Monday
May 7

MS06 Part III
Discovery from Data
10:35 AM - 12:35 PM
AAB201

The number of large-scale high-dimensional datasets recording different aspects of interrelated phenomena is growing, accompanied by a need for mathematical frameworks for discovery from data arranged in structures more complex than that of a single matrix. In the three sessions of this minisymposium we will present recent studies demonstrating "Discovery from Data," in "I: Systems Biology," and "II: Personalized Medicine," by developing and using the mathematics of "III: Tensors."

Organizers:
Sri Priya Ponnapalli, Scientific Computing and Imaging Institute, University of Utah,
priya@sci.utah.edu
Katherine A. Aiello, Scientific Computing and Imaging Institute, University of Utah,
kaiello@sci.utah.edu
Orly Alter, Scientific Computing and Imaging Institute, University of Utah, orly@sci.utah.edu

UPDATED INFORMATION
10:35-11:05 Tensor Higher-Order GSVD: A Comparative Spectral Decomposition of Multiple Column-Matched But Row-Independent Large-Scale High-Dimensional Datasets
Sri Priya Ponnapalli, University of Utah

11:05-11:35 The GSVD: Where are the ellipses?
Alan Edelman, Massachusetts Institute of Technology

11:35-12:05 Tensor Convolutional Neural Networks (TCNN): Improved Featurization Using High-Dimensional Frameworks
Elizabeth Newman, Tufts University

12:05-12:35 Three-Way Generalized Canonical Correlation Analysis
Arthur Tenenhaus, CentraleSupélec

Monday
May 7

MS09 Part I
Exploiting Low-Complexity Structures in Data Analysis: Theory and Algorithms
10:35 AM - 12:35 PM
WLB104

Low-complexity structures are central to modern data analysis — they are exploited to tame data dimensionality, to rescue ill-posed problems, and to ease and speed up hard numerical computation. In this line, the past decade features remarkable advances in theory and practice of estimating sparse vectors or low-rank matrices from few linear measurements. Looking ahead, there are numerous fundamental problems in data analysis coming with more complex data formation processes. For example, the dictionary learning and the blind deconvolution problems have intrinsic bilinear structures, whereas the phase retrieval problem and variants pertain to quadratic measurements. Moreover, many of these applications can be naturally formulated as nonconvex optimization problems, which are ruled to be hard by the worst-case theory. In practice, however, simple numerical methods are surprisingly effective in solving them. Partial explanation of this curious gap has started to appear very recently.
This minisymposium highlights the intersection between numerical linear algebra/numerical optimization and the mathematics of modern signal processing and data analysis. Novel results on both theoretical and algorithmic sides of exploiting low-complexity structures will be discussed, with an emphasis on addressing the new challenges.

Organizers:
Ju Sun, Department of Mathematics, Stanford University,
sunju@stanford.edu
Ke Wei, School of Data Science, Fudan University,
weike1986@gmail.com

TALK CANCELED
~~**10:35-11:05 When are**~~

~~**nonconvex optimization problems not scary?**~~
~~*Ju* Sun, Stanford University~~

NEW TALK
10:35-11:05 Geometry and Algorithm for Sparse Blind Deconvolution
Yuqian Zhang, Columbia University

11:05-11:35 The Scaling Limit of Online Lasso, Sparse PCA and Related Algorithms
Yue M. Lu, Harvard University

11:35-12:05 Accelerated Alternating Projection for Robust Principle Component Analysis
Jian-Feng Cai, Hong Kong University of Science and Technology

12:05-12:35 Numerical Integrators for Rank-Constrained Differential Equations
Bart Vandereycken, University of Geneva

Monday May 7

MS25 Part I
Polynomial and Rational Matrices
10:35 AM - 12:35 PM
WLB205

Polynomial and rational matrices have attracted much attention in the last years. Their appearance in numerous modern applications requires revising and improving known as well as developing new theories and algorithms concerning the associated eigenvalue problems, error and perturbation analyses, efficient numerical implementations, etc. This Mini-Symposium aims to give an overview of the recent research on these topics, focusing on numerical stability of quadratic eigenvalue problem; canonical forms, that reveal transparently the complete eigenstructures; sensitivity of complete eigenstructures to perturbations; low-rank matrix pencils and matrix polinomials; block-tridiagonal linearizations.

Organizers:
Javier Pérez, Department of Mathematical Sciences, University of Montana, javier.perez-alvaro@mso.umt.edu
Andrii Dmytryshyn, Department of Computing Science, Umeå University, andrii@cs.umu.se

UPDATED INFORMATION
10:35-11:05 Stratifying Complete Eigenstructures: From Matrix Pencils to Polynomials and Back
Andrii Dmytryshyn, Umeå University

11:05-11:35 Block-Symmetric Linearizations of Odd Degree Matrix Polynomials with Optimal Condition Number and Backward Error
Maria Isabel Bueno, University of California, Santa Barbara

11:35-12:05 Transparent Realizations for Polynomial and Rational Matrices
Steve Mackey, Western Michigan University

12:05-12:35 Generic Eigenstructures of Matrix Polynomials with Bounded Rank and Degree
Andrii Dmytryshyn, Umeå University

Monday
May 7

MS37 Part I
Tensor Analysis, Computation, and Applications II
10:35 AM - 12:35 PM
WLB211

The term *tensor* has both meanings of a geometric object and a multi-way array. Applications of tensors include various disciplines in science and engineering, such as mechanics, quantum information, signal and image processing, optimization, numerical PDE, and hypergraph theory. There are several hot research topics on tensors, such as tensor decomposition and low-rank approximation, tensor spectral theory, tensor completion, tensor-related systems of equations, and tensor complementarity problems. Researchers in all these mentioned areas will give presentations to broaden our perspective on tensor research. This is one of a series minisymposia and focuses more on tensor analysis and algorithm design.

Organizer:
Shenglong Hu, School of Mathematics, Tianjin University,
timhu@tju.edu.cn

10:35-11:05 The Fiedler Vector of a Laplacian Tensor for Hypergraph Partitioning
Yannan Chen, The Hong Kong Polytechnic University and Zhengzhou University

11:05-11:35 Solving Tensor Problems via Continuation Methods
Lixing Han, University of Michigan-Flint

TALK CANCELED
~~**11:35-12:05 Local Convergence Rate Analysis for the Higher-Order Power Method in Best Rank One Approximations of Tensors**~~
~~*Guoyin Li, The University of New South Wales*~~

NEW TALK
11:35-12:05 The Rank of $W \otimes W$ is Eight
Shmuel Friedland, University of Illinois at Chicago

TALK CANCELED
~~**12:05-12:35 Tensor Splitting Methods for Solving the Multi-Linear System**~~
~~*Wen Li, South China Normal University*~~

NEW TALK
12:05-12:35 Randomized Algorithms for the Approximations of Tucker and the Tensor Train Decomposition
Maolin Che, Southwestern University of Finance and Economics

Monday
May 7

MS09 Part II
Exploiting Low-Complexity Structures in Data Analysis: Theory and Algorithms
3:30 PM - 5:00 PM
WLB104

Low-complexity structures are central to modern data analysis — they are exploited to tame data dimensionality, to rescue ill-posed problems, and to ease and speed up hard numerical computation. In this line, the past decade features remarkable advances in theory and practice of estimating sparse vectors or low-rank matrices from few linear measurements. Looking ahead, there are numerous fundamental problems in data analysis coming with more complex data formation processes. For example, the dictionary learning and the blind deconvolution problems have intrinsic bilinear structures, whereas the phase retrieval problem and variants pertain to quadratic measurements. Moreover, many of these applications can be naturally formulated as nonconvex optimization problems, which are ruled to be hard by the worst-case theory. In practice, however, simple numerical methods are surprisingly effective in solving them. Partial explanation of this curious gap has started to appear very recently.
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Organizers:
Ju Sun, Department of Mathematics, Stanford University,
sunju@stanford.edu
Ke Wei, School of Data Science, Fudan University,
weike1986@gmail.com

3:30-4:00 Foundations of Nonconvex and Nonsmooth Robust Subspace Recovery

Tyler Maunu, University of Minnesota

UPDATED INFORMATION
CHANGE OF TIME
4:00-4:30 Geometry and Algorithm for Sparse Blind Deconvolution
Yuqian Zhang, Columbia University
Move to Monday 7 May, MS09 Part I, 10:35-11:05, WLB104

NEW TALK
4:00-4:30 On Mathematical Theories of Deep Learning
Yuan Yao, The Hong Kong University of Science & Technology

4:30-5:00 Convergence of the Randomized Kaczmarz Method for Phase Retrieval
Halyun Jeong, Courant Institute of Mathematical Sciences

TALK CANCELED
~~**5:00-5:30 Nonconvex Optimization for High-Dimensional Learning**~~
~~*Mahdi Soltanolkotabi, University of Southern California*~~

Monday May 7

MS25 Part II
Polynomial and Rational Matrices
3:30 PM - 5:00 PM
WLB205

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Organizers:
Javier Pérez, Department of Mathematical Sciences, University of Montana, javier.perez-alvaro@mso.umt.edu
Andrii Dmytryshyn, Department of Computing Science, Umeå University, andrii@cs.umu.se

TALK CANCELED
~~**3:30-4:00 A Backward Stable Quadratic Eigenvalue Solver**~~
~~*Françoise* Tisseur, The University of Manchester~~

CHANGE OF TIME
3:30-4:00 A Geometric Description of the Sets of Palindromic and Alternating Matrix Pencils with Bounded Rank
Fernando De Terán, Universidad Carlos III de Madrid

4:00-4:30 Strong Linearizations of Rational Matrices with Polynomial Part Expressed in an Orthogonal Basis
M. Carmen Quintana, Universidad Carlos III de Madrid

4:30-5:00 On the Stability of the Two-Level Orthogonal Arnoldi Method for Quadratic Eigenvalue Problems
Javier Pérez, University of Montana

Monday
May 7

MS37 Part II
Tensor Analysis, Computation, and Applications II
3:30 PM - 5:30 PM
WLB211

The term *tensor* has both meanings of a geometric object and a multi-way array. Applications of tensors include various disciplines in science and engineering, such as mechanics, quantum information, signal and image processing, optimization, numerical PDE, and hypergraph theory. There are several hot research topics on tensors, such as tensor decomposition and low-rank approximation, tensor spectral theory, tensor completion, tensor-related systems of equations, and tensor complementarity problems. Researchers in all these mentioned areas will give presentations to broaden our perspective on tensor research. This is one of a series minisymposia and focuses more on tensor analysis and algorithm design.

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Shenglong Hu, School of Mathematics, Tianjin University,
timhu@tju.edu.cn

3:30-4:00 Sparse Tucker Decomposition Completion for 3D Facial Expression Recognition
Ziyan Luo, Beijing Jiaotong University

CHANGE OF TIME
4:00-4:30 Hankel Tensor Decompositions and Ranks
Ke Ye, Chinese Academy of Science and University of Chicago

TALK CANCELED
~~**4:00-4:30 Tensor Ranks and Secant Varieties**~~
~~*Yang Qi, University of Chicago*~~
~~**4:30-5:00 S-lemma of the Fourth Order Tensor Systems**~~
~~*Qingzhi Yang, Nankai University*~~

NEW TALK
4:30-5:00 Polytopes of Stochastic Tensors
Xiaodong Zhang, Shanghai Jiaotong University

5:00-5:30 Some Spectral Bounds and Properties on Non-Uniform Hypergraphs
Chen Ouyang, The Hong Kong Polytechnic University