwa Zhou*, Shanghai University, China

Thursday, May 25

MS122

Recent Trends in PDE-Constrained Optimization

2:15 PM-4:15 PM

Room:Pavilion Ballroom C - Third Floor North Tower

Recent challenges in the field of PDE constrained optimization include, on the analytical side, the handling of variational inequality type constraints or the study of minimizing appropriately chosen risk measures subject to PDE systems with stochastic components. Either case typically requires to cope with the underlying non-smoothness induced by the constraints and/or the objectives. Connected to these analytical challenges, on the numerical side, the efficient solution of problems involving parabolic or hyperbolic, i.e., time dependent PDEs or the design of efficient solvers for MPECs in function space have come into focus. Here, one of the major issues is to devise a method which is robust under mesh refinements. This minisymposium brings together experts in the field and aims to cover both the aforementioned analytical as well as the numerical challenges. Particular emphasis will be given to model reduction and preconditioning techniques for the efficient numerical solution to time dependent problems, the derivation of stationarity conditions and associated numerical solvers for problems involving degenerate equilibrium constraints, as well as the analysis and efficient solution of optimal control problems involving uncertain exogenous parameters.

Organizer: Michael Hintermueller

Humboldt University Berlin, Germany

Organizer: Stefan Ulbrich

Technische Universität Darmstadt, Germany

Organizer: Michael Ulbrich

Technische Universität München, Germany

continued on next page

2:15-2:40 Optimal Control of Quasilinear Parabolic Equations with State Constraints
Hannes Meinlschmidt, TU Darmstadt, Germany

2:45-3:10 PDE-Constrained Optimization Using Epi-Regularized Risk Measures
Drew P. Kouri, Sandia National Laboratories, USA

3:15-3:40 Risk-Averse PDE-Constrained Optimization and Nash Equilibrium Problems
Thomas M. Surowiec, Philipps-Universität Marburg, Germany

3:45-4:10 Adaptive Finite Element Solvers for MPECs in Function Space
Michael Hintermueller, Humboldt University Berlin, Germany

Thursday, May 25

MS123

New Perspectives on Convergence Acceleration

2:15 PM-4:15 PM

Room:Pavilion Ballroom D - Third Floor North Tower

Ever since the original result by Nesterov (1983) providing an optimal algorithm for smooth minimization, acceleration techniques have been both very successful and somewhat mysterious. IN particular, the original convergence proof relies on a sequence of algebraic tricks which have no unifying intuitive source. Very recently however, several results have shed new light on acceleration. Some of these results are directly related to Nesterov's work, some are fundamentally different. This minisymposium will cover a sample of these advances.

Organizer: Alexandre d'Aspremont

CNRS - Ecole Normale Superieure, France

2:15-2:40 Regularized Nonlinear Acceleration
Alexandre d'Aspremont, CNRS - Ecole Normale Superieure, France

2:45-3:10 A Universal Catalyst for First-Order Optimization
Zaid Harcahoui, University of Washington, USA

3:15-3:40 A Variational Perspective on Accelerated Methods in Optimization
Ashia Wilson, University of California, Berkeley, USA

3:45-4:10 A Novel, Simple Interpretation of Nesterov's Accelerated Method as a Combination of Gradient and Mirror Descent
Lorenzo Orecchia, Boston University, USA

Thursday, May 25

MS124

Optimization Methods for Spatiotemporal Modulation of Radiotherapy Treatment Plans

2:15 PM-4:15 PM

Room:Junior Ballroom A -Third Floor North Tower

Radiotherapy treatments are typically performed over multiple sessions spanning between one to several weeks to allow the normal tissue to recover from sublethal radiation damage between treatment sessions. Radiotherapy plans are traditionally designed and delivered with no variation in the dose distribution throughout the treatment course. However, the advent of modern radiotherapy modalities and advanced medical imaging techniques have made it possible to design and deliver more refined radiotherapy plans that vary over the treatment course to account for anatomical changes and biological principles underlying the radiation response. The integration of these new aspects into radiotherapy planning involves accommodating biological dose-response and probabilistic organ-motion models that cannot be captured in the traditional convex optimization planning approaches, thereby hindering an accurate assessment of the potential therapeutic gain achievable through plan variation. Addressing this gap requires formulating and solving large- scale non-convex and stochastic optimization problems that arise in advanced radiotherapy planning in a clinically reasonable time to a desired optimality gap. The scope of this minisymposium is to present novel applications of global and stochastic optimization techniques to optimal spatiotemporal modulation of radiotherapy plans in order to account for biological and anatomical motion information.

Organizer: Ehsan Salari

Wichita State University, USA

continued on next page

Thursday, May 25

MS124

Optimization Methods for Spatiotemporal Modulation of Radiotherapy Treatment Plans

2:15 PM-4:15 PM

continued

2:15-2:40 Biologically-Informed Radiotherapy Planning using a Global Optimization Approach

Ehsan Salari and Ali Adibi, Wichita State University, USA

2:45-3:10 Multi-Modality Optimal Radiation Therapy

Minsun Kim, Archis Ghate, and Sevnaz Nourollahi, University of Washington, USA

3:15-3:40 Optimization of Spatiotemporal Fractionation in Photon Radiotherapy with Optimality Bounds

Melissa Gaddy and David Papp, North Carolina State University, USA; Jan Unkelbach, Massachusetts General Hospital and Harvard Medical School, USA

3:45-4:10 Adaptive SBRT Planning for Interfraction Motion

Victor Wu, Marina A. Epelman, and Randall Ten Haken, University of Michigan, USA; Kristy Brock, MD Anderson Cancer Center, USA; Martha Matuszak, University of Michigan, USA

Thursday, May 25

MS125

Parallel Algorithms for Stochastic Programming

2:15 PM-4:15 PM

Room:Junior Ballroom B -Third Floor North Tower

This one-session minisymposium will cover a variety of techniques for utilizing parallel computation to solve large-scale stochastic programming problems. The key application behind this kind of research is planning for electric power systems. A broad range of approaches will be covered, including two very different non-decomposition approaches, one using a barrier method and the other an approximate augmented Lagrangian scheme, as well as two decomposition approaches. One decomposition approach uses a relatively new underlying splitting method, and the other significantly sharpens and extends an existing approach, progressive hedging.

Organizer: Jonathan Eckstein

Rutgers University, USA

2:15-2:40 Asynchronous Parallel Operator Splitting Methods for Convex Stochastic Programming

Jonathan Eckstein, Rutgers University, USA; Jean-Paul Watson, Sandia National Laboratories, USA

2:45-3:10 Object-Parallel Augmented Lagrangian Solution of Continuous Stochastic Programs

Gyorgy Matyasfalvi and Jonathan Eckstein, Rutgers University, USA

3:15-3:40 Highly Parallelized, Exact Progressive Hedging for Stochastic MIPs

David Woodruff, University of California, Davis, USA

3:45-4:10 Scenario-Based Decomposition for Parallel Solution of the Contingency-Constrained ACOPF

Jean-Paul Watson, Carl Laird, and Anya Castillo, Sandia National Laboratories, USA

Thursday, May 25

MS126

Algebraic and Variational Approaches to Problems on Graphs

2:15 PM-4:15 PM

Room:Junior Ballroom C -Third Floor North Tower

Due to their flexible modeling capabilities, graphs provide a useful abstraction for describing many combinatorial problems arising in various applications. Examples of problems that have received much attention in recent years include community detection and finding structured subgraphs inside larger graphs. This minisymposium presents recent developments on efficient algorithms for such problems on large graphs, with a particular emphasis on algebraic and variational approaches.

Organizer: Utkan Onur Candogan

California Institute of Technology, USA

Organizer: Venkat Chandrasekaran

California Institute of Technology, USA

2:15-2:40 Finding Planted Graphs with Few Eigenvalues using the Schur-Horn Relaxation

Utkan Onur Candogan and Venkat Chandrasekaran, California Institute of Technology, USA

2:45-3:10 Graph Structure in Polynomial Systems: Chordal Networks

Diego Cifuentes and Pablo A. Parrilo, Massachusetts Institute of Technology, USA

3:15-3:40 Local Graph Profiles: Algorithms and Large-Scale Applications

Ethan R. Elenberg and Alex Dimakis, University of Texas at Austin, USA

3:45-4:10 What You Ask Is What You Get: Query Design and Robust Algorithms for Crowdsourced Clustering

Ramya Korlakai Vinayak, California Institute of Technology, USA

Thursday, May 25

MS127

Non-Convex Optimization for Low Complexity Models: Theory and Applications - Part II of II

2:15 PM-4:15 PM

Room:Junior Ballroom D -Third Floor North Tower

For Part 1 see MS112

Low complexity models arise from a wide range of applications in signal processing and data analysis. Typical examples include sparse signal recovery, low rank matrix/tensor reconstruction and dictionary learning. There is a growing interest of studying non-convex optimization methods for those low complexity signal and data reconstruction problems. Compared with the conventional convex approaches, non-convex approaches are usually more efficient, particularly for high dimensional problems. Recently, there has been a large body of work on guarantee analysis of non-convex optimization for low complexity models, based on local convergence analysis, saddle point analysis or other particular problem structures. We are going to gather together the leading experts on this topic and discuss recent breakthroughs, potential applications and future directions.

Organizer: Jian-Feng Cai

Hong Kong University of Science and Technology, Hong Kong

Organizer: Ke Wei

University of California, Davis, USA

2:15-2:40 The Projected Power Method: An Efficient Nonconvex Approach for Joint Alignment from Pairwise Differences

Yuxin Chen, Princeton University, USA; Emmanuel Candes, Stanford University, USA

2:45-3:10 Fast and Provable Algorithms for Low-Rank Hankel Matrix Completion

Jian-Feng Cai, Hong Kong University of Science and Technology, Hong Kong; Tianming Wang, University of Iowa, USA; Ke Wei, University of California, Davis, USA

3:15-3:40 Semidefinite Programs with a Dash of Smoothness: Why and When the Low-Rank Approach Works

Nicolas Boumal, Princeton University, USA

3:45-4:10 Gradient Descent for Rectangular Matrix Completion

Qinqing Zheng and John Lafferty, University of Chicago, USA

continued in next column

Thursday, May 25

MS128

Complexity and Optimal Algorithms for Large Scale Optimization Problems

2:15 PM-4:15 PM

Room:Parksville - Third Floor North Tower

Modern techniques for data gathering--arising from medicine and bioinformatics, physics and astronomy, mobile data gathering platforms--have yielded an explosion in the mass and diversity of data. Concurrently, optimization, statistics, and machine learning have successfully layed a groundwork for answering questions about our world based on analysis of this data. Yet as we collect more information, classical approaches for optimization and analyzing complexity--such as minimax or resisting oracle analyses--are insufficient. This prompts a number of basic questions. As we collect more information, classical approaches for optimization and learning are insufficient, as we have a number of additional concerns--computational resources, storage limitations, network communication constraints--outside of optimization accuracy. Moreover, the structure of modern optimization problems, often stochastic, begs for finer-grained analyses and more careful understanding of problem complexity. As we solve larger-scale problems from data that may be noisy, fat-tailed, or otherwise break assumptions that classical analyses, it is important to leverage problem structure and develop methods that automatically adapt to problem geometry and structure, even in stochastic regimes.

Organizer: John C. Duchi

Stanford University, USA

2:15-2:40 Local Complexities and Adaptive Algorithms in Stochastic Convex Optimization

John C. Duchi, Stanford University, USA; Sabyasachi Chatterjee and John Lafferty, University of Chicago, USA; Yuancheng Zhu, University of Pennsylvania, USA

continued on next page

Thursday, May 25

MS128

Complexity and Optimal Algorithms for Large Scale Optimization Problems

2:15 PM-4:15 PM

continued

2:45-3:10 Oracle Complexity of Second-Order Methods
Ohad Shamir, Yossi Arjevani, and Ron Shiff, Weizmann Institute of Science, Israel

3:15-3:40 Efficient Second Order Online Learning by Sketching
Alekh Agarwal and *Haipeng Luo*, Microsoft Research, USA

3:45-4:10 Tight Complexity Bounds for Optimizing Composite Objectives
Blake Woodworth and Nati Srebro, Toyota Technological Institute at Chicago, USA

Thursday, May 25

MS129

Mixed-Integer PDE-Constrained Optimization - Part II of II

2:15 PM-3:45 PM

Room:Orca - Third Floor B Tower

For Part 1 see MS114

Many complex design applications involve both discrete or integer design variables as well as complex physical models described by partial differential equations (PDEs). We provide an introduction to this challenging class of optimization problems, and then present a range of applications and solution approaches that cleverly combine discrete optimization approaches with scalable solvers for the PDEs.

Organizer: Sven Leyffer
Argonne National Laboratory, USA

Organizer: Geoffrey M. Oxberry
Lawrence Livermore National Laboratory, USA

2:15-2:40 Switching Controls for Reaction-Diffusion Equation
Christian Kirches and Paul Manns, Technische Universität Braunschweig, Germany

2:45-3:10 New Decomposition Strategies for Mixed-Integer Optimal Control
Clemens Zelle and Sebastian Sager, Universität Magdeburg, Germany

3:15-3:40 On the (Non)Convexity of Different Mixed-Integer Optimal Control Formulations
Sebastian Sager, Universität Magdeburg, Germany

Thursday, May 25

MS130

Numerical Variational Analysis - Part II of II

2:15 PM-4:15 PM

Room:Finback - Third Floor B Tower

For Part 1 see MS115

This minisymposium focuses on research that uses computational techniques to build variational analysis objects. This could be as part of a larger optimization algorithm, or as a standalone goal. Applications in algorithm design, visualization, and error analysis will all be discussed.

Organizer: Warren Hare
University of British Columbia, Canada

Organizer: Yves Lucet
University of British Columbia, Canada

2:15-2:40 The Nesterov Smoothing Technique and Minimizing Differences of Convex Functions with Applications to Facility Location and Clustering
Mau Nam Nguyen, Portland State University, USA; Wondi Geremew, Stockton University, USA; Sam Reynolds and Tuyen Tran, Portland State University, USA

2:45-3:10 Decomposable Nonsmooth Optimization: Methods and Applications
Adil Baghirov, Federation University Australia, Australia

3:15-3:40 Epsilon Subdifferential Computation in Computational Convex Analysis
Yves Lucet and Warren Hare, University of British Columbia, Canada; Anuj Bajaj, Wayne State University, USA

3:45-4:10 A Chain Rule for Convexly Generated Spectral Max Functions
Julia Eaton and James V. Burke, University of Washington, USA

Thursday, May 25

MS131

Geometric Structures in Optimization

2:15 PM-4:15 PM

Room:Beluga - Third Floor B Tower

Algorithms for constrained optimization frequently use the geometric structure of the constraint set in an essential way. Most famously, the simplex algorithm pivots through the vertices of a polyhedral set. This session considers aspects of polyhedra and generalizations that connect to the efficiency of optimization, including Hirsch-like bounds relating the number of pivots required to traverse a polyhedron to its input complexity.

Organizer: Steffen Borgwardt

University of Colorado, Denver, USA

Organizer: Tamon Stephen

Simon Fraser University, Canada

2:15-2:40 Network-Flow Polytopes Satisfy the Hirsch Conjecture

Steffen Borgwardt, University of Colorado, Denver, USA

2:45-3:10 Superlinear Diameters for Combinatorial Abstractions of Polyhedra

Edward Kim, University of Wisconsin, La Crosse, USA

3:15-3:40 A New Model for Realization Spaces of Polytopes

Rekha Thomas, University of Washington, USA; Joao Gouveia and Antonio Macchio, Universidade de Coimbra, Portugal; Amy Wiebe, University of Washington, USA

3:45-4:10 On the Circuit Diameter Conjecture

Steffen Borgwardt, University of Colorado, Denver, USA; *Tamon Stephen* and Timothy Yusun, Simon Fraser University, Canada

Thursday, May 25

MS132

Relationship Between Optimization and Quantum Computation - Part II of II

2:15 PM-4:15 PM

Room:Azure - Third Floor South Tower

For Part 1 see MS117

Quantum computation is an emerging technology seeking computational power stemming from natural phenomenon as described by quantum mechanics. While the building blocks of classical computers are bits that take one of the two definite values of 0 or 1, a quantum computer uses qubits that behave like both 0 and 1 simultaneously using the superposition principle. As a result, n qubits can have properties of up to 2^n possible different classical states. Quantum algorithms can employ principles such as superposition, entanglement, and tunnelling to solve hard problems significantly faster than classical computers. The most celebrated quantum algorithm is, perhaps, Shor's algorithm for factoring an integer in polynomial time. The two main paradigms in quantum computation are gate modelling and adiabatic quantum computation which are known to be equivalent. Building the hardware architecture of quantum computers is progressing rapidly and currently there exists a commercial quantum annealer with over a thousand qubits. In this minisymposium, researchers from various fields address how quantum computation tackles hard optimization problems, as well as how optimization techniques are utilized to represent and solve problems arising in quantum computation and information theory.

Organizer: Sahar Karimi

1QBit, Canada

Organizer: Jamie Sikora

National University of Singapore, Singapore

continued in next column

2:15-2:40 Analyzing Quantum Cryptographic Protocols using Semidefinite Programming

Jamie Sikora, National University of Singapore, Singapore

2:45-3:10 Quantum Speed-Ups for Semidefinite Programming

Krysta Svore, Microsoft Research, USA

3:15-3:40 Classical Approximation Algorithms for Quantum Constraint Satisfaction Problems

Sevag Gharibian, Virginia Commonwealth University, USA

3:45-4:10 Parameter Tuning for Optimization in Quantum Annealing Processors

Andrew King, D-Wave Systems, Inc., Canada

Thursday, May 25

MS133

Proximal Techniques for High-Dimensional Statistics - Part II of II

2:15 PM-4:15 PM

Room:Gulf Islands B - Lower Lobby North Tower

For Part 1 see MS118

In recent years, proximal techniques have become a cornerstone in modeling and solving scientific problems across many disciplines. One of the arguably most prolific application areas is high-dimensional statistics where many inference tasks are now routinely formulated as composite, non-smooth, convex optimization problems. The composite functions often comprise non-smooth regularization functions that capture structural assumptions about the statistical problem and for which proximity operators are readily available. The resulting optimization problems are then amenable to modern proximal splitting algorithms. In the proposed minisymposium we intend to further strengthen the close connection between proximal techniques and high-dimensional statistics by bringing together a diverse group of researchers from the fields of optimization and statistics who (i) develop proximal tools for novel statistical applications, (ii) improve the efficiency of existing proximal algorithms for statistical inference, or (iii) create new proximal schemes for large-scale estimation problems. The key objective of the minisymposium is to cross-fertilize both fields of optimization and statistics by exploring current strengths and limitations of proximal techniques in high-dimensional statistics and by establishing novel collaborations among the participating researchers at the fruitful interface between convex analysis, statistical inference, and non-smooth optimization.

continued in next column

Organizer: Patrick L. Combettes

North Carolina State University, USA

Organizer: Christian L. Mueller

Simons Foundation, USA

2:15-2:40 Efficient Bayesian Computation by Proximal Markov Chain Monte Carlo: When Langevin meets Moreau

Marcelo Pereyra, University of Bristol, United Kingdom

2:45-3:10 Perspective-Based Proximal Data Processing

Patrick L. Combettes, North Carolina State University, USA

3:15-3:40 Estimating High Dimensional Generalized Additive Models via Proximal Methods

Noah Simon, University of Washington, USA

3:45-4:10 Alternating Projections, ADMM, and Parallel Coordinate Descent

Ryan Tibshirani, Carnegie Mellon University, USA

Thursday, May 25

MS134

Modern Frank-Wolfe Optimization and Applications - Part II of II

2:15 PM-4:15 PM

Room:Gulf Islands C - Lower Lobby North Tower

For Part 1 see MS119

This minisymposium covers recent advances in Frank-Wolfe optimization (a.k.a. Conditional Gradient methods), a first-order method having gained a lot of traction in the last years both in theory and applications, thanks to its ability to cheaply exploit the structured constraint sets appearing in machine learning and signal processing. The theme brings together several research directions under this umbrella, including recent improvements of the theoretical understanding of these methods, such as linear convergence rates with new complexity constants, but also generalized algorithms covering larger problem classes and the most recent new applications for such techniques.

Organizer: Simon Lacoste-Julien

University of Montreal, Canada

Organizer: Martin Jaggi

EPFL, Switzerland

2:15-2:40 Three Variations on a Frank-Wolfe Theme

Patrice Marcotte, Universite de Montreal, Canada

2:45-3:10 Forward-Backward Methods for Atomic Norm Constrained Optimization

Nikhil Rao, Technicolor, USA

3:15-3:40 Conditional Gradient Sliding for Convex Optimization

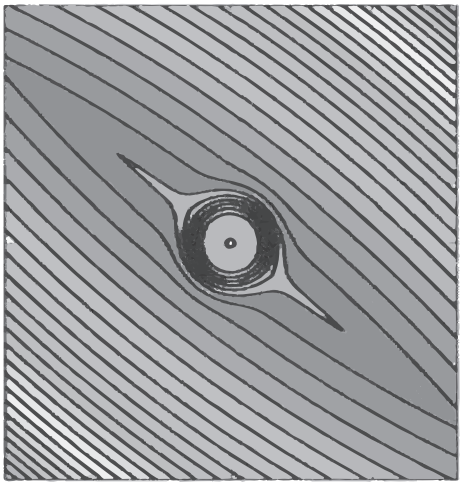
Guanghui Lan, Georgia Institute of Technology, USA; *Yi Zhou*, University of Florida, USA

3:45-4:10 A Unified Optimization View on Generalized Matching Pursuit and Frank-Wolfe

Francesco Locatello, ETH Zürich, Switzerland; Rajiv Khanna, University of Texas at Austin, USA; Michael Tschannen, ETH Zürich, Switzerland; *Martin Jaggi*, EPFL, Switzerland

OP17 Abstracts

SIAM Conference on



OPTIMIZATION

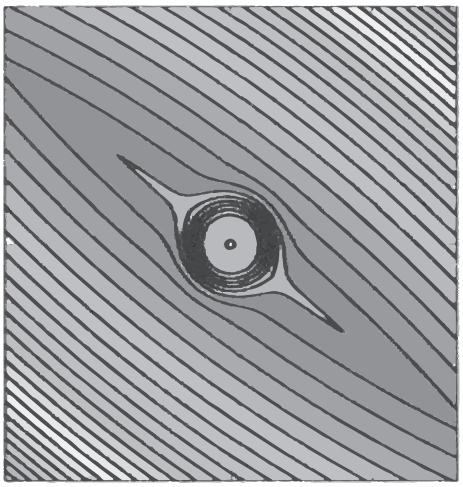
Based on Audet and Dennis' plot of Kolda, Lewis and Torczon's modification of the Dennis-Wood canoe function.

May 22-25, 2017
Sheraton Vancouver Wall Centre
Vancouver, British Columbia, Canada

Abstracts are printed as submitted by the authors.

Organizer and Speaker Index

SIAM Conference on



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Italicized names indicate session organizers

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OP17 Budget

Conference Budget
SIAM Conference on Optimization
May 22-25, 2017
Vancouver, British Columbia, Canada

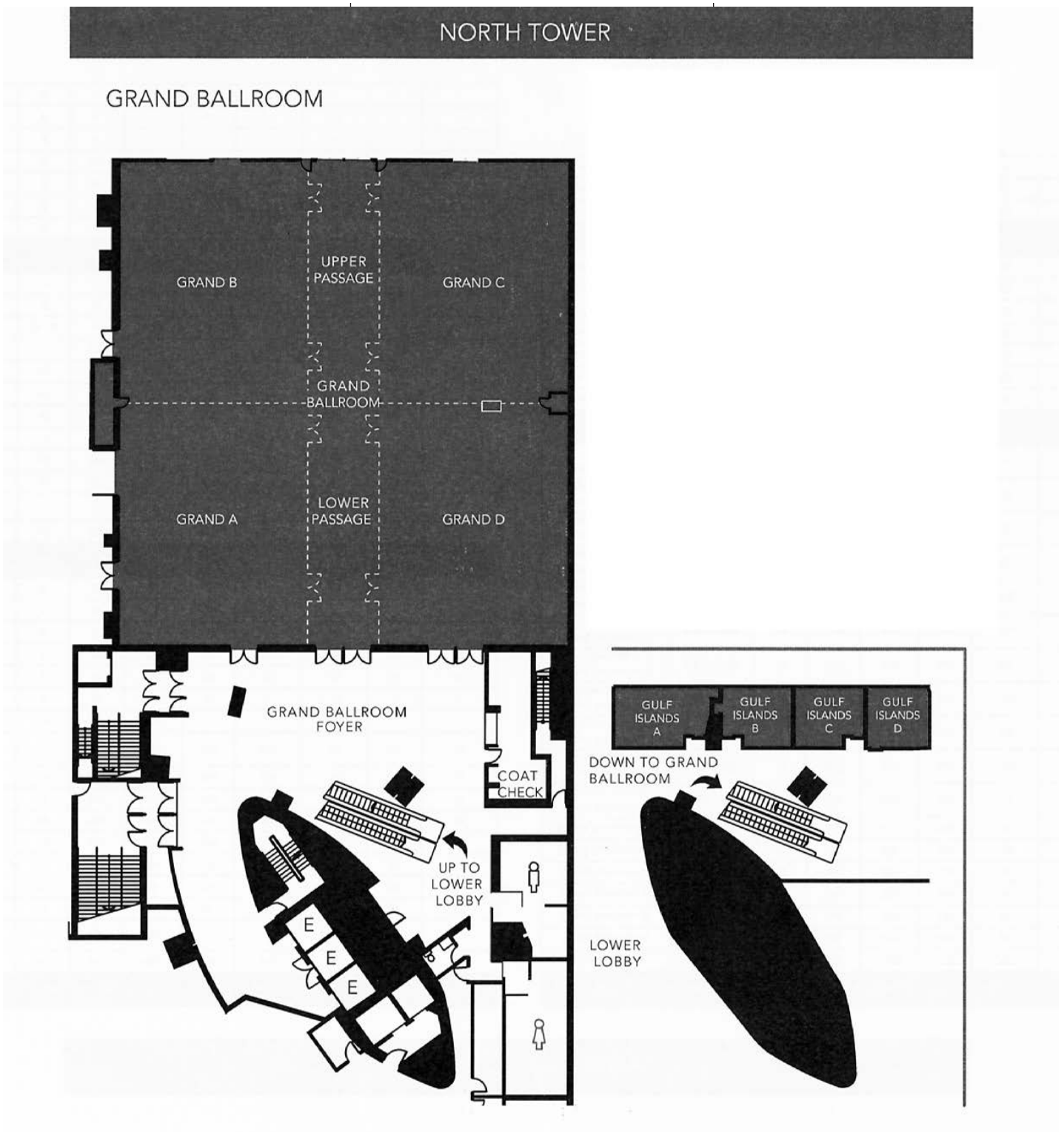
Expected Paid Attendance 600

Revenue		
Registration Income		$196,290.00
	Total	$196,290.00
Expenses		
Printing		$4,100.00
Organizing Committee		$4,500.00
Invited Speakers		$12,800.00
Food and Beverage		$41,500.00
AV Equipment and Telecommunication		$23,900.00
Advertising		$7,500.00
Conference Labor (including benefits)		$41,849.00
Other (supplies, staff travel, freight, misc.)		$13,175.00
Administrative		$14,867.00
Accounting/Distribution & Shipping		$8,126.00
Information Systems		$14,941.00
Customer Service		$5,598.00
Marketing		$8,641.00
Office Space (Building)		$5,711.00
Other SIAM Services		$5,952.00
	Total	$213,160.00
Net Conference Expense		-$16,870.00
Support Provided by SIAM		$16,870.00
		$0.00

Estimated Support for Travel Awards not included above:

Students and Early Career	26	$19,500.00

Sheraton Vancouver Wall Center Floor Plan



Sheraton Vancouver Wall Center Floor Plan