Final Program and Abstracts

SIAM CONFERENCE ON APPLIED LINEAR ALGEBRA

Hyatt Regency Atlanta
Atlanta, Georgia, USA

Sponsored by the SIAM Activity Group on Linear Algebra

The SIAM Activity Group on Linear Algebra promotes research in linear algebra and its applications. The group organizes a triennial SIAM Conference on Applied Linear Algebra and a triennial International Summer School on Numerical Linear Algebra (ISSNLA) for graduate students. They also support smaller, less formal conferences as requested by the membership. Every three years the activity group awards prizes for the best paper and the best poster in linear algebra.

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The SIAM registration desk is located in the Embassy Hall Foyer - Lower Level 2. It is open during the following hours:

Sunday, October 25
4:00 PM – 8:00 PM

Monday, October 26
7:00 AM – 4:00 PM

Tuesday, October 27
7:30 AM – 4:00 PM

Wednesday, October 28
7:30 AM – 4:00 PM

Thursday, October 29
7:30 AM – 4:00 PM

Friday, October 30
7:30 AM – 2:30 PM

Hotel Address

Hyatt Regency Atlanta
265 Peachtree Street
Atlanta, Georgia, 30303
USA
Hotel web address:
http://www.atlantaregency.hyatt.com

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List current August 2015.

Funding Agencies

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

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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.

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Registration Fee Includes

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

Conference Dinner Banquet

(separate fee applies; ticket required)

A conference dinner banquet will be held in the Regency V - Ballroom Level on Wednesday, October 28, 2015 at 6:00 PM.

A limited number of tickets are available at SIAM Registration Desk for $56.00 per person until 12:00 PM on Tuesday, October 27. Tickets will not be sold after this time. The dinner banquet will include a four course meal.

Job Postings

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Important Notice to Poster Presenters

The poster session is scheduled for Wednesday, October 28, 3:00 PM – 5:00 PM. Presenters are requested to put up their posters no later than 3:00 PM on Wednesday, the official start time of the session. Boards and push pins will be available to presenters beginning Monday, October 26, at 12:00 PM. Posters will remain on display through Friday, October 30. Poster displays must be removed by 10:15 AM. Posters remaining after this time will be discarded. SIAM is not responsible for discarded posters.

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Table Top Displays

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SIAM

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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
  Sunday, October 25
  6:00 PM – 8:00 PM

- Business Meeting
  (open to SIAG/LA members)
  Tuesday, October 27
  1:45 PM – 2:30 PM
  Complimentary soft drinks will be served.

- Poster Session and Coffee Break
  Wednesday, October 28
  3:00 PM – 5:00 PM

- Conference Dinner Banquet
  (separate fee applies; ticket required)
  Wednesday, October 28
  6:00 PM – 9:00 PM
  See page 3 for details.

Please Note

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

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Minitutorial

Monday, October 26

10:15 AM – 12:15 PM

MT1 Randomization in Numerical Linear Algebra: Theory and Practice

Room: International Ballroom North - Lower Level 1

Organizer: **Ilse Ipsen**, *North Carolina State University, USA*

Prize Lecture

Thursday, October 29

1:45 PM – 2:30 PM

SIAG/Linear Algebra Prize Lecture - Localizing Nonlinear Eigenvalues: Theory and Applications

David Bindel, *Cornell University, USA*

Invited Plenary Speakers

** All Invited Plenary Presentations will take place in International Ballroom - Lower Level**

Monday, October 26

8:15 AM – 9:00 AM

IP1 Fast Approximation of the Stability Radius and the H^∞ Norm for Large-Scale Linear Dynamical Systems

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

9:00 AM – 9:45 AM

IP2 Tuned Preconditioners for Inexact Two-Sided Inverse and Rayleigh Quotient Iteration

Melina Freitag, *University of Bath, United Kingdom*

1:45 PM – 2:30 PM

IP3 Sketching-Based Matrix Computations for Large-Scale Data Analysis

Haim Avron, *Tel Aviv University, Israel*

Tuesday, October 27

8:15 AM – 9:00 AM

IP4 Point-Spread Function Reconstruction in Ground-Based Astronomy

Raymond H. Chan, *Chinese University of Hong Kong, Hong Kong*

9:00 AM – 9:45 AM

IP5 Accelerating Direct Linear Solvers with Hardware and Algorithmic Advances

Xiaoye Sherry Li, *Lawrence Berkeley National Laboratory, USA*

* These speakers are supported in cooperation with the International Linear Algebra Society.

Invited Plenary Speakers

Wednesday, October 28

8:15 AM – 9:00 AM

IP6 Variational Gram Functions: Convex Analysis and Optimization

Maryam Fazel, *University of Washington, USA*

9:00 AM – 9:45 AM

IP7 Combinatorial Matrix Theory and Majorization

Geir Dahl*, *University of Oslo, Norway*

1:45 PM – 2:30 PM

IP8 Numerical Solution of Eigenvalue Problems Arising in the Analysis of Disc Brake Squeal

Volker Mehrmann, *Technische Universitaet Berlin, Germany*

Thursday, October 29

8:15 AM – 9:00 AM

IP9 Linear Algebra Computations for Parameterized Partial Differential Equations

Howard C. Elman, *University of Maryland, College Park, USA*

9:00 AM – 9:45 AM

IP10 Accurate Linear Algebra in Computational Methods for System and Control Theory

Zlatko Drmac, *University of Zagreb, Croatia*

Friday, October 30

8:15 AM – 9:00 AM

IP11 Low Rank Decompositions of Tensors and Matrices: Theory, Applications, Perspectives

Eugene Tyrtyshnikov, *Russian Academy of Sciences, Russia*

9:00 AM – 9:45 AM

IP12 Constrained Low Rank Approximations for Scalable Data Analytics

Haesun Park, *Georgia Institute of Technology, USA*

* These speakers are supported in cooperation with the International Linear Algebra Society.

SIAM Activity Group on Linear Algebra (SIAG/LA)

www.siam.org/activity/la

A GREAT WAY TO GET INVOLVED!

Collaborate and interact with mathematicians and applied scientists whose work involves linear algebra.

SIAM CONFERENCE ON APPLIED LINEAR ALGEBRA

OCTOBER 26-30, 2015

HYATT REGENCY ATLANTA
ATLANTA, GEORGIA, USA

ACTIVITIES INCLUDE:

- Special sessions at SIAM Annual Meetings
- Triennial conference
- Website
- Triennial International Summer School on Numerical Linear Algebra (ISSNLA)

BENEFITS OF SIAG/DMA MEMBERSHIP:

- Listing in the SIAG's online membership directory
- Additional $10 discount on registration at SIAM Conference on Applied Linear Algebra (excludes students)
- Electronic communications about recent developments in your specialty
- Eligibility for candidacy for SIAG/LA office
- Participation in the selection of SIAG/LA officers

ELIGIBILITY:

- Be a current SIAM member.

COST:

- $10 per year
- Student members can join two activity groups for free!

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- Vice Chair: James G. Nagy, Emory University
- Program Director: Francoise Tisseur, The University of Manchester
- Secretary: David S. Bindel, Cornell University

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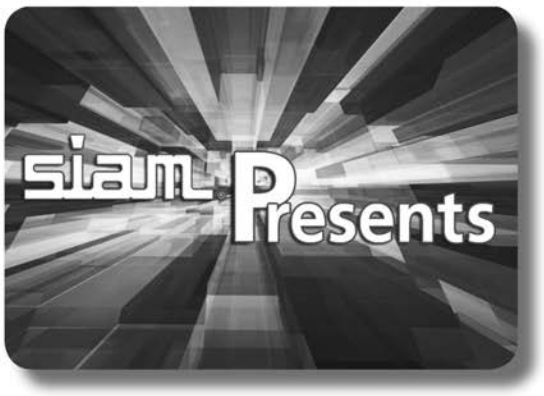

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- algebraic geometry
- atmospheric and oceanographic science
- computational science
- data mining
- geophysical science
- optimization
- uncertainty quantification

and more…

The collection, *Featured Lectures from our Archives,* includes audio and slides from 25 conferences since 2008, including talks by invited and prize speakers, select minisymposia, and minitutorials from the 2014 Annual Meeting and four 2014 SIAG meetings.

In addition, you can view brief video clips of speaker interviews and topic overviews from sessions at Annual Meetings starting in 2010, as well as the 2013 SIAM Conference on Computational Science and Engineering and the 2014 SIAM Conference on the Life Sciences.

Plans for adding more content from SIAM meetings abound, including presentations from six meetings in 2015.

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 keywords.

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 support this project.

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LA15 Program

SIAM CONFERENCE ON APPLIED LINEAR ALGEBRA

Hyatt Regency Atlanta
Atlanta, Georgia, USA

Sunday, October 25

Registration

4:00 PM-8:00 PM

Room:Embassy Hall Foyer - Lower Level 2

Welcome Reception

6:00 PM-8:00 PM

Room:Regency V - Ballroom Level

Monday, October 26

Registration

7:00 AM-4:00 PM

Room:Embassy Hall Foyer - Lower Level 2

Welcome Remarks

8:00 AM-8:15 AM

Room:International Ballroom - Lower Level 1

Monday, October 26

IP1

Fast Approximation of the Stability Radius and the H∞ Norm for Large-Scale Linear Dynamical Systems

8:15 AM-9:00 AM

Room:International Ballroom - Lower Level 1

Chair: Chen Greif, The University of British Columbia, Canada

The stability radius and the H∞ norm are well-known quantities in the robust analysis of linear dynamical systems with output feedback. These two quantities, which are reciprocals of each other in the simplest interesting case, respectively measure how much system uncertainty can be tolerated without losing stability, and how much an input disturbance may be magnified in the output. The standard method for computing them, the Boyd-Balakrishnan-Bruinsma-Steinbuch algorithm from 1990, is globally and quadratically convergent, but its cubic cost per iteration makes it inapplicable to large-scale dynamical systems. We present a new class of efficient methods for approximating the stability radius and the H∞ norm, based on iterative methods to find rightmost points of spectral value sets, which are generalizations of pseudospectra for modeling the linear fractional matrix transformations that arise naturally in analyzing output feedback. We also discuss a method for approximating the real structured stability radius, which offers additional challenges. Finally, we describe our new public-domain MATLAB toolbox for low-order controller synthesis, HIFOOS (H-infinity fixed-order optimization --- sparse). This offers a possible alternative to popular model order reduction techniques by applying fixed-order controller design directly to large-scale dynamical systems. This is joint work with Nicola Guglielmi, Mert Gurbuzbalaban and Tim Mitchell. This speaker is supported in cooperation with the International Linear Algebra Society.

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

Monday, October 26

IP2

Tuned Preconditioners for Inexact Two-Sided Inverse and Rayleigh Quotient Iteration

9:00 AM-9:45 AM

Room:International Ballroom - Lower Level 1

Chair: Chen Greif, The University of British Columbia, Canada

Computing both right and left eigenvectors of a generalised eigenvalue problem simultaneously is of interest in several important applications. We provide convergence results for inexact two-sided inverse and Rayleigh quotient iteration, which extend the previously established theory to the generalized non-Hermitian eigenproblem and inexact solves with a decreasing solve tolerance. Moreover, we consider the simultaneous solution of the forward and adjoint problem arising in two-sided methods and extend the successful tuning strategy for preconditioners to two-sided methods, creating a novel way of preconditioning two-sided algorithms. This is joint work with Patrick Kuerschner (MPI Magdeburg, Germany).

Melina Freitag
University of Bath, United Kingdom

Coffee Break

9:45 AM-10:15 AM

Room:Embassy Hall - Lower Level 2

Monday, October 26

MT1

Randomization in Numerical Linear Algebra: Theory and Practice

10:15 AM-12:15 PM

Room:International Ballroom North - Lower Level 1

Chair: Ilse Ipsen, North Carolina State University, USA

Speakers:

Ilse Ipsen, North Carolina State University, USA

Petros Drineas, Rensselaer Polytechnic Institute, USA

Michael Mahoney, University of California, Berkeley, USA

Monday, October 26

MS1

Recent Advances in Matrix Functions - Part I of II

10:15 AM-12:15 PM

Room:International Ballroom South - Lower Level 1

For Part 2 see MS8

Matrix functions are an important tool in many areas of science and engineering. The development of improved algorithms for their computation continues to be a very active area of research. This minisymposium focuses on some recent advances, including functions of structured matrices, the action of a matrix function on a vector, multivariate matrix functions, and the design of algorithms that exploit modern computer architectures.

Organizer: Samuel Relton
University of Manchester, United Kingdom

Organizer: Nicholas Higham
University of Manchester, United Kingdom

Organizer: Edvin Deadman
University of Manchester, United Kingdom

10:15-10:40 Error Estimation in Krylov Subspace Methods for Matrix Functions
Marcel Schweitzer, Bergische Universität Wuppertal, Germany; Andreas J. Frommer, Bergische Universität, Germany

10:45-11:10 Functions of Matrices with Kronecker Sum Structure
Michele Benzi, Emory University, USA; Valeria Simoncini, Universita' di Bologna, Italy

11:15-11:40 First-Order Riemannian Optimization Techniques for the Karcher Mean
Bruno Iannazzo, Università di Perugia, Italy; Margherita Porcelli, University of Bologna, Italy

11:45-12:10 A High Performance Algorithm for the Matrix Sign Function
Sivan A. Toledo, Tel Aviv University, Israel

Monday, October 26

MS2

Iterative Methods for Solving Families of Shifted Linear Systems - Part I of II

10:15 AM-12:15 PM

Room:Piedmont - Atlanta Conference Level

For Part 2 see MS9

Many problems which arise in the computational sciences can be reduced to the solution of a family of shifted linear systems with matrices differing by multiples of the identity. This relationship is frequently exploited when designing iterative solvers. However, doing so can also impose restrictions, e.g., on the choice of preconditioner. Thus, we seek methods which exploit the relationship between all shifted systems while allowing for robust preconditioning. The goal of this minisymposium is to bring together those developing such solvers and those who use them in applications, fostering communication and presenting this work to a broader audience.

Organizer: Kirk M. Soodhalter
Johannes Kepler University, Austria

Organizer: Martin B. van Gijzen
Delft University of Technology, Netherlands

10:15-10:40 Iterative Methods for Solving Shifted Linear Systems Built Upon a Block Matrix-vector Product
Kirk M. Soodhalter, Johannes Kepler University, Austria

10:45-11:10 One Matrix, Several Right Hand Sides: Efficient Alternatives to Block Krylov Subspace Methods
Andreas J. Frommer, Bergische Universität, Germany; Somaiyeeh Rashedi, University of Tabriz, Iran

11:15-11:40 Mpgmres-Sh : Multipreconditioned GMRES for Shifted Systems
Tania Bakhos and Peter K. Kitanidis, Stanford University, USA; Scott Ladenheim, Temple University, USA; Arvind Saibaba, Tufts University, USA; Daniel B. Szyld, Temple University, USA

11:45-12:10 Nested Krylov Methods for Shifted Linear Systems
Manuel Baumann and Martin B. van Gijzen, Delft University of Technology, Netherlands

Monday, October 26

MS3

Polynomial Eigenvalue Problems - Part I of II

10:15 AM-12:15 PM

Room:Spring - Atlanta Conference Level

For Part 2 see MS10

Polynomial Eigenvalue Problems arise in many applications from signal processing, quantum physics or computer aided design, and in the modeling and analysis of vibrating systems, mechanical structures, or electrical circuits. Much progress has been made in the last few years both from the theory and the development of algorithms in this area. The minisymposium will survey the most recent theoretical developments oriented to applications. We cover a range of topics including inverse problems, linearizations and l-ifications, and perturbation theory of structured matrix polynomials. The minisymposium is dedicated to the memory of Leiba Rodman, who passed away last March 2, 2015

Organizer: Fernando De Teran
Universidad Carlos III de Madrid, Spain

Organizer: Vanni Noferini
University of Manchester, United Kingdom

Organizer: María I. Bueno
University of California, Santa Barbara, USA

10:15-10:40 Low Rank Perturbations of Canonical Forms
Fernando De Teran, Universidad Carlos III de Madrid, Spain; Froilán M. Dopico, Universidad Carlos III, Spain; Julio Moro, Universidad Carlos III de Madrid, Spain

continued in next column

10:45-11:10 Linearizations of Hermitian Matrix Polynomials Preserving the Sign Characteristic
Maria Bueno, University of California, Santa Barbara, USA; Froilan Dopico, Universidad Carlos III de Madrid, Spain; Susana Furtado, Faculdade Economia Porto, Portugal

11:15-11:40 Matrix Polynomials in Non-Standard Form
D. Steven Mackey, Western Michigan University, USA

11:45-12:10 A Diagonal Plus Low Rank Family of Linearizations for Matrix Polynomials
Vanni Noferini, University of Manchester, United Kingdom; Leonardo Robol, Scuola Normale Superiore, Pisa, Italy

Monday, October 26

MS4

Undergraduate Research in Linear Algebra

10:15 AM-12:15 PM

Room:Roswell - Atlanta Conference Level

Participating in mathematical research can be an extremely beneficial experience for undergraduate students. Linear Algebra is an ideal mathematical area for undergraduate research because it is more accessible to students, most of whom begin studying it their freshman or sophomore year, and because Linear Algebra has many mathematically beautiful and interesting problems, many of which are directly connected to real world situations, which is of further motivation to students. In this session we will discuss our experiences in supervising undergraduate research in Linear Algebra and share suggestions about how others can effectively do the same.

Organizer: David M. Strong
Pepperdine University, USA

10:15-10:40 Research in Linear Algebra with Undergraduates
David M. Strong, Pepperdine University, USA

10:45-11:10 Student Research on Infinite Toeplitz Matrices
Gil Strang, Massachusetts Institute of Technology, USA

11:15-11:40 Undergraduate Research Projects in Linear Algebra
Hugo J. Woerdeman, Drexel University, USA

11:45-12:10 Undergraduate Research in Linear Algebra 4
Charles Johnson, College of William & Mary, USA

Monday, October 26

MS5

Sparse Matrix-Matrix Multiplication: Applications, Algorithms, and Implementations - Part I of II

10:15 AM-12:15 PM

Room:Techwood - Atlanta Conference Level

For Part 2 see MS12

Sparse matrix-matrix multiplication is a fundamental kernel in computations ranging from the numerical (algebraic multigrid) to the combinatorial (graph and network analysis). Its performance is constrained by the kernel's irregularity, depending on the sparsity structure of the matrices, and by its low arithmetic intensity, making data movement within the memory hierarchy and across processors a bottleneck. This minisymposium will discuss applications, implementations, algorithms, and means of characterizing the communication costs for sparse matrix-matrix multiplication.

Organizer: Grey Ballard
Sandia National Laboratories, USA

Organizer: Alex Druinsky
Lawrence Berkeley National Laboratory, USA

10:15-10:40 Hypergraph Partitioning for Sparse Matrix-Matrix Multiplication
Grey Ballard, Sandia National Laboratories, USA; Alex Druinsky, Lawrence Berkeley National Laboratory, USA; Nicholas Knight, New York University, USA; Oded Schwartz, Hebrew University of Jerusalem, Israel

10:45-11:10 Exploiting Sparsity in Parallel Sparse Matrix-Matrix Multiplication
Kadir Akbudak, Oguz Selvitopi, and *Cevdet Aykanat*, Bilkent University, Turkey

11:15-11:40 Generalized Sparse Matrix-Matrix Multiplication and Its Use in Parallel Graph Algorithms
Ariful Azad, Purdue University, USA; Aydin Buluc, Lawrence Berkeley National Laboratory, USA; John R. Gilbert, University of California, Santa Barbara, USA

11:45-12:10 The Input/Output Complexity of Sparse Matrix Multiplication
Morten Stöckel and Rasmus Pagh, IT University of Copenhagen, Denmark

Monday, October 26

MS6

Recent Spectral Approaches for Graph Clustering

10:15 AM-12:15 PM

Room:Vinings - Atlanta Conference Level

Clustering structures in networks are deeply related to spectral properties of suitable operators. Due to their generality, efficiency and rich theoretical foundations, spectral based techniques for graph clustering problems have been widely explored and applied to various research areas. The talks in this minisymposium sample some recent advances on the linear algebra approach to the problem of analysing the clustering structure of graphs and networks, also considering possible multilinear and nonlinear models and techniques.

Organizer: Francesco Tudisco
Saarland University, Germany

10:15-10:40 Eigenvectors of the Nonlinear Graph p-Laplacian and Application in Graph Clustering
Francesco Tudisco and Matthias Hein, Saarland University, Germany

10:45-11:10 Eigenvector Norms Matter in Spectral Graph Theory
Franklin Kenter, Rice University, USA

11:15-11:40 Local Clustering with Graph Diffusions and Spectral Solution Paths
Kyle Kloster and David F. Gleich, Purdue University, USA

11:45-12:10 Signed Laplacians and Spectral Clustering Via Quotient Space Metrics
Shiping Liu, University of Durham, United Kingdom; Fatihcan M. Atay, Max Planck Institute for Mathematics in the Sciences, Germany

Monday, October 26

CP1

Inverse Problems

10:15 AM-12:15 PM

Room:Marietta - Atlanta Conference Level

Chair: Geoffrey Dillon, Virginia Tech, USA

10:15-10:30 An Augmented Hybrid Method for Large Scale Inverse Problems
Geoffrey Dillon, Texas Tech University, USA; Julianne Chung and Eric De Sturler, Virginia Tech, USA

10:35-10:50 On a Nonlinear Inverse Problem in Electromagnetic Sounding
Caterina Fenu, Gian Piero Deidda, and Giuseppe Rodriguez, University of Cagliari, Italy

10:55-11:10 Localized-Deim: An Overlapping Cluster Framework with Application in Model Reduction for Nonlinear Inversion
Alexander R. Grimm and Serkan Gugercin, Virginia Tech, USA

11:15-11:30 Matrix Affine Transformation Algorithm for Rank-Reducing Image Data Informatics Process
Jay Min Lee, Pohang Accelerator Lab, POSTECH, Korea; Youngjoo Chung, Daegu Gyeongbuk Institute of Science and Technology, Korea; Yonghoon Kwon, POSTECH, Korea

11:35-11:50 Efficiencies in Global Basis Approximation for Model Order Reduction in Diffuse Optical Tomography
Meghan O'Connell and Misha E. Kilmer, Tufts University, USA; Eric De Sturler, Serkan Gugercin, and Christopher A. Beattie, Virginia Tech, USA

11:55-12:10 Robust Multi-Instance Regression
Dimitri Papadimitriou, Bell Laboratories, Lucent Technologies, USA

Monday, October 26

CP2

Eigenvalue and SVD Problems: Part I

10:15 AM-12:15 PM

Room:University - Atlanta Conference Level

Chair:Kensuke Aishima, University of Tokyo, Japan

10:15-10:30 Iterative Refinement for Symmetric Eigenvalue Decomposition and Singular Value Decomposition
Kensuke Aishima, University of Tokyo, Japan; Takeshi Ogita, Tokyo Woman's Christian University, Japan

10:35-10:50 Two-Level Orthogonal Arnoldi Method for Large Rational Eigenvalue Problems
Javier A. González Pizarro and Froilan Dopico, Universidad Carlos III de Madrid, Spain

10:55-11:10 A Communication-Avoiding Arnoldi-Type of the Complex Moment-Based Eigensolver
Akira Imakura and Tetsuya Sakurai, University of Tsukuba, Japan

11:15-11:30 Some Inverse Numerical Range Problems
Russell Carden, University of Kentucky, USA; M Jahromi, Shahid Bahonar University, Iran; Iran Katsouleas and Greece Maroulas, National Technical University of Athens, Greece

11:35-11:50 An Algorithm for Finding a 2-Similarity Transformation from a Numerical Contraction to a Contraction
Daeshik Choi, Southern Illinois University, Edwardsville, USA; Anne Greenbaum, University of Washington, USA

11:55-12:10 The Markovian Joint Spectral Radius: What It Is and How to Compute It Efficiently
Antonio Cicone and Nicola Guglielmi, Università degli Studi dell'Aquil, Italy; Vladimir Y. Protasov, Moscow State University, Russia

Lunch Break

12:15 PM-1:45 PM

Attendees on their own

Monday, October 26

IP3

Sketching-Based Matrix Computations for Large-Scale Data Analysis

1:45 PM-2:30 PM

Room:International Ballroom - Lower Level 1

Chair: Petros Drineas, Rensselaer Polytechnic Institute, USA

Matrix computations lies at the core of a broad range of methods in data analysis and machine learning, and certain numerical linear algebra primitives (e.g. linear least-squares regression and principal component analysis) are widely and routinely used. Devising scalable algorithms that enable large scale computation of the aforementioned primitives is crucial for meeting the challenges of Big Data applications. Sketching, which reduces dimensionality through randomization, has recently emerged as a powerful technique for scaling-up these primitives in the presence of massive data, for an extensive class of applications. In this talk, we outline how sketching can be used to accelerate these core computations, and elaborate on the tradeoffs involved in their use. We will also demonstrate the utility of the presented algorithms for data analysis and machine learning applications

Haim Avron
Tel Aviv University, Israel

Coffee Break

2:30 PM-3:00 PM

Room:Embassy Hall - Lower Level 2

Monday, October 26

MS7

Finding and Exploting Structure in Data

3:00 PM-5:00 PM

Room:International Ballroom North - Lower Level 1

In recent years there has been tremendous progress in developing both a robust theoretical framework and a variety of practical algorithms for solving a wide range of inference and inverse problems when confronted with indirect, and often highly incomplete, observations. The key assumption that lies at the heart of these methods is that the data, while often seemingly high-dimensional, frequently exhibits low-dimensional structure that can be exploited to enable highly efficient acquisition and inference. This minisymposium will showcase several ways in which such structure can enable novel approaches in modern data processing applications.

Organizer: Mark Davenport
Georgia Institute of Technology, USA

3:00-3:25 Computationally-Efficient Approximations to Arbitrary Linear Dimensionality Reduction Operators
Jarvis Haupt, University of Minnesota, USA

3:30-3:55 Recovering Planted Subgraphs via Convex Graph Invariants
Venkat Chandrasekaran, California Institute of Technology, USA

4:00-4:25 More Data, Less Work: Sharp Data–Computation Tradeoffs for Linear Inverse Problems
Mahdi Soltanolkotabi, University of Southern California, USA

4:30-4:55 A Data-dependent Weighted LASSO under Poisson Noise
Xin Jiang, Duke University, USA; Patricia Reynaud-Bouret, University of Nice, France; Vincent Rivoirard, University of Paris, Dauphine, France; Laure Sansonnet, Argo ParisTech, France; *Rebecca Willett*, University of Wisconsin, Madison, USA

Monday, October 26

MS8

Recent Advances in Matrix Functions - Part II of II

3:00 PM-5:00 PM

Room:International Ballroom South - Lower Level 1

For Part 1 see MS1
Matrix functions are an important tool in many areas of science and engineering. The development of improved algorithms for their computation continues to be a very active area of research. This minisymposium focuses on some recent advances, including functions of structured matrices, the action of a matrix function on a vector, multivariate matrix functions, and the design of algorithms that exploit modern computer architectures.

Organizer: Samuel Relton
University of Manchester, United Kingdom

Organizer: Nicholas Higham
University of Manchester, United Kingdom

Organizer: Edvin Deadman
University of Manchester, United Kingdom

3:00-3:25 The Leja Method: Backward Error Analysis and Implementation
Marco Caliari, University of Verona, Italy; *Peter Kandolf*, Alexander Ostermann and Stefan Rainer, Universität of Innsbruck, Austria

3:30-3:55 An Algorithm for the Lambert W Function on Matrices
Massimiliano Fasi and Nicholas Higham, University of Manchester, United Kingdom; Bruno Iannazzo, Università di Perugia, Italy

4:00-4:25 An Exponential Integrator for Polynomially Perturbed Linear ODEs
Antti Koskela and Elias Jarlebring, KTH Royal Institute of Technology, Sweden; M.E. Hochstenbach, Eindhoven University of Technology, Netherlands

4:30-4:55 Estimating the Condition Number of *f(A)b*
Edvin Deadman, University of Manchester, United Kingdom

Monday, October 26

MS9

Iterative Methods for Solving Families of Shifted Linear Systems - Part II of II

3:00 PM-5:00 PM

Room:Piedmont - Atlanta Conference Level

For Part 1 see MS2
Many problems which arise in the computational sciences can be reduced to the solution of a family of shifted linear systems with matrices differing by multiples of of the identity. This relationship is frequently exploited when designing iterative solvers. However, doing so can also impose restrictions, e.g., on the choice of preconditioner. Thus, we seek methods which exploit the relationship between all shifted systems while allowing for robust preconditioning. The goal of this minisymposium is to bring together those developing such solvers and those who use them in applications, fostering communication and presenting this work to a broader audience.

Organizer: Kirk M. Soodhalter
Johannes Kepler University, Austria

Organizer: Martin B. van Gijzen
Delft University of Technology, Netherlands

3:00-3:25 Solving Linear Systems with Nonlinear Parameter Dependency
Karl Meerbergen, Roel Van Beeumen, and Wim Michiels, Katholieke Universiteit Leuven, Belgium

3:30-3:55 Perfectly Matched Layers and Rational Krylov Subspaces with Adaptive Shifts for Maxwell Systems
Vladimir L. Druskin, Schlumberger-Doll Research, USA; *Rob Remis*, Delft University of Technology, Netherlands; Mikhail Zaslavsky, Schlumberger-Doll Research, USA; Joern Zimmerling, Delft University of Technology, Netherlands

4:00-4:25 Parallelization of the Rational Arnoldi Method
Mario Berljafa and Stefan Guettel, University of Manchester, United Kingdom

4:30-4:55 Interpolatory Techniques for Model Reduction of Multivariate Linear Systems using Error Estimation
Mian Ilyas Ahmad, Max Planck Institute, Magdeburg, Germany; Lihong Feng, Max Planck Institute for Dynamics of Complex Systems, Germany; Peter Benner, Max Planck Institute, Magdeburg, Germany

Monday, October 26

MS10

Polynomial Eigenvalue Problems - Part II of II

3:00 PM-5:00 PM

Room:Spring - Atlanta Conference Level

For Part 1 see MS3

Polynomial Eigenvalue Problems arise in many applications from signal processing, quantum physics or computer aided design, and in the modeling and analysis of vibrating systems, mechanical structures, or electrical circuits. Much progress has been made in the last few years both from the theory and the development of algorithms in this area. The minisymposium will survey the most recent theoretical developments oriented to applications. We cover a range of topics including inverse problems, linearizations and l-ifications, and perturbation theory of structured matrix polynomials. The minisymposium is dedicated to the memory of Leiba Rodman, who passed away last March 2, 2015

Organizer: Fernando De Teran
Universidad Carlos III de Madrid, Spain

Organizer: Vanni Noferini
University of Manchester, United Kingdom

Organizer: María I. Bueno
University of California, Santa Barbara, USA

3:00-3:25 Recent Advances on Inverse Problems for Matrix Polynomials
Froilán M. Dopico, Universidad Carlos III, Spain; Fernando De Teran, Universidad Carlos III de Madrid, Spain; D. Steven Mackey, Western Michigan University, USA; Paul Van Dooren, Universite Catholique de Louvain, Belgium

3:30-3:55 A Factorized Form of the Inverse Polynomial Matrix Problem
Paul M. Van Dooren, Université Catholique de Louvain, Belgium

4:00-4:25 Generic Low Rank Perturbations of Structured Matrices
Leonhard Batzke and *Christian Mehl*, TU Berlin, Germany; Andre C. Ran, Vrije Universiteit Amsterdam, The Netherlands; Leiba Rodman, College of William & Mary, USA

4:30-4:55 Matrix Functions: The Contributions of Leiba Rodman
Peter Lancaster, University of Calgary, Canada

Monday, October 26

MS11

Online Linear Algebra Education: Are MOOCs The Answer?

3:00 PM-5:00 PM

Room:Roswell - Atlanta Conference Level

The Massive Open Online Course (MOOC) has been touted as a major disruptive force in education. Some see it as the path towards affordable quality education for all. In this minisymposium, we discuss the practical experiences gained from four different online courses that focus on linear algebra offered through MIT OpenCourseWare, Coursera, and edX.

Organizer: Robert A. van de Geijn
University of Texas at Austin, USA

3:00-3:25 Experience with OpenCourseWare Online Video Lectures
Gilbert Strang, Massachusetts Institute of Technology, USA

3:30-3:55 Coding the Matrix: Linear Algebra through Computer Science Applications
Philip Klein, Brown University, USA

4:00-4:25 LAFF Long and Prosper?
Maggie E. Myers and Robert A. van de Geijn, University of Texas at Austin, USA

4:30-4:55 When Life is Linear Worldwide
Tim Chartier, Davidson College, USA

Monday, October 26

MS12

Sparse Matrix-matrix Multiplication: Applications, Algorithms, and Implementations - Part II of II

3:00 PM-5:00 PM

Room:Techwood - Atlanta Conference Level

For Part 1 see MS5

Sparse matrix-matrix multiplication is a fundamental kernel in computations ranging from the numerical (algebraic multigrid) to the combinatorial (graph and network analysis). Its performance is constrained by the kernel's irregularity, depending on the sparsity structure of the matrices, and by its low arithmetic intensity, making data movement within the memory hierarchy and across processors a bottleneck. This minisymposium will discuss applications, implementations, algorithms, and means of characterizing the communication costs for sparse matrix-matrix multiplication.

Organizer: Grey Ballard
Sandia National Laboratories, USA

Organizer: Alex Druinsky
Lawrence Berkeley National Laboratory, USA

3:00-3:25 Analyzing Spgemm on Gpu Architectures
Steven Dalton and Luke Olson, University of Illinois at Urbana-Champaign, USA

3:30-3:55 A Framework for SpGEMM on GPUs and Heterogeneous Processors
Weifeng Liu and Brian Vinter, University of Copenhagen, Denmark

4:00-4:25 The Distributed Block-Compressed Sparse Row Library: Large Scale and GPU Accelerated Sparse Matrix Multiplication
Alfio Lazzaro, Ole Schuett, and Joost VandeVondele, ETH Zürich, Switzerland

4:30-4:55 Strong Scaling and Stability: SpAMM Acceleration for the Matrix Square Root Inverse and the Heavyside Function
Matt Challacombe, Los Alamos National Laboratory, USA

Monday, October 26

MS13

Active Subspaces for Dimension Reduction in Functions of Many Variables

3:00 PM-5:00 PM

Room:Vinings - Atlanta Conference Level

Active subspaces are an emerging set of tools for working with nonlinear functions of many variables. The active subspace is the span of the eigenvectors of the average outer product of the function's gradient with itself. These eigenvectors reduce the dimension of the function's inputs to enable otherwise infeasible studies with the function---e.g., optimization or uncertainty quantification. This minisymposium will explore the linear algebra aspects of active subspaces.

Organizer: Paul Constantine
Colorado School of Mines, USA

3:00-3:25 Active Subspaces in Theory and Practice
Paul Constantine, Colorado School of Mines, USA

3:30-3:55 Recovery of Structured Multivariate Functions
Jan Vybiral, Technical University Berlin, Germany; Massimo Fornasier, Technical University of Munich, Germany; Karin Schnass, University of Innsbruck, Austria

4:00-4:25 Sketching Active Subspaces
Armin Eftekhari, First Name Eftehari, Paul Constantine, and Michael B. Wakin, Colorado School of Mines, USA

4:30-4:55 Adaptive Morris Techniques for Active Subspace Construction
Allison Lewis and Ralph C. Smith, North Carolina State University, USA; Brian Williams, Los Alamos National Laboratory, USA

Monday, October 26

CP3

Multigrid Methods

3:00 PM-5:00 PM

Room:Marietta - Atlanta Conference Level

Chair: To Be Determined

3:00-3:15 Block-Smoothers in Multigrid Methods for Structured Matrices
Matthias Bolten, University of Wuppertal, Germany

3:20-3:35 Multigrid Preconditioners for Boundary Control of Elliptic-Constrained Optimal Control Problems
Mona Hajghassem and Andrei Draganescu, University of Maryland, Baltimore County, USA; Harbir Antil, George Mason University, USA

3:40-3:55 A Multigrid Solver for the Tight-Binding Hamiltonian of Graphene
Nils Kintscher, Bergische Universität Wuppertal, Germany; Karsten Kahl, University of Wuppertal, Germany

4:00-4:15 Multigrid for Tensor-Structured Problems
Sonja Sokolovic, Bergische Universität Wuppertal, Germany; Matthias Bolten and Karsten Kahl, University of Wuppertal, Germany

4:20-4:35 Adaptive Algebraic Multigrid for Lattice QCD
Matthias Rottmann, Bergische Universität Wuppertal, Germany; Andreas J. Frommer, Bergische Universität, Germany; Karsten Kahl, University of Wuppertal, Germany; Bjoern Leder, Bergische Universität Wuppertal, Germany; Stefan Krieg, Forschungszentrum Jülich, Germany

4:40-4:55 Multigrid Preconditioning for the Overlap Operator in Lattice QCD
Artur Strebel, Bergische Universität Wuppertal, Germany; James Brannick, Pennsylvania State University, USA; Andreas J. Frommer, Bergische Universität, Germany; Karsten Kahl, University of Wuppertal, Germany; Björn Leder and Matthias Rottmann, Bergische Universität Wuppertal, Germany

Monday, October 26

CP4

Eigenvalue and SVD Problems: Part II

3:00 PM-5:00 PM

Room:University - Atlanta Conference Level

Chair: To Be Determined

3:00-3:15 Devide-and-conquer Method for Symmetric-definite Generalized Eigenvalue Problems of Banded Matrices on Manycore Systems
Yusuke Hirota and Toshiyuki Imamura, RIKEN, Japan

3:20-3:35 Performance Analysis of the Householder Back-transformation with Asynchronous Collective Communication
Toshiyuki Imamura, RIKEN, Japan

3:40-3:55 Dynamic Parallelization for the Reduction of a Banded Matrix to Tridiagonal Form
Nadezhda Mozartova, Intel Corporation, USA; Sergey V Kuznetsov, Intel Corporation, Russia; Aleksandr Zotkevich, Intel Corporation, USA

4:00-4:15 Performance of the Block Jacobi-Davidson Method for the Solution of Large Eigenvalue Problems on Modern Clusters
Melven Roehrig-Zoellner and Jonas Thies, German Aerospace Center (DLR), Germany; Achim Basermann, German Aerospace Center (DLR), Simulation and Software Technology (SISTEC), Germany; Florian Fritzen and Patrick Aulbach, German Aerospace Center (DLR), Germany

4:20-4:35 Performance Comparison of Feast and Primme in Computing Many Eigenvalues in Hermitian Problems
Eloy Romero Alcalde and Andreas Stathopoulos, College of William & Mary, USA

4:40-4:55 The Implicit Hari-Zimmermann Algorithm for the Generalized Svd
Sanja Singer, University of Zagreb, Croatia; Vedran Novakovic, STFC Daresbury Laboratory, United Kingdom; Sasa Singer, University of Zagreb, Croatia

Tuesday, October 27

Registration
7:30 AM-4:00 PM

Room:Embassy Hall Foyer - Lower Level 2

Announcements
8:00 AM-8:15 AM

Room:International Ballroom - Lower Level 1

IP4
Point-Spread Function Reconstruction in Ground-Based Astronomy
8:15 AM-9:00 AM

Room:International Ballroom - Lower Level 1

Chair: Zhong-Zhi Bai, Chinese Academy of Sciences, China

Because of atmospheric turbulence, images of objects in outer space acquired via ground-based telescopes are usually blurry. One way to estimate the blurring kernel or point spread function (PSF) is to make use of the aberration of wavefronts received at the telescope, i.e., the phase. However only the low-resolution wavefront gradients can be collected by wavefront sensors. In this talk, I will discuss how to use regularization methods to reconstruct high-resolution phase gradients and then use them to recover the phase and the PSF in high accuracy. I will also address related numerical linear algebra issues such as the estimation of the regularization parameter and the solution of the linear systems arising from the model.

Raymond H. Chan
Chinese University of Hong Kong, Hong Kong

IP5
Accelerating Direct Linear Solvers with Hardware and algorithmic Advances
9:00 AM-9:45 AM

Room:International Ballroom - Lower Level 1

Chair: - Zhaojun Bai, University of California, Davis, USA

Factorization-based algorithms often play a significant role in developing scalable solvers. The higher fidelity simulations and extreme-scale parallel machines present unique challenges for designing new parallel algorithms and software. In this talk, we first present some techniques to enhance sparse factorization algorihtms to exploit the newer heterogeneous node architectures, such as nodes with GPU accelerators or Intel Xeon Phi. Secondly, we present a new class of scalable factorization algorithms that have asymptotically lower complexity in both flops and storage, for which the acceleration power comes form exploiting low-rank submatrices and randomization.

Xiaoye Sherry Li
Lawrence Berkeley National Laboratory, USA

Coffee Break
9:45 AM-10:15 AM

Room:Embassy Hall - Lower Level 2

MS14
Recent Advances in Numerical Linear Algebra for Image Processing - Part I of II
10:15 AM-12:15 PM

Room:International Ballroom North - Lower Level 1

For Part 2 see MS21

Methods of numerical linear algebra play an important role in the solution and analysis of ill-posed problems. Conversely, the desire to compute solutions of ill-posed problems has spurred the development of efficient and robust algorithms based on numerical linear algebra. This minisymposium highlights some of the latest advances in numerical linear algebra for the analysis and solution of linear and nonlinear ill-posed problems. The topics considered include iterative and direct solution methods, regularization techniques, single- and multi- parameter regularization, and determination of the regularization operators and regularization parameters. The applications considered comprise image deblurring, remote sensing, compressed sensing, and adaptive optics.

Organizer: Lothar Reichel
Kent State University, USA

Organizer: Ronny Ramlau
Johannes Kepler University, Austria

10:15-10:40 Fractional Tikhonov Regularization and the Discrepancy Principle for Deterministic and Stochastic Noise Models

Daniel Gerth, Technical University of Chemnitz, Germany; Esther Klann, University of Linz, Austria; Lothar Reichel, Kent State University, USA; Ronny Ramlau, Johannes Kepler University, Austria

10:45-11:10 Unbiased Predictive Risk Estimator for Regularization Parameter Estimation in the Context of Iteratively Reweighted Lsqr Algorithms for Ill-Posed Problems

Rosemary A. Renaut, Arizona State University, USA; Saeed Vatankhah, University of Tehran, Iran

continued on next page

11:15-11:40 A Singular Value Decomposition for Atmospheric Tomography
Ronny Ramlau, Johannes Kepler University, Austria

11:45-12:10 Shape Reconstruction by Photometric Stereo with Unknown Lighting
Giuseppe Rodriguez, University of Cagliari, Italy; Riccardo Dessì, Politecnico di Torino, Italy; Gabriele Stocchino and Massimo Vanzi, University of Cagliari, Italy

Tuesday, October 27

MS15

Advances in Fast Iterative Solvers for Sparse Linear Systems - Part I of II

10:15 AM-12:15 PM

Room:International Ballroom South - Lower Level 1

For Part 2 see MS22
New developments in various applications across science, engineering, economics and industry continue to demand improvements in the effectiveness and efficiency of fast iterative solvers. This in turn poses many problems of theoretical and practical interest in the field of numerical linear algebra. In this minisymposium, speakers will present some recent advances in this area, covering a range of topical and interesting issues.

Organizer: Chen Greif
University of British Columbia, Canada

Organizer: Alison Ramage
University of Strathclyde, United Kingdom

10:15-10:40 On Nonsingular Saddle-Point Systems with a Maximally Rank Deficient Leading Block
Chen Greif, University of British Columbia, Canada

10:45-11:10 Sparse Approximate Inverse Preconditioners, Revisited
Edmond Chow, Georgia Institute of Technology, USA

11:15-11:40 A Tridiagonalization Method for Saddle-Point and Quasi-Definite Systems
Dominique Orban, École Polytechnique de Montréal, Canada

11:45-12:10 Iterative Solver for Linear Systems Arising in Interior Point Methods for Semidefinite Programming
Jacek Gondzio, University of Edinburgh, United Kingdom; Stefania Bellavia, Universita' di Firenze, Italy; Margherita Porcelli, University of Bologna, Italy

Tuesday, October 27

MS16

Matrix Equations and Matrix Geometric Means

10:15 AM-12:15 PM

Room:Piedmont - Atlanta Conference Level

Matrix and tensor equations and matrix geometric means are central topics of research in both theoretical and numerical linear algebra, because of their beautiful mathematical properties and the large number of applications in which they arise. Many challenges are still ahead, as it is important to deeply understand the theoretical properties and to exploit the maximum of available structure in order to reduce the computational cost of algorithms, especially in large-scale problems. We aim to draw a picture of some recent lines of research in this field.

Organizer: Bruno Iannazzo
Università di Perugia, Italy

Organizer: Raf Vandebril
Katholieke Universiteit Leuven, Belgium

10:15-10:40 Averaging Block-Toeplitz Matrices with Preservation of Toeplitz Block Structure
Ben Jeuris and Raf Vandebril, Katholieke Universiteit Leuven, Belgium

10:45-11:10 Theory and Algorithms of Operator Means
Miklos Palfia, Kyoto University, Japan

11:15-11:40 Using Inverse-free Arithmetic in Large-scale Matrix Equations
Volker Mehrmann, Technische Universitaet Berlin, Germany; *Federico Poloni*, University of Pisa, Italy

11:45-12:10 Preconditioned Riemannian Optimization for Low-Rank Tensor Equations
Bart Vandereycken, Université de Genève, Switzerland; Daniel Kressner and Michael Steinlechner, EPFL, Switzerland

Tuesday, October 27

MS17

Matrix and Tensor Decompositions and Applications: Part I of II

10:15 AM-12:15 PM

Room:Spring - Atlanta Conference Level

For Part 2 see MS24

This session will provide opportunities to present and exchange ideas on new matrix and tensor methods for established application areas in signal and image processing as well as in new application areas in machine learning, compressed sensing and big data science.

Organizer: Carmeliza Navasca
University of Alabama at Birmingham, USA
Organizer: Dana Lahat
Gipsa-Lab, France

Organizer: Mariya Ishteva
Vrije Universiteit Brussel, Belgium

10:15-10:40 Tensors and Structured Matrices of Low Rank
Mariya Ishteva and Ivan Markovsky, Vrije Universiteit Brussel, Belgium

10:45-11:10 Generating Polynomials and Symmetric Tensor Decomposition
Jiawang Nie, University of California, San Diego, USA

11:15-11:40 On the Convergence of Higher-order Orthogonality Iteration and Its Extension
Yangyang Xu, Rice University, USA

11:45-12:10 Alternating Least-Squares Variants for Tensor Approximation
Nathaniel McClatchey and Martin J. Mohlenkamp, Ohio University, USA

Tuesday, October 27

MS18

Communication Costs: New Algorithms and Lower Bounds - Part I of II

10:15 AM-12:15 PM

Room:Roswell - Atlanta Conference Level

For Part 2 see MS25

The relative costs of communication compared to computation continue to increase, and historically computation-bound algorithms in numerical linear algebra are becoming communication bound. In order to make efficient use of today's and future hardware, algorithms must be designed in a way that reduces the amount of communication they perform, both across the network and within the memory hierarchy. This minisymposium discusses recent progress in both the practice of designing and implementing algorithms and in the theory of deriving lower bounds on communication costs of algorithms.

Organizer: Nicholas Knight
New York University, USA

Organizer: Oded Schwartz
Hebrew University of Jerusalem, Israel

10:15-10:40 Communication-optimal Loop Nests
Nicholas Knight, New York University, USA

10:45-11:10 Communication Lower Bounds for Distributed-Memory Computations
Michele Scquizzato, University of Houston, USA; Francesco Silvestri, University of Padova, Italy

11:15-11:40 Minimizing Communication in Tensor Contraction Algorithms
Edgar Solomonik, ETH Zürich, Switzerland

11:45-12:10 A Computation and Communication-Optimal Parallel Direct 3-Body Algorithm
Penporn Koanantakool, University of California, Berkeley, USA

Tuesday, October 27

MS19

New Numerical Linear Algebra Methods Meet New Challenges of Physics - Part I of II

10:15 AM-12:15 PM

Room:Techwood - Atlanta Conference Level

For Part 2 see MS26

Numerical linear algebra is the building block of many computational physics and chemistry applications. Recent advances in numerical linear algebra algorithms have led to acceleration of scientific discovery through computation. On the other hand, new numerical algebra problems and algorithms for solving these problems have been identified in several applications. New perspectives on some existing algorithms have also emerged from the interaction between numerical linear algebraists and application scientists. This minisymposium will highlight some of these new developments.

Organizer: Chao Yang
Lawrence Berkeley National Laboratory, USA

Organizer: Yousef Saad
University of Minnesota, USA

10:15-10:40 Numerical Tensor Algebra in Modern Quantum Chemistry and Physics
Garnet Chan, Princeton University, USA

10:45-11:10 Efficient Algorithms for Transition State Calculations
Weiguo Gao, Fudan University, China

11:15-11:40 Compression of the Electron Repulsion Integral Tensor
Jianfeng Lu, Duke University, USA

11:45-12:10 Reduced Density Matrix Methods in Theoretical Chemistry and Physics
David A. Mazziotti, University of Chicago, USA

Tuesday, October 27

MS20

Generalizations of Positive Matrices - Part I of II

10:15 AM-12:15 PM

Room:Vinings - Atlanta Conference Level

For Part 2 see MS27

Positive and nonnegative matrices and their generalizations, including positive (semi)definite matrices, eventually positive matrices, totally positive matrices, etc. play a vital role in many applications, especially to statistics. Generalizations of the study of positive matrices include various directions such as cones of matrices and matrices that share Perron-Frobenius structure. This mini-symposium will present recent results on generalizations of positive matrices and their applications.

Organizer: Leslie Hogben
Iowa State University, USA

Organizer: Ulrica Wilson
Morehouse College, USA

10:15-10:40 Perron-Frobenius Theory of Generalizations of Nonnegative Matrices
Leslie Hogben, Iowa State University, USA

10:45-11:10 Geometric Mapping Properties of Semipositive Matrices
Michael Tsatsomeros, Washington State University, USA

11:15-11:40 On Powers of Certain Positive Matrices
Shaun M. Fallat, University of Regina, Canada

11:45-12:10 Inverses of Acyclic Matrices and Parter Sets
Bryan L. Shader, University of Wyoming, USA; Curtis Nelson, Brigham Young University, USA

Tuesday, October 27

CP5

Graphs and Linear Algebra

10:15 AM-12:15 PM

Room:Marietta - Atlanta Conference Level

Chair: To Be Determined

10:15-10:30 Heuristics for Optimizing the Communicability of Digraphs
Francesca Arrigo, University of Insubria, Italy; Michele Benzi, Emory University, USA

10:35-10:50 Generalizing Spectral Graph Partitioning to Sparse Tensors
Lars Eldén, Linköping University, Sweden

10:55-11:10 Graph Partitioning with Spectral Blends
James P. Fairbanks, Georgia Institute of Technology, USA; Geoffrey D. Sanders, Lawrence Livermore National Laboratory, USA

11:15-11:30 On the Relation Between Modularity and Adjacency Graph Partitioning Methods
Hansi Jiang and Carl Meyer, North Carolina State University, USA

11:35-11:50 Detecting Highly Cyclic Structure with Complex Eigenpairs
Christine Klymko and Geoffrey D. Sanders, Lawrence Livermore National Laboratory, USA

11:55-12:10 Orthogonal Representations, Projective Rank, and Fractional Minimum Positive Semidefinite Rank: Connections and New Directions
Leslie Hogben and *Kevin Palmowski*, Iowa State University, USA; David Roberson, Nanyang Technological University, Singapore; Simone Severini, University College London, United Kingdom

Tuesday, October 27

CP6

Eigenvalue and SVD Problems: Part III

10:15 AM-12:15 PM

Room:University - Atlanta Conference Level

Chair: To Be Determined

10:15-10:30 A Multigrid Krylov Method for Eigenvalue Problems
Zhao Yang, Oklahoma State University, USA; Ronald Morgan, Baylor University, USA

10:35-10:50 Inverse Eigenvalue Problems for Totally Nonnegative Matrices in Terms of Discrete Integrable Systems
Kanae Akaiwa and Yoshimasa Nakamura, Kyoto University, Japan; Masashi Iwasaki, Kyoto Prefectural University, Japan; Hisayoshi Tsutsumi, Akira Yoshida, and Koichi Kondo, Doshisha University, Japan

10:55-11:10 A Kinetic Ising Model and the Spectra of Some Jacobi Matrices
Carlos Fonseca, Kuwait University, Kuwait; Said Kouachi, Qassim University, Saudi Arabia; Dan Mazilu and Irina Mazilu, Washington and Lee University, USA

11:15-11:30 The Molecular Eigen-Problem and Applications
Erik Verriest and *Nak-Seung Hyun*, Georgia Institute of Technology, USA

11:35-11:50 Spectral Properties of the Boundary Value Problems for the Discrete Beam Equation
Jun Ji and Bo Yang, Kennesaw State University, USA

11:55-12:10 Matrix Nearness Problems for General Lyapunov-Type Stability Domains
Vladimir Kostic, University of Novi Sad, Serbia; Agnieszka Miedlar, Technische Universität Berlin, Germany

Lunch Break

12:15 PM-1:45 PM

Attendees on their own

Tuesday, October 27

SIAG/LA Business Meeting

1:45 PM-2:30 PM

Room:International Ballroom - Lower Level 1

Complimentary soft drinks wil be served.

Coffee Break

2:30 PM-3:00 PM

Room:Embassy Hall - Lower Level 2

Tuesday, October 27

MS21

Recent Advances in Numerical Linear Algebra for Image Processing - Part II of II

3:00 PM-5:00 PM

Room:International Ballroom North - Lower Level 1

For Part 1 see MS14

Methods of numerical linear algebra play an important role in the solution and analysis of ill-posed problems. Conversely, the desire to compute solutions of ill-posed problems has spurred the development of efficient and robust algorithms based on numerical linear algebra. This minisymposium highlights some of the latest advances in numerical linear algebra for the analysis and solution of linear and nonlinear ill-posed problems. The topics considered include iterative and direct solution methods, regularization techniques, single- and multi- parameter regularization, and determination of the regularization operators and regularization parameters. The applications considered comprise image deblurring, remote sensing, compressed sensing, and adaptive optics.

Organizer: Lothar Reichel
Kent State University, USA

Organizer: Ronny Ramlau
Johannes Kepler University, Austria

3:00-3:25 Vector Etrapolation for Image Restoration
Hassane Sadok, Université du Littoral Calais Cedex, France

3:30-3:55 Psf Reconstruction for Extremely Large Telescopes
Roland Wagner, Radon Institute for Computational and Applied Mathematics, Austria

4:00-4:25 Randomized Tensor Singular Value Decomposition
Jiani Zhang, Shuchin Aeron, Arvind Saibaba, and Misha E. Kilmer, Tufts University, USA

4:30-4:55 Multidirectional Subspace Expansion for Single-Parameter and Multi-Parameter Tikhonov Regularization
Ian Zwaan, TU Eindhoven, The Netherlands; M.E. Hochstenbach, Eindhoven University of Technology, Netherlands

Tuesday, October 27

MS22

Advances in Fast Iterative Solvers for Sparse Linear Systems - Part II of II

3:00 PM-5:00 PM

Room:International Ballroom South - Lower Level 1

For Part 1 see MS15

New developments in various applications across science, engineering, economics and industry continue to demand improvements in the effectiveness and efficiency of fast iterative solvers. This in turn poses many problems of theoretical and practical interest in the field of numerical linear algebra. In this minisymposium, speakers will present some recent advances in this area, covering a range of topical and interesting issues.

Organizer: Chen Greif
University of British Columbia, Canada

Organizer: Alison Ramage
University of Strathclyde, United Kingdom

3:00-3:25 A Multilevel Preconditioner for Data Assimilation with 4D-Var
Kirsty Brown, University of Strathclyde, United Kingdom; Igor Gejadze, Irstea, France; *Alison Ramage*, University of Strathclyde, United Kingdom

3:30-3:55 Fast Iterative Solvers for a Coupled Cahn-Hilliard/Navier-Stokes System
Jessica Bosch and Martin Stoll, Max Planck Institute, Magdeburg, Germany

4:00-4:25 Preconditioning a Mass-Conserving DG Discretization of the Stokes Equations
Scott Maclachlan, Memorial University, Newfoundland, Canada

4:30-4:55 Asynchronous Optimized Schwarz Methods
Daniel B. Szyld, Temple University, USA

Tuesday, October 27

MS23

Preconditioning and Iterative Methods for Complex Linear Systems

3:00 PM-5:00 PM

Room:Piedmont - Atlanta Conference Level

Introduction of The Minisymposium: Large sparse and specially structured complex linear systems arise widely in computational science and engineering applications. Transformed into the block two-by-two real linear systems, the complex linear systems could be solved by typical algorithms with real arithmetic. The accuracy, efficiency and robustness of the solvers are strongly dependent on the quality of the preconditioners adopted. However, the current preconditioning methods are not sophisticate and should be further explored. This minisymposium should aim to improve the theoretical results and the implement efficiency of the typical preconditioners and the iteration methods and inspire new preconditioning techniques and (preconditioned) iteration methods. The inexact solution of the intermediate variables should be paid more attention. Besides, theoretical analysis and numerical implementation related to the preconditioned iterative methods should be discussed.

Organizer: Zeng-Qi Wang
Shanghai Jiaotong University, China

3:00-3:25 Title Not Available at Time of Publication
Xin He, Delft University of Technology, Netherlands

3:30-3:55 Preconditioners for Linear Systems Arising From The Eddy Current Problem
Jianyu Pan and Xin Guan, East China Normal University, China

4:00-4:25 An Alternating Positive Semidefinite Splitting Preconditioner for Saddle Point Problems from Time-harmonic Eddy Current Models
Zhiru Ren, Chinese Academy of Sciences, China; Yang Cao, Nantong University, China

4:30-4:55 Title Not Available at Time of Publication
Guo-Feng Zhang and Zhong Zheng, Lanzhou University, China

Tuesday, October 27

MS24

Matrix and Tensor Decompositions and Applications: Part II of II

3:00 PM-5:00 PM

Room:Spring - Atlanta Conference Level

For Part 1 see MS17
This session will provide opportunities to present and exchange ideas on new tensor methods for established application areas in signal and image processing as well as in new application areas in machine learning, compressed sensing and big data science.

Organizer: Carmeliza Navasca
University of Alabama at Birmingham, USA

Organizer: Dana Lahat
Gipsa-Lab, France

Organizer: Mariya Ishteva
Vrije Universiteit Brussel, Belgium

3:00-3:25 The Decomposition of Matrices
Ke Ye and Lek-Heng Lim, University of Chicago, USA

3:30-3:55 On the Uniqueness of Coupled Matrix Block Diagonalization in the Joint Analysis of Multiple Datasets
Dana Lahat and Christian Jutten, Gipsa-Lab, France

4:00-4:25 "Sequentially Drilled" Joint Congruence Decompositions (SeDJoCo): The Simple Case and the Extended Case
Yao Cheng, Ilmenau University of Technology, Germany; *Arie Yeredor*, Tel Aviv University, Israel; Martin Haardt, Ilmenau University of Technology, Germany

4:30-4:55 Localization and Reconstruction of Brain Sources Using a Constrained Tensor-based Approach
Laurent Albera and *Ahmad Karfoul*, Université de Rennes 1 & Inserm, France; Hanna Becker, Gipsa-Lab, France; Remi Gribonval, INRIA Rennes, France; Amar Kachenoura and Lofti Senhadji, Université de Rennes 1, France; Guillotel Philippe, Technicolor R&D France, France; Isabelle Merlet, Université de Rennes 1 & Inserm, France

Tuesday, October 27

MS25

Communication Costs: New Algorithms and Lower Bounds - Part II of II

3:00 PM-5:00 PM

Room:Roswell - Atlanta Conference Level

For Part 1 see MS18
The relative costs of communication compared to computation continue to increase, and historically computation-bound algorithms in numerical linear algebra are becoming communication bound. In order to make efficient use of today's and future hardware, algorithms must be designed in a way that reduces the amount of communication they perform, both across the network and within the memory hierarchy. This minisymposium discusses recent progress in both the practice of designing and implementing algorithms and in the theory of deriving lower bounds on communication costs of algorithms.

Organizer: Nicholas Knight
New York University, USA

Organizer: Oded Schwartz
Hebrew University of Jerusalem, Israel

3:00-3:25 Network Oblivious Algorithms
Gianfranco Bilardi, Andrea Pietracaprina, and Geppino Pucci, University of Padova, Italy; Michele Scquizzato, University of Houston, USA; Francesco Silvestri, IT University of Copenhagen, Denmark

3:30-3:55 Using Symmetry to Schedule Algorithms
Harsha Vardhan Simhadri, Lawrence Berkeley National Laboratory, USA

4:00-4:25 Data Movement Lower Bounds for Computational Directed Acyclic Graphs
Saday Sadayappan, The Ohio State University, USA

4:30-4:55 Characterizing the Communication Costs of Sparse Matrix Multiplication
Grey Ballard, Sandia National Laboratories, USA; *Alex Druinsky*, Lawrence Berkeley National Laboratory, USA; Nicholas Knight, New York University, USA; Oded Schwartz, Hebrew University of Jerusalem, Israel

Tuesday, October 27

MS26

New Numerical Linear Algebra Methods Meet New Challenges of Physics - Part II of II

3:00 PM-5:00 PM

Room:Techwood - Atlanta Conference Level

For Part 1 see MS19

Numerical linear algebra is the building block of many computational physics and chemistry applications. Recent advances in numerical linear algebra algorithms have led to acceleration of scientific discovery through computation. On the other hand, new numerical algebra problems and algorithms for solving these problems have been identified in several applications. New perspectives on some existing algorithms have also emerged from the interaction between numerical linear algebraists and application scientists. This minisymposium will highlight some of these new developments.

Organizer: Chao Yang
Lawrence Berkeley National Laboratory, USA

Organizer: Yousef Saad
University of Minnesota, USA

3:00-3:25 Randomized Estimation of Spectral Densities of Large Matrices Made Accurate
Lin Lin, Lawrence Berkeley National Laboratory, USA

3:30-3:55 O(N) Density Functional Theory Calculations: The Challenge of Going Sparse
Jean-Luc Fattebert and Daniel Osei-Kuffuor, Lawrence Livermore National Laboratory, USA

4:00-4:25 Towards Large and Fast Density Functional Theory Calculations
Phanish Suryanarayana, Georgia Institute of Technology, USA

4:30-4:55 Challenges and Opportunities for Solving Large-scale Eigenvalue Problems in Electronic Structure Calculations
Eric Polizzi, University of Massachusetts, Amherst, USA

Tuesday, October 27

MS27

Generalizations of Positive Matrices - Part II of II

3:00 PM-5:00 PM

Room:Vinings - Atlanta Conference Level

For Part 1 see MS20

Positive and nonnegative matrices and their generalizations, including positive (semi)definite matrices, eventually positive matrices, totally positive matrices, etc. play a vital role in many applications, especially to statistics. Generalizations of the study of positive matrices include various directions such as cones of matrices and matrices that share Perron-Frobenius structure. This mini-symposium will present recent results on generalizations of positive matrices and their applications.

Organizer: Leslie Hogben
Iowa State University, USA

Organizer: Ulrica Wilson
Morehouse College, USA

3:00-3:25 The Jordan Form of An Irreducible Eventually Nonnegative Matrix
Ulrica Wilson, Morehouse College, USA

3:30-3:55 Arrangements of Equal Minors in the Positive Grassmannian
Miriam Farber and Alexander Postnikov, Massachusetts Institute of Technology, USA

4:00-4:25 Preserving Positivity for Matrices with Sparsity Constraints
Bala Rajaratnam, Stanford University, USA; Dominique Guillot, University of Delaware, USA; Apoorva Khare, Stanford University, USA

4:30-4:55 Critical Exponents and Positivity
Apoorva Khare, Stanford University, USA; Dominique Guillot, University of Delaware, USA; Bala Rajaratnam, Stanford University, USA

Tuesday, October 27

CP7

Mathematical Software and High Performance Computing

3:00 PM-5:00 PM

Room:Marietta - Atlanta Conference Level

Chair: - Hartwig Anzt, University of Tennessee, USA

3:00-3:15 Block-Asynchronous Jacobi Iterations with Overlapping Domains
Hartwig Anzt, University of Tennessee, USA; Edmond Chow, Georgia Institute of Technology, USA; Daniel B. Szyld, Temple University, USA; Jack J. Dongarra, University of Tennessee, Knoxville, USA

3:20-3:35 Performance Evaluation of the Choleskyqr2 Algorithm
Takeshi Fukaya, Hokkaido University, Japan; Yuji Nakatsukasa, University of Tokyo, Japan; Yuka Yanagisawa, Waseda University, Japan; Yusaku Yamamoto, University of Electro-Communications, Japan

3:40-3:55 High Performance Resolution of Dense Linear Systems Using Compression Techniques and Application to 3D Electromagnetics Problems
David Goudin, Cedric Augonnet, Agnes Pujols, and Muriel Sesques, CEA/CESTA, France

4:00-4:15 Batched Matrix-Matrix Multiplication Operations for Intel ® Xeon Processor and Intel ® Xeon Phi Co-Processor
Murat E. Guney, Sarah Knepper, Kazushige Goto, Vamsi Sripathi, Greg Henry, and Shane Story, Intel Corporation, USA

4:20-4:35 Data Sparse Technique
Yuval Harness, Luc Giraud, and Emmanuel Agullo, INRIA, France; Eric Drave, Stanford University, USA

4:40-4:55 A Newly Proposed BLAS Extension (xGEMMT) to Update a Symmetric Matrix Efficiently
Sarah Knepper, Kazushige Goto, Murat E. Guney, Greg Henry, and Shane Story, Intel Corporation, USA

Tuesday, October 27

CP8

Eigenvalue and SVD Problems: Part IV

3:00 PM-5:00 PM

Room:University - Atlanta Conference Level

Chair: To Be Determined

3:00-3:15 Eigenvalue Condition Numbers of Polynomial Eigenvalue Problems under Möbius Transformations
Luis Miguel Anguas Marquez and Froilan Dopico, Universidad Carlos III de Madrid, Spain

3:20-3:35 A Novel Numerical Algorithm for Triangularizing Quadratic Matrix Polynomials
Yung-Ta Li, Fu Jen Catholic University, Taiwan

3:40-3:55 A Fiedler-Like Approach to Spectral Equivalence of Matrix Polynomials
Vasilije Perovic, Western Michigan University, USA; D. Steven Mackey, Western Michigan University, USA

4:00-4:15 Computation of All the Eigenpairs for a Particular Kind of Banded Matrix
Hiroshi Takeuchi and Kensuke Aihara, Tokyo University of Science, Japan; *Akiko Fukuda*, Shibaura Institute of Technology, Japan; Emiko Ishiwata, Tokyo University of Science, Japan

4:20-4:35 Fixed-Point Singular Value Decomposition Algorithms with Tight Analytical Bounds
Bibek Kabi, Aurobinda Routray, and Ramanarayan Mohanty, Indian Institute of Technology Kharagpur, India

4:40-4:55 On First Order Expansions for Multiplicative Perturbation of Eigenvalues
Fredy E. Sosa and Julio Moro, Universidad Carlos III de Madrid, Spain

SIMAX Editorial Board Meeting

7:00 PM-9:00 PM

Room:Meeting Room TBA

Wednesday, October 28

Registration

7:30 AM-4:00 PM

Room:Embassy Hall Foyer - Lower Level 2

Announcements

8:00 AM-8:15 AM

Room:International Ballroom - Lower Level 1

IP6

Variational Gram Functions: Convex Analysis and Optimization

8:15 AM-9:00 AM

Room:International Ballroom - Lower Level 1

Chair: David F. Gleich, Purdue University, USA

We propose a class of convex penalty functions, called "Variational Gram Functions", that can promote pairwise relations, such as orthogonality, among a set of vectors in a vector space. When used as regularizers in convex optimization problems, these functions of a Gram matrix find application in hierarchical classification, multitask learning, and estimation of vectors with disjoint supports, among other applications. We describe a general condition for convexity, which is then used to prove the convexity of a few known functions as well as new ones. We give a characterization of the associated subdifferential and the proximal operator, and discuss efficient optimization algorithms for loss-minimization problems regularized with these penalty functions. Numerical experiments on a hierarchical classification problem are presented, demonstrating the effectiveness of these penalties and the associated optimization algorithms in practice.

Maryam Fazel
University of Washington, USA

Wednesday, October 28

IP7

Combinatorial Matrix Theory and Majorization

9:00 AM-9:45 AM

Room:International Ballroom - Lower Level 1

Chair: Beatrice Meini, University of Pisa, Italy

Majorization theory provides concepts for comparing mathematical objects according to "how spread out' their elements are. In particular, two n vectors may be ordered by comparing the partial sums of the k largest components for $k \leq n$. This is a fruitful concept in many areas of mathematics and its applications, e.g., in matrix theory, combinatorics, probability theory, mathematical finance and physics. In this talk we discuss some combinatorial problems for classes of matrices where majorization plays a role. This includes (0,1)-matrices with line sum and pattern constraints, doubly stochastic matrices and Laplacian matrices of graphs. An extension of majorization to partially ordered sets is presented. We also discuss a problem motivated by mathematical finance which leads to interesting questions in qualitative matrix theory. This speaker is supported in cooperation with the International Linear Algebra Society.

Geir Dahl
University of Oslo, Norway

Coffee Break

9:45 AM-10:15 AM

Room:Embassy Hall - Lower Level 2

Wednesday, October 28

MS28

Complex Networks

10:15 AM-12:15 PM

Room:International Ballroom North - Lower Level 1

Network Science has become fundamental to a number of fields in the natural and social sciences, as well as for engineering, computer science, and just about any field of study concerned with the analysis of complex systems and data sets consisting of many interconnected entities. Graph theory and linear algebra play a central role in the analysis of networks, which in turn provides a powerful stimulus for research in these areas. The talks in this invited minisymposium will address different mathematical and computational challenges arising in the structural analysis of complex networks.

Organizer: Michele Benzi
Emory University, USA

Organizer: Christine Klymko
Lawrence Livermore National Laboratory, USA

10:15-10:40 Dynamic Network Centrality with Edge Multidamping
Mary Aprahamian, University of Manchester, United Kingdom

10:45-11:10 Solving Graph Laplacians for Complex Networks
Erik G. Boman, Sandia National Laboratories, USA; Kevin Deweese, University of California, Santa Barbara, USA

11:15-11:40 On Growth and Form of Networks
Ernesto Estrada, University of Strathclyde, United Kingdom

11:45-12:10 Using the Heat Kernel of a Graph for Local Algorithms
Olivia Simpson, University of California, San Diego, USA

Wednesday, October 28

MS29

Krylov Methods

10:15 AM-12:15 PM

Room:International Ballroom South - Lower Level 1

Krylov subspace methods have been and continue to be among the top ways for solving large systems of linear equations and large eigenvalue problems. As scientists push toward solving a larger variety of problems and solving them more accurately, the linear algebra problems become more challenging and better methods are needed. Here we look at new developments for Krylov methods. These include methods that combine linear equations and eigenvalue computation, that combine multigrid with Krylov and that are geared for modern computer architechtures. Preconditioning and other convergence acceleration techniques and links to model reduction will also be considered.

Organizer: Ron Morgan
Baylor University, USA

Organizer: Eric De Sturler
Virginia Tech, USA

10:15-10:40 Near-Krylov for Eigenvalues and Linear Equations Including Multigrid and Rank-1
Ron Morgan, Baylor University, USA

10:45-11:10 Efficient Iterative Algorithms for Linear Stability Analysis of Incompressible Flows
Minghao W. Rostami, Worcester Polytechnic Institute, USA; Howard C. Elman, University of Maryland, College Park, USA

11:15-11:40 Krylov Methods in Adaptive Finite Element Computations
Agnieszka Miedlar, Technische Universität Berlin, Germany

11:45-12:10 Constraint Preconditioning for the Coupled Stokes-Darcy System
Scott Ladenheim and Daniel B. Szyld, Temple University, USA; Prince Chidyagwai, Loyola University, USA

Wednesday, October 28

MS30

Matrix Scaling - Theory and Algorithms

10:15 AM-12:15 PM

Room:Piedmont - Atlanta Conference Level

Diagonal scaling is an important preprocessing step in a wide range of numerical algorithms. Scaling can also be used to highlight certain features or to provide different normal forms for matrices. In this minisymposium four talks will explore new research in the use of scalings in numerical linear algebra, principally in connection to solving linear systems and eigenproblems. As well as new techniques for using scaling to help solve NLA problems there will be some discussion of the algorithms used to compute these scalings.

Organizer: James Hook
University of Manchester, United Kingdom

10:15-10:40 Squish Scalings
James Hook, University of Manchester, United Kingdom

10:45-11:10 Max-Balancing Hungarian Scalings
Francoise Tisseur, James Hook, and Jennifer Pestana, University of Manchester, United Kingdom

11:15-11:40 Hungarian Scaling of Polynomial Eigenproblems
Marianne Akian, Stephane Gaubert, and *Andrea Marchesini*, INRIA and CMAP, Ecole Polytechnique, France; Francoise Tisseur, University of Manchester, United Kingdom

11:45-12:10 Using Matrix Scaling to Identify Block Structure
Philip Knight, University of Strathclyde, United Kingdom

Wednesday, October 28

MS31

Numerical Linear Algebra in Large-scale Optimization

10:15 AM-12:15 PM

Room:Spring - Atlanta Conference Level

Many large-scale optimization methods involve solving linear systems quickly and reliably at each iteration. Often matrix sparsity and structure are exploited to make these calculations computationally feasible. This minisymposium will highlight the latest contributions from various optimization approaches, including trust-region methods, sequential quadratic programming, and derivative-free optimization.

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

10:15-10:40 Obtaining Singular Value Decompositions in a Distributed Environment
Ben-Hao Wang and Joshua Griffin, SAS Institute, Inc., USA

10:45-11:10 Linear Algebra Software in Nonlinear Optimization
Elizabeth Wong, University of California, San Diego, USA

11:15-11:40 A High-Accuracy SR1 Trust-Region Subproblem Solver for Large-Scale Optimization
Jennifer Erway, Wake Forest University, USA

11:45-12:10 Compact Representation of Quasi-Newton Matrices
Roummel F. Marcia, University of California, Merced, USA

Wednesday, October 28

MS32

Numerical Linear Algebra Issues in the Solution of Stochastic PDEs

10:15 AM-12:15 PM

Room:Roswell - Atlanta Conference Level

The numerical treatment of mathematical models that also account for uncertainties in the data gives rise to a wide class of new linear algebra problems. These are characterized by a high level of complexity, caused by both the exploding number of variables, and the presence of many parameters whose variability is crucial for assessing the model reliability and for subsequent simulation purposes. The aim of the minisymposium is to present new numerical linear algebra techniques, system solvers and preconditioners, specifically designed to efficiently solve these problems, by appropriately handling memory consumption and by limiting computational costs.

Organizer: Valeria Simoncini
Universita' di Bologna, Italy

10:15-10:40 Hierarchical Low Rank Approximation for Extreme Scale Uncertainty Quantification
Lars Grasedyck, RWTH Aachen University, Germany; Jonas Ballani, EPFL, Switzerland; Christian Loebbert, RWTH Aachen University, Germany

10:45-11:10 Low-Rank Cross Approximation Methods for Reduction of Parametric Equations
Sergey Dolgov, Max Planck Institute, Magdeburg, Germany

11:15-11:40 Stochastic Galerkin Method for the Steady State Navier-Stokes Equations
Bedrich Sousedik, University of Maryland, Baltimore County, USA; Howard C. Elman, University of Maryland, College Park, USA

11:45-12:10 Interpolation of Inverse Operators for Preconditioning Parameter-Dependent Equations and Projection-Based Model Reduction Methods
Anthony Nouy, Ecole Centrale de Nantes, France

Wednesday, October 28

MS33

Numerical Rootfinding: Computational Methods & Applications

10:15 AM-12:15 PM

Room:Techwood - Atlanta Conference Level

Despite an overwhelming body of published research on the numerical computation of roots of uni- and multivariate polynomials, the development of efficient and accurate/stable algorithms remains a challenge. In this minisymposium we present some of the latest developments and techniques in this field, including fast and stable computation of univariate polynomial roots, along with roots or poles of meromorphic functions, conditioning analysis of multivariate multivariate rootfinding via resultants, and local optimization for the computations of zeros of complex harmonic mappings. By bringing together strong researchers with diverse backgrounds, we hope to stimulate new research directions and foster future collaborations.

Organizer: Yuji Nakatsukasa
University of Tokyo, Japan

Organizer: Robert Luce
EPFL, Switzerland

10:15-10:40 Global and Local Methods for Solving the Gravitational Lens Equation
Robert Luce, EPFL, Switzerland

10:45-11:10 Fast and Stable Computation of the Roots of Polynomials
Thomas Mach, Katholieke Universiteit Leuven, Belgium; Jared Aurentz, University of Oxford, United Kingdom; Raf Vandebril, Katholieke Universiteit Leuven, Belgium; David S. Watkins, Washington State University, USA

11:15-11:40 Stable Polefinding-Rootfinding and Rational Least-Squares Fitting Via Eigenvalues
Shinji Ito and *Yuji Nakatsukasa*, University of Tokyo, Japan

11:45-12:10 Resultant Methods for Multidimensional Rootfinding Are Exponentially Unstable
Vanni Noferini, University of Manchester, United Kingdom; Alex Townsend, Massachusetts Institute of Technology, USA

Wednesday, October 28

MS34

Randomness in Spectral Analysis

10:15 AM-12:15 PM

Room:Vinings - Atlanta Conference Level

Spectral methods have become a fundamental tool with a broad range of applications in several areas including machine learning, data mining, web search and ranking, scientific computing, and computer vision. This minisymposium addresses the use of spectral methods when randomness is heavily involved, such as randomized spectral algorithms and the spectral analysis of random inputs. The speakers will present recent advances concerning both theoretical and practical problems, including improvements over classical perturbation bounds (such as Weyl's inequality and the Davis-Kahan theorem), advancements in independent component analysis, and new spectral algorithms for the stochastic block model.

Organizer: Sean O'Rourke
University of Colorado Boulder, USA

Organizer: Van Vu
Yale University, USA

10:15-10:40 Singular Values and Vectors under Random Perturbation
Sean O'Rourke, University of Colorado Boulder, USA; Van Vu, Yale University, USA; Ke Wang, University of Minnesota, USA

10:45-11:10 Applications of Matrix Perturbation Bounds with Random Noise in Matrix Recovery Problems
Sean O'Rourke, University of Colorado Boulder, USA; Van Vu, Yale University, USA; *Ke Wang*, University of Minnesota, USA

11:15-11:40 The Stochastic Block Model and Communities in Sparse Random Graphs: Detection at Optimal Rate
Anup Rao, Yale University, USA

11:45-12:10 Robust Tensor Decomposition and Independent Component Analysis
Santosh Vempala, Georgia Institute of Technology, USA; Navin Goyal, Microsoft Research, India; Ying Xiao, Palantir, USA

Wednesday, October 28

CP9

Matrix Functions and Nonlinear Eigenvalue Problems

10:15 AM-12:15 PM

Room:Marietta - Atlanta Conference Level

Chair: Sarah W. Gaaf, Eindhoven University of Technology, Netherlands

10:15-10:30 Approximating the Leading Singular Triplets of a Large Matrix Function
Sarah W. Gaaf, Eindhoven University of Technology, Netherlands; Valeria Simoncini, Universita' di Bologna, Italy

10:35-10:50 Inverse Probing for Estimating *diag(f(A))*
Jesse Laeuchli and Andreas Stathopoulos, College of William & Mary, USA

10:55-11:10 The Waveguide Eigenvalue Problem and the Tensor Infinite Arnoldi Method
Giampaolo Mele and Elias Jarlebring, KTH Royal Institute of Technology, Sweden; Olof Runborg, KTH Stockholm, Sweden

11:15-11:30 Verified Solutions of Delay Eigenvalue Problems with Multiple Eigenvalues
Shinya Miyajima, Gifu University, Japan

11:35-11:50 Taylor's Theorem for Matrix Functions and Pseudospectral Bounds on the Condition Number
Samuel Relton and Edvin Deadman, University of Manchester, United Kingdom

11:55-12:10 Contour Integration Via Rational Krylov for Solving Nonlinear Eigenvalue Problems
Roel Van Beeumen, Karl Meerbergen, and Wim Michiels, Katholieke Universiteit Leuven, Belgium

Wednesday, October 28

CP10

Matrix Factorizations and Numerical Stability

10:15 AM-12:15 PM

Room:University - Atlanta Conference Level

Chair: Nicola Mastronardi, Istituto per le Applicazioni del Calcolo "Mauro Picone", Italy

10:15-10:30 On the Factorization of Symmetric Indefinite Matrices into Anti-Triangular Ones
Nicola Mastronardi, Istituto per le Applicazioni del Calcolo "Mauro Picone", Italy; Paul Van Dooren, Universite Catholique de Louvain, Belgium

10:35-10:50 A Block Gram-Schmidt Algorithm with Reorthogonalization and Conditions on the Tall, Skinny Qr
Jesse L. Barlow, Pennsylvania State University, USA

10:55-11:10 Block Methods for Solving Banded Symmetric Linear Systems
Linda Kaufman, William Paterson University, USA

11:15-11:30 Gram-Schmidt Process with Respect to Bilinear Forms
Miro Rozloznik, Czech Academy of Sciences, Czech Republic

11:35-11:50 Roundoff Error Analysis of the Choleskyqr2 and Related Algorithms
Yusaku Yamamoto, University of Electro-Communications, Japan; Yuji Nakatsukasa, University of Tokyo, Japan; Yuuka Yanagisawa, Waseda University, Japan; Takeshi Fukaya, Hokkaido University, Japan

11:55-12:10 Mixed-Precision Orthogonalization Processes
Ichitaro Yamazaki, University of Tennessee, Knoxville, USA; Jesse L. Barlow, Pennsylvania State University, USA; Stanimire Tomov, Jakub Kurzak, and Jack J. Dongarra, University of Tennessee, Knoxville, USA

Lunch Break

12:15 PM-1:45 PM

Attendees on their own

Wednesday, October 28

IP8

Numerical Solution of Eigenvalue Problems Arising in the Analysis of Disc Brake Squeal

1:45 PM-2:30 PM

Room:International Ballroom - Lower Level 1

Chair: Francoise Tisseur, University of Manchester, United Kingdom

We present adaptive numerical methods for the solution of parametric eigenvalue problems arsing from the discretization of partial differential equations modeling disc brake squeal. The eigenvectors are used for model reduction to achieve a low order model that can be used for optimization and control. The model reduction method is a variation of the proper orthogonal decomposition method. Several important challenges arise, some of which can be traced back to the finite element modeling stage. Compared to the current industrial standard our new approach is more accurate in vibration prediction and achieves a better reduction in model size. This comes at the price of an increased computational cost, but it still gives useful results when the traditional method fails to do so. We illustrate the results with several numerical experiments, some from real industrial models and indicate where improvements of the current black box industrial codes are advisable. We then also discuss the use of adaptive methods such as the adaptive finite element model and the algebraic multilevel substructering method for the discussed problem, and we point out the challenges and deficiencies in these approaches.

Volker Mehrmann
Technische Universitaet Berlin, Germany

Wednesday, October 28

Poster Blitz

2:30 PM-3:00 PM

Room:International Ballroom - Lower Level 1

PP1

Poster Session and Coffee Break

3:00 PM-5:00 PM

Room:Embassy Hall - Lower Level 2

On the Global Convergence of the Cyclic Jacobi Methods for the Symmetric Matrix of Order 4
Erna Begovic and Vjeran Hari, University of Zagreb, Croatia

Pivotality of Nodes in Reachability Problems Using Avoidance and Transit Hitting Time Metrics
Daniel L. Boley, Golshan Golnari, Yanhua Li, and Zhi-Li Zhang, University of Minnesota, USA

A Constructive Proof of Upper Hessenberg Form for Matrix Polynomials
Thomas R. Cameron, Washington State University, USA

A New Parallel Sparse Linear Solver
Chao Chen, Stanford University, USA

Towards Batched Linear Solvers on Accelerated Hardware Platforms
Tingxing Dong, University of Tennessee, USA; Azzam Haidar and Stanimire Tomov, University of Tennessee, Knoxville, USA; Piotr Luszczek, University of Tennessee, USA; Jack J. Dongarra, University of Tennessee, Knoxville, USA

Improved Incremental 2-Norm Condition Estimation of Triangular Matrices
Jurjen Duintjer Tebbens, Academy of Sciences of the Czech Republic, Prague, Czech Republic; Miroslav Tuma, Czech Republic Academy of Science, Czech Republic

A New Regularization Method for Computational Color Constancy
Malena I. Espanol and Michael Wransky, University of Akron, USA

Design and Analysis of a Low-Memory Multigrid Algorithm
Stefan Henneking, Georgia Institute of Technology, USA

Anderson Acceleration of the Alternating Projections Method for Computing the Nearest Correlation Matrix
Nicholas Higham and Nataša Strabić University of Manchester, United Kingdom

Block Preconditioning for Time-Dependent Coupled Fluid Flow Problems
Victoria Howle and Ashley Meek, Texas Tech University, USA

Structured Computations of Block Matrices with Application in Quantum Monte Carlo Simulation
Chengming Jiang, Zhaojun Bai, and Richard Scalettar, University of California, Davis, USA

MHD Stagnation Point over a Stretching Cylinder with Variable Thermal Conductivity
Farzana Khan, Quaid-i-Azam University, Islamabad, Pakistan

On Simple Algorithm Approximating Arbitrary Real Powers A^{α} of a Matrix from Number Representation System
Yeonji Kim, Pusan National University, Busan (Pusan), Republic of Korea; Jong-Hyeon Seo, Daegu Gyeongbuk Institute of Science and Technology, Korea; Hyun-Min Kim, Pusan National University, Busan (Pusan), Republic of Korea

Cycles of Linear and Semilinear Mappings
Tetiana Klymchuk, Taras Shevchenko University of Kyiv, Ukraine

Regularization of the Kernel Matrix via Covariance Matrix Shrinkage Estimation
Tomer Lancewicki, University of Tennessee, USA

Computationally Enhanced Projection Methods for Symmetric Lyapunov Matrix Equations
Davide Palitta and Valeria Simoncini, Universita' di Bologna, Italy

continued in next column

continued on next page

Wednesday, October 28

PP1

Poster Session and Coffee Break

3:00 PM-5:00 PM

continued

Fast Interior Point Solvers for PDE-Constrained Optimization
John Pearson, University of Kent, United Kingdom

An Optimal Solver for Linear Systems Arising from Stochastic FEM Approximation of Diffusion Equations with Random Coefficients
Pranjal Prasad and David Silvester, University of Manchester, United Kingdom

Approximation of the Scattering Amplitude Using Nonsymmetric Saddle Point Matrices
Amber S. Robertson, University of Southern Mississippi, USA

Generalizing Block Lu Factorization:A Lower-Upper-Lower Block Triangular Decomposition with Minimal Off-Diagonal Ranks
François Serre and Markus Püschel, ETH Zürich, Switzerland

Existence and Uniqueness for the Inverse Problem for Linear and Linear-in-parameters Dynamical Systems
Shelby Stanhope, University of Pittsburgh, USA

Is Numerical Stability an Important Issue in Iterative Computations?
Zdenek Strakos, Charles University, Czech Republic

Computing Geodesic Rotations
Brian D. Sutton, Randolph-Macon College, USA

On the Numerical Behavior of Quadrature-based Bounds for the *A*-Norm of the Error in CG
Petr Tichy, Academy of Sciences of the Czech Republic, Prague, Czech Republic; Gerard Meurant, Retired from Commissariat a l'Energie Atomique (CEA), France

continued in next column

A Set of Fortran 90 and Python Routines for Solving Linear Equations with IDR(s)
Martin B. van Gijzen and Reinaldo Astudillo, Delft University of Technology, Netherlands

Tensor Notation: What Would Hamlet Say?
Charles Van Loan, Cornell University, USA

Pseudospectra Computation Via Rank-Revealing QR Factorization
Zhengsheng Wang, Nanjing University of Aeronautics and Astronautics, China; Lothar Reichel, Kent State University, USA; Min Zhang and Xudong Liu, Nanjing University of Aeronautics and Astronautics, China

Linear Response and the Estimation of Absorption Spectrum in Time-Dependent Density Functional Theory
Chao Yang, Lawrence Berkeley National Laboratory, USA

Best Rank-1 Approximations Without Orthogonal Invariance for the 1-norm and Frobenius 1-norm
Varun Vasudevan, Purdue University, USA; Tim Poston, Forus Health, USA; David F. Gleich, Purdue University, USA

Conference Dinner Banquet *(separate fee applies; ticket required)*

6:00 PM-9:00 PM

Room:Regency V - Ballroom Level

See page 3 for additional details.

Thursday, October 29

Registration

7:30 AM-4:00 PM

Room:Embassy Hall Foyer - Lower Level 2

Announcements

8:00 AM-8:15 AM

Room:International Ballroom - Lower Level 1

IP9

Linear Algebra Computations for Parameterized Partial Differential Equations

8:15 AM-9:00 AM

Room:International Ballroom - Lower Level 1

Chair: Alison Ramage, University of Strathclyde, United Kingdom

The numerical solution of partial differential equations (PDEs) often entails the solution of large linear systems of equations. This compute-intensive task becomes more challenging when components of the problem such as coefficients of the PDE depend on parameters that are uncertain or variable. In this scenario, there there is a need to compute many solutions for a single simulation, and for accurate discretizations, costs may be prohibitive. We discuss new computational algorithms designed to improve efficiency in this setting, with emphasis on new algorithms to handle stochastic problems and new approaches for reduced-order models.

Howard C. Elman

University of Maryland, College Park, USA

Thursday, October 29

IP10

Accurate Linear Algebra in Computational Methods for System and Control Theory

9:00 AM-9:45 AM

Room:International Ballroom - Lower Level 1

Chair: Zdenek Strakos, Charles University, Czech Republic

We discuss the importance of robust and accurate implementation of core numerical linear algebra procedures in computational methods for system and control theory. In particular, we stress the importance of error and perturbation analysis that identifies relevant condition numbers and guides computation with noisy data, and careful software implementation. The themes used as case studies include rational matrix valued least squares fitting (e.g. least squares fit to frequency response measurements of an LTI system), model order reduction issues (e.g. the Discrete Empirical Interpolation Method (DEIM)), accurate computation with structured matrices such as scaled Cauchy, Vandermonde and Hankel matrices.

Zlatko Drmac
University of Zagreb, Croatia

Coffee Break

9:45 AM-10:15 AM

Room:Embassy Hall - Lower Level 2

Thursday, October 29

MS35

A Celebration in Honor of Dianne P. O'Leary on the Occasion of her Retirement - Part I of II

10:15 AM-12:15 PM

Room:International Ballroom North - Lower Level 1

For Part 2 see MS42

Dianne P. O'Leary has made broad contributions to numerical linear algebra, numerical optimization, and scientific computing since the 1970s, and this minisymposium is a celebration of those accomplishments. Her contributions include fundamental work in preconditioned (block) conjugate gradient algorithms, multisplitting iterative methods, numerical solution of ill-poised problems, iterative methods in optimization, Markov chain analysis, and much more. Her work has found application in image processing, quantum computing, information retrieval, text summarization, and biomedicine, and many other areas. The talks in this minisymposium will highlight the breadth and depth of Dianne O'Leary's influential career.

Organizer: Misha E. Kilmer
Tufts University, USA

Organizer: Tamara G. Kolda
Sandia National Laboratories, USA

Organizer: James G. Nagy
Emory University, USA

Organizer: Julianne Chung
Virginia Tech, USA

10:15-10:40 A Hybrid LSMR Algorithm for Large-Scale Tikhonov Regularization
Julianne Chung, Virginia Tech, USA; Katrina Palmer, Appalachian State University, USA

10:45-11:10 Solving Eigenvalue and Linear System Problems on GPU for Three-Dimentional Photonic Device Simulations
Weichung Wang, National Taiwan University, Taiwan

11:15-11:40 A Flexible Regression Model for Count Data
Kimberly F. Sellers, Georgetown University, USA

11:45-12:10 Lanczos Bidiagonalization with Subspace Augementation for Discrete Inverse Problems
Per Christian Hansen, Technical University of Denmark, Denmark

continued in next column

Thursday, October 29

MS36

Linear Algebra for PDE-constrained Optimization

10:15 AM-12:15 PM

Room:International Ballroom South - Lower Level 1

Real-world processes from far-reaching areas of science and industry may be formulated as PDE-constrained optimization problems. As these problems typically lead to huge scale matrix systems upon discretization, it is therefore crucial to develop fast and efficient numerical solvers tailored specifically to the application at hand. In this minisymposium we wish to draw upon and combine state-of-the-art methods for solving these systems, using techniques from multigrid, block preconditioning, domain decomposition, and others. We also provide an outlook to future challenges in the field, as well as practical scientific applications of these important problems.

Organizer: Tyrone Rees
Rutherford Appleton Laboratory, United Kingdom

Organizer: John W. Pearson
University of Edinburgh, United Kingdom

10:15-10:40 The Iterative Solution of Systems from Pde Constrained Optimization: An Overview
Tyrone Rees, Rutherford Appleton Laboratory, United Kingdom

10:45-11:10 Rotated Block Two-by-Two Preconditioners Based on Pmhss
Zhong-Zhi Bai, Chinese Academy of Sciences, China

11:15-11:40 Optimal Order Multigrid Preconditioners for Linear Systems Arising in the Semismooth Newton Method Solution Process of a Class of Control-Constrained Problems
Andrei Draganescu, University of Maryland, Baltimore County, USA; Jyoti Saraswat, Thomas More College, USA

11:45-12:10 Inexact Full-space Methods for PDE-constrained Optimization
Denis Ridzal, Sandia National Laboratories, USA

Thursday, October 29

MS37

Large-Scale Eigenvalue Computations - Part I of II

10:15 AM-12:15 PM

Room:Piedmont - Atlanta Conference Level

For Part 2 see MS44
The increasing complexity of modern physical simulations and data analysis tasks, as well as advances in computational hardware, are introducing new challenges for existing eigensolver technologies. Such challenges include, among others, solution of yet larger eigenvalue problems, efficient computation of interior eigenpairs, approximation of large invariant subspaces, problems with nonlinearity and structure. This minisymposium addresses recent developments in methodologies for large-scale eigenvalue computations and highlights applications where they play a critical role.

Organizer: Meiyue Shao
Lawrence Berkeley National Laboratory, USA

Organizer: Eugene Vecharynski
Lawrence Berkeley National Laboratory, USA

10:15-10:40 Eigenvalues and Beyond
Andrew Knyazev, Mitsubishi Electric Research Laboratories, USA

10:45-11:10 Spectrum Slicing by Polynomial and Rational Function Filtering
Yousef Saad, University of Minnesota, USA

11:15-11:40 Implementation of LOBPCG for Symmetric Eigenvalue Problems in SLEPc
Jose E. Roman, Universidad Politecnica de Valencia, Spain

11:45-12:10 Techniques for Computing a Large Number of Eigenpairs of Sparse, Hermitian Matrices
Andreas Stathopoulos and Eloy Romero Alcalde, College of William & Mary, USA

Thursday, October 29

MS38

Fast Solvers in Numerical Linear Algebra - Part I of II

10:15 AM-12:15 PM

Room:Spring - Atlanta Conference Level

For Part 2 see MS45
The numerical solution of large linear algebra problems is involved in the inner most loop of many academic and industrial simulations and is consequently often the most time-consuming computation in many large-scale computer simulations in science and engineering. The design of numerical kernels with reduced computational costs (flops and memory footprint) is of prime interest on the route to extreme scale. In this minisymposium, we intend to review a few of the recent advents in these directions covering data-sparse calculations and FMM calculations

Organizer: Olivier Coulaud
INRIA, France

Organizer: Eric F. Darve
Stanford University, USA

Organizer: Xiaoye Sherry Li
Lawrence Berkeley National Laboratory, USA

10:15-10:40 Fast Solvers for H^2 Matrices Using Sparse Algebra
Mohammad Hadi Pour Ansari, Eric F. Darve, Zhengyu Huang, and Pieter Coulier, Stanford University, USA

10:45-11:10 Title Not Available at Time of Publication
Gunnar Martinsson, University of Colorado Boulder, USA

11:15-11:40 A Tensor Train Decomposition Solver for Integral Equations on Two and Three Dimensions
Denis Zorin and Eduardo Corona, Courant Institute of Mathematical Sciences, New York University, USA; Abtin Rahimian, Georgia Institute of Technology, USA

11:45-12:10 Data Sparse Techniques for Parallel Hybrid Solvers
Yuval Harness, INRIA, France; Eric F. Darve, Stanford University, USA; Luc Giraud and Emmanuel Agullo, INRIA, France

Thursday, October 29

MS39

Recent Developments in Low-rank Preconditioning Techniques

10:15 AM-12:15 PM

Room:Roswell - Atlanta Conference Level

This minisymposium presents latest advances in low-rank approximation-based preconditioning techniques. These new preconditioners seek data sparsity rather than the standard non-zero sparsity in the matrices and offer promising alternatives to the incomplete LU-type preconditioners on modern high performance computers. We bring together researchers who study these techniques with different methodologies and initiate an effort to assemble the different ideas to further improve the performance of these techniques.

Organizer: Yuanzhe Xi
University of Minnesota, USA

Organizer: Yousef Saad
University of Minnesota, USA

10:15-10:40 An Algebraic Multilevel Preconditioner with Low-Rank Corrections for General Sparse Symmetric Matrices
Yuanzhe Xi, Yousef Saad, and Ruipeng Li, University of Minnesota, USA

10:45-11:10 A Robust Algebraic Schur Complement Preconditioner Based on Low Rank Corrections
Laura Grigori, INRIA, France; Frederic Nataf, Laboratoire Jacques-Louis Lions, France; Soleiman Yousef, IFPEN, France

11:15-11:40 Approximating Kernel Matrix with Recursive Low-Rank Structure
Jie Chen, Argonne National Laboratory, USA

11:45-12:10 A Comparison of Different Low-Rank Approximation Techniques
Francois-Henry Rouet, Lawrence Berkeley National Laboratory, USA; Patrick Amestoy, Université of Toulouse, France; Cleve Ashcraft, Livermore Software Technology Corporation, USA; Alfredo Buttari, CNRS, France; Pieter Ghysels, Lawrence Berkeley National Laboratory, USA; Jean-Yves L'Excellent, INRIA-LIP-ENS Lyon, France; Xiaoye Sherry Li, Lawrence Berkeley National Laboratory, USA; Theo Mary, Universite de Toulouse, France; Clément Weisbecker, Livermore Software Technology Corporation, USA

Thursday, October 29

MS40

Multilinear Algebra, Markov Chains, and Hypergraphs - Part I of II

10:15 AM-12:15 PM

Room:Techwood - Atlanta Conference Level

For Part 2 see MS47
There was a rich interplay between matrix algebra, Markov chains, and graph theory with key results such as the link between the existence of a stationary distribution of a Markov chain, the connectedness of the associated graph, and the convergence of the power method. Recent results have shown various generalizations of these ideas to the cases of higher-order Markov chains and hypergraphs through the use of multilinear algebra on hypermatrices or tensors. In this minisymposia, we seek to survey the state of the art and identify key challenges and open questions regarding these connections.

Organizer: David F. Gleich
Purdue University, USA

Organizer: Lek-Heng Lim
University of Chicago, USA

10:15-10:40 Spacey Random Walks, Tensor Eigenvalues, and Multilinear PageRank
David F. Gleich, Purdue University, USA; Lek-Heng Lim, University of Chicago, USA; Austin Benson, Stanford University, USA

10:45-11:10 Spectral Clustering with Tensors
Austin Benson, Stanford University, USA; David F. Gleich, Purdue University, USA; Jure Leskovec, Stanford University, USA

11:15-11:40 Eigenvalues of Tensors and a Second Order Markov Chain
Shenglong Hu, University of Chicago, USA

11:45-12:10 The Anatomy of the Second Dominant Eigenvalue in a Transition Probability Tensor --- The Power Iteration for Markov Chains with Memory
Moody T. Chu, North Carolina State University, USA; Sheng-Jhih Wu, Soochow University, China

Thursday, October 29

MS41

Hierarchically Rank-Structured Matrix Techniques - Part I of II

10:15 AM-12:15 PM

Room:Vinings - Atlanta Conference Level

For Part 2 see MS46
Recent years have seen significant advances in the field of rank-structured methods that extend the fundamental ideas of multipole and panel-clustering methods to general non-local solution operators. While there exist various more or less closely related methods, the unifying aim of these methods is to reduce the computational complexity of matrix computations through the exploitation of efficient hierarchically structured low-rank approximations. In this minisymposium, we aim to present and discuss recent new developments such as efficient linear complexity algorithms, the construction of direct solvers for partial differential and integral equations, as well as aspects of implementation.

Organizer: Sabine Le Borne
Hamburg University of Technology, Germany

Organizer: Jianlin Xia
Purdue University, USA

10:15-10:40 Hierarchical Matrix Factorization of the Inverse
Sabine Le Borne, Hamburg University of Technology, Germany

10:45-11:10 H-Matrices for Elliptic Problems: Approximation of the Inverses of FEM and BEM Matrices
Markus Melenk, Markus Faustmann, and Dirk Praetorius, Vienna University of Technology, Austria

11:15-11:40 Fast Direct Solvers as Preconditioners for Time Evolution Problems
Adrianna Gillman, Rice University, USA

11:45-12:10 Solving the Bethe-Salpeter Eigenvalue Problem using Low-rank Tensor Factorization and a Reduced Basis Approach
Peter Benner, Max Planck Institute, Magdeburg, Germany; Venera Khoromskaia, Max Planck Institute for Mathematics in the Sciences, Germany; Boris Khoromskij, Max Planck Institut Leipzig, Germany

Thursday, October 29

CP11

Structured Matrix Computations

10:15 AM-12:15 PM

Room:Marietta - Atlanta Conference Level

Chair: To Be Determined

10:15-10:30 A Fast Structured Eigensolver for Toeplitz Matrices
Xin Ye and Jianlin Xia, Purdue University, USA; Raymond H. Chan, Chinese University of Hong Kong, Hong Kong

10:35-10:50 A New Asynchronous Solver for Banded Linear Systems
Michael A. Jandron and Anthony Ruffa, Naval Undersea Warfare Center, USA; James Baglama, University of Rhode Island, USA

10:55-11:10 The Inverse of Two Level Topelitz Operator Matrices
Selcuk Koyuncu, University of North Georgia, USA; Hugo Woerdeman, Drexel University, USA

11:15-11:30 Recursive, Orthogonal, Radix-2, Stable Dct-Dst Algorithms and Applications
Sirani M. Perera, Embry-Riddle Aeronautical University, USA

11:35-11:50 Structured Condition Numbers for the Solution of Parameterized Quasiseparable Linear Systems
Kenet J. Pomés Portal, Universidad Carlos III de Madrid, Spain; Froilán M. Dopico, Universidad Carlos III, Spain

11:55-12:10 Local Fourier Analysis of Pattern Structured Operators
Hannah Rittich, Matthias Bolten, and Karsten Kahl, University of Wuppertal, Germany

Thursday, October 29

CP12

Numerical Linear Algebra on GPUs

10:15 AM-12:15 PM

Room:University - Atlanta Conference Level

Chair: Marc Baboulin, INRIA/University of Paris-Sud, France

10:15-10:30 Solving Dense Symmetric Indefinite Linear Systems on GPU Accelerated Architectures
Marc Baboulin, INRIA/University of Paris-Sud, France; Jack J. Dongarra, University of Tennessee, Knoxville, USA; Adrien Remy, University of Paris, France; Stanimire Tomov and Ichitaro Yamazaki, University of Tennessee, Knoxville, USA

10:35-10:50 A Parallel Divide-and-Conquer Algorithm for Computing the Moore-Penrose Inverses on Gpu
Xuzhou Chen, Fitchburg State University, USA; Jun Ji, Kennesaw State University, USA

10:55-11:10 Exploring Qr Factorization on Gpu for Quantum Monte Carlo Simulation
Eduardo F. D'Azevedo, Paul Kent, and Ying Wai Li, Oak Ridge National Laboratory, USA

11:15-11:30 Comparing Hybrid and Native GPU Acceleration for Linear Algebra
Mark Gates, University of Tennessee, USA; Azzam Haidar and Stanimire Tomov, University of Tennessee, Knoxville, USA

11:35-11:50 Efficient Eigensolver Algorithm on Accelerator Based Architecture
Azzam Haidar, University of Tennessee, Knoxville, USA; Piotr Luszczek, University of Tennessee, USA; Stanimire Tomov and Jack J. Dongarra, University of Tennessee, Knoxville, USA

11:55-12:10 Batched Matrix Computations on Hardware Accelerators Based on GPUs.
Azzam Haidar, University of Tennessee, Knoxville, USA; Ahmad Ahmad, University of Tennessee, USA; *Stanimire Tomov* and Jack J. Dongarra, University of Tennessee, Knoxville, USA

Lunch Break

12:15 PM-1:45 PM

Attendees on their own

Thursday, October 29

SP1

SIAG/Linear Algebra Prize Lecture - Localizing Nonlinear Eigenvalues: Theory and Applications

1:45 PM-2:30 PM

Room:International Ballroom - Lower Level 1

Chair: Danny C. Sorensen, Rice University, USA

Vibrations are everywhere, and so are the eigenvalues that describe them. Physical models that include involve damping, delay, or radiation often lead to nonlinear eigenvalue problems, in which we seek complex values for which an (analytic) matrix-valued function is singular. In this talk, we show how to generalize eigenvalue localization results, such as Gershgorin's theorem, Bauer-Fike, and pseudospectral theorems, to the nonlinear case. We demonstrate the usefulness of our results on examples from delay differential equations and quantum resonances.

David Bindel
Cornell University, USA

Coffee Break

2:30 PM-3:00 PM

Room:Embassy Hall - Lower Level 2

Thursday, October 29

MS42

A Celebration in Honor of Dianne P. O'Leary on the Occasion of her Retirement - Part II of II

3:00 PM-5:00 PM

Room:International Ballroom North - Lower Level 1

For Part 1 see MS35

Dianne P. O'Leary has made broad contributions to numerical linear algebra, numerical optimization, and scientific computing since the 1970s, and this minisymposium is a celebration of those accomplishments. Her contributions include fundamental work in preconditioned (block) conjugate gradient algorithms, multisplitting iterative methods, numerical solution of ill-poised problems, iterative methods in optimization, Markov chain analysis, and much more. Her work has found application in image processing, quantum computing, information retrieval, text summarization, and biomedicine, and many other areas. The talks in this minisymposium will highlight the breadth and depth of Dianne O'Leary's influential career.

Organizer: Misha E. Kilmer
Tufts University, USA

Organizer: Tamara G. Kolda
Sandia National Laboratories, USA

Organizer: James G. Nagy
Emory University, USA

Organizer: Julianne Chung
Virginia Tech, USA

3:00-3:25 Towards Textbook Multigrid for the Helmholtz Equation
Oliver G. Ernst, TU Chemnitz, Germany

3:30-3:55 Symmetric Tensor Analysis
Tamara G. Kolda, Sandia National Laboratories, USA

4:00-4:25 Matrix Computations and Text Summarization
John M. Conroy, Institute for Defense Analyses, USA

4:30-4:55 Blocks, Curves, and Splits: A Glimpse into the O'Leary Toolbox
Margaret H. Wright, Courant Institute of Mathematical Sciences, New York University, USA

Thursday, October 29

MS43

The Least Squares Challenge: Modern Methods and Applications

3:00 PM-5:00 PM

Room:International Ballroom South - Lower Level 1

The method of least squares (LS) is a commonly used approach to find an approximate solution of overdetermined or inexactly specified systems of equations. Since the 18th century, the solution of LS problems has been and continues to be a fundamental method in scientific data fitting and LS solvers are used across a wide range of disciplines. However, despite recent progress, solving LS problems efficiently and accurately remains a tough challenge. The aim of this minisymposium is to bring together researchers working on the development of new robust algorithms and software for linear and non-linear LS problems.

Organizer: Jennifer Scott
Rutherford Appleton Laboratory, United Kingdom

Organizer: Miroslav Tuma
Czech Republic Academy of Science, Czech Republic

3:00-3:25 The State-of-the-Art of Preconditioners for Sparse Linear Least Squares
Jennifer Scott and Nick Gould, Rutherford Appleton Laboratory, United Kingdom

3:30-3:55 LU Preconditioning for Full-Rank and Singular Sparse Least Squares
Michael A. Saunders, Nick W. Henderson, and Ding Ma, Stanford University, USA

4:00-4:25 Solving Large Scale NNLS Problems Arising In Computer Vision
Sameer Agarwal, Google, Inc., USA

4:30-4:55 Modulus Iterative Methods for Least Squares Problems with Box Constraints
Ning Zheng, The Graduate University for Advanced Studies, Sokendai, Japan; *Ken Hayami*, National Institute of Informatics, Japan; Jun-Feng Yin, Tongji University, China

Thursday, October 29

MS44

Large-Scale Eigenvalue Computations - Part II of II

3:00 PM-5:00 PM

Room:Piedmont - Atlanta Conference Level

For Part 1 see MS37

The increasing complexity of modern physical simulations and data analysis tasks, as well as advances in computational hardware, are introducing new challenges for existing eigensolver technologies. Such challenges include, among others, solution of yet larger eigenvalue problems, efficient computation of interior eigenpairs, approximation of large invariant subspaces, problems with nonlinearity and structure. This minisymposium addresses recent developments in methodologies for large-scale eigenvalue computations and highlights applications where they play a critical role.

Organizer: Meiyue Shao
Lawrence Berkeley National Laboratory, USA

Organizer: Eugene Vecharynski
Lawrence Berkeley National Laboratory, USA

3:00-3:25 Preconditioned Locally Harmonic Residual Methods for Interior Eigenvalue Computations
Eugene Vecharynski, Lawrence Berkeley National Laboratory, USA

3:30-3:55 Preconditioned Solvers for Nonlinear Hermitian Eigenproblems with Variational Characterization
Fei Xue, University of Louisiana, Lafayette, USA; Daniel B. Szyld, Temple University, USA; Eugene Vecharynski, Lawrence Berkeley National Laboratory, USA

4:00-4:25 A Structure-preserving Lanczos Algorithm for the Complex J-symmetric Eigenproblem
Heike Fassbender, TU Braunschweig, Germany; Peter Benner, Max Planck Institute, Magdeburg, Germany; Chao Yang, Lawrence Berkeley National Laboratory, USA

continued on next page

Thursday, October 29

MS44

Large-Scale Eigenvalue Computations - Part II of II

3:00 PM-5:00 PM

continued

4:30-4:55 Structure Preserving Algorithms for Solving the Bethe--Salpeter Eigenvalue Problem
Meiyue Shao, Lawrence Berkeley National Laboratory, USA; Felipe da Jornada, University of California, Berkeley, USA; Chao Yang, Lawrence Berkeley National Laboratory, USA; Jack Deslippe, National Energy Research Scientific Computing Center, USA; Steven Louie, University of California, Berkeley, USA

Thursday, October 29

MS45

Fast Solvers in Numerical Linear Algebra - Part II of II

3:00 PM-5:00 PM

Room:Spring - Atlanta Conference Level

For Part 1 see MS38
The numerical solution of large linear algebra problems is involved in the inner most loop of many academic and industrial simulations and is consequently often the most time-consuming computation in many large-scale computer simulations in science and engineering. The design of numerical kernels with reduced computational costs (flops and memory footprint) is of prime interest on the route to extreme scale. In this minisymposium, we intend to review a few of the recent advents in these directions covering data-sparse calculations and FMM calculations

Organizer: Olivier Coulaud
INRIA, France

Organizer: Eric F. Darve
Stanford University, USA

Organizer: Xiaoye Sherry Li
Lawrence Berkeley National Laboratory, USA

3:00-3:25 Algebraic Operations with H^2-Matrices
Steffen Börm, University of Kiel, Germany; Knut Reimer, Kiel University, Germany

3:30-3:55 Fast Hierarchical Randomized Methods for the Approximation of Large Covariance Matrices
Pierre Blanchard and Olivier Coulaud, INRIA, France; Eric F. Darve, Stanford University, USA

4:00-4:25 Comparison of FMM and HSS at Large Scale
Rio Yokota, Tokyo Institute of Technology, Japan; Francois-Henry Rouet and Xiaoye Sherry Li, Lawrence Berkeley National Laboratory, USA

4:30-4:55 Fast Numerical Linear Algebra for Kohn-Sham Density Functional Theory via Compression
Anil Damle and Lexing Ying, Stanford University, USA

Thursday, October 29

MS46

Hierarchically Rank-structured Matrix Techniques - Part II of II

3:00 PM-5:00 PM

Room:Vinings - Atlanta Conference Level

For Part 1 see MS41
Recent years have seen significant advances in the field of rank-structured methods that extend the fundamental ideas of multipole and panel-clustering methods to general non-local solution operators. While there exist various more or less closely related methods, the unifying aim of these methods is to reduce the computational complexity of matrix computations through the exploitation of efficient hierarchically structured low-rank approximations. In this minisymposium, we aim to present and discuss recent new developments such as efficient linear complexity algorithms, the construction of direct solvers for partial differential and integral equations, as well as aspects of implementation.

Organizer: Sabine Le Borne
Hamburg University of Technology, Germany

Organizer: Jianlin Xia
Purdue University, USA

3:00-3:25 Some Recent Progress on Algorithms for FMM Matrices
Shivkumar Chandrasekaran, University of California, Santa Barbara, USA; Kristen Lessel, University of California, Santa Barbara, USA

3:30-3:55 Fast Linear Solvers for Weakly Hierarchical Matrices
Eric F. Darve, Pieter Coulier, and Mohammad Hadi Pour Ansari, Stanford University, USA

4:00-4:25 MHS Structures for the Direct Solution of Multi-Dimensional Problems
Jianlin Xia, Purdue University, USA

4:30-4:55 A Stable and Efficient Matrix Version of the Fast Multipole Method
Difeng Cai and Jianlin Xia, Purdue University, USA

Thursday, October 29

MS47

Multilinear Algebra, Markov Chains, and Hypergraphs - Part II of II

3:00 PM-5:00 PM

Room:Techwood - Atlanta Conference Level

For Part 1 see MS40

There was a rich interplay between matrix algebra, Markov chains, and graph theory with key results such as the link between the existence of a stationary distribution of a Markov chain, the connectedness of the associated graph, and the convergence of the power method. Recent results have shown various generalizations of these ideas to the cases of higher-order Markov chains and hypergraphs through the use of multilinear algebra on hypermatrices or tensors. In this minisymposia, we seek to survey the state of the art and identify key challenges and open questions regarding these connections.

Organizer: David F. Gleich
Purdue University, USA

Organizer: Lek-Heng Lim
University of Chicago, USA

3:00-3:25 Positive Diagonal Scaling of a Nonnegative Tensor to One with Prescribed Slice Sums
Shmuel Friedland, University of Illinois, Chicago, USA

3:30-3:55 The Laplacian Tensor of a Multi-Hypergraph
Kelly Pearson, Murray State University, USA

4:00-4:25 A Semi-Tensor Product Approach for Probabilistic Boolean Networks
Xiaoqing Cheng, Yushan Qiu, Wenpin Hou, and Wai-Ki Ching, University of Hong Kong, China

4:30-4:55 Open Problems and Concluding Discussions
David F. Gleich, Purdue University, USA; Lek-Heng Lim, University of Chicago, USA

Thursday, October 29

MS48

Parallel Sparse Linear Solvers

3:00 PM-5:00 PM

Room:Roswell - Atlanta Conference Level

The numerical solution of large sparse systems of linear equations is important in computational science. Although this is a mature field, the trend of higher concurrency in computer architectures suggests we revisit strategies for complete and incomplete factorizations. This minisymposium will feature current work in parallel linear solvers, both sparse direct and approximate (incomplete) factorizations for preconditioning iterative solvers.

Organizer: Erik G. Boman
Sandia National Laboratories, USA

Organizer: Siva Rajamanickam
Sandia National Laboratories, USA

3:00-3:25 Parallel Multilevel Incomplete LU Factorization Preconditioner with Variable-Block Structure
Masha Sosonkina, Old Dominion University, USA; Bruno Carpentieri, University of Groningen, Netherlands

3:30-3:55 Basker: A Scalable Sparse Direct Linear Solver for Many-Core Architectures
Joshua D. Booth, Siva Rajamanickam, and Erik G. Boman, Sandia National Laboratories, USA

4:00-4:25 A Sparse Direct Solver for Distributed Memory GPU and Xeon Phi Accelerated Systems
Piyush Sao, Xing Liu, and Richard Vuduc, Georgia Institute of Technology, USA; Xiaoye Sherry Li, Lawrence Berkeley National Laboratory, USA

4:30-4:55 Parallel Iterative Incomplete Factorizations and Triangular Solves
Aftab Patel, Georgia Institute of Technology, USA; Siva Rajamanickam and Erik G. Boman, Sandia National Laboratories, USA; Edmond Chow, Georgia Institute of Technology, USA

Thursday, October 29

CP13

Krlov Subspace Methods

3:00 PM-5:00 PM

Room:Marietta - Atlanta Conference Level

Chair: To Be Determined

3:00-3:15 Recycling Krylov Subspace Methods for Sequences of Linear Systems with An Application to Lattice Qcd
Nemanja Bozovic, University of Wuppertal, Germany; Andreas J. Frommer, Bergische Universität, Germany; Matthias Bolten, University of Wuppertal, Germany

3:20-3:35 Generalized Jacobi Matrices and Band Algorithms
Iveta Hnetynkova, Charles University, Czech Republic; Martin Plesinger, Technical University of Liberec, Czech Republic

3:40-3:55 Symmetric Inner-Iteration Preconditioning for Rank-Deficient Least Squares Problems
Keiichi Morikuni, University of Tsukuba, Japan

4:00-4:15 On Solving Linear Systems Using Adaptive Strategies for Block Lanczos Method
Christian E. Schaerer and Pedro Torres, National University of Asuncion, Paraguay; Amit Bhaya, Federal University of Rio de Janerio, Brazil

4:20-4:35 On Rotations and Approximate Rational Krylov Subspaces
Raf Vandebril and Thomas Mach, Katholieke Universiteit Leuven, Belgium; Miroslav Pranic, University of Banja Luka, Bosnia and Herzegovina

4:40-4:55 Improving Thick-Restarting Lanczos Method by Subspace Optimization For Large Sparse Eigenvalue Problems
Lingfei Wu and Andreas Stathopoulos, College of William & Mary, USA

Thursday, October 29

CP14

Preconditioning Methods

3:00 PM-5:00 PM

Room:University - Atlanta Conference Level

Chair: To Be Determined

3:00-3:15 Ca-Ilu Preconditioner
Sebastien Cayrols and Laura Grigori, INRIA, France; Sophie M. Moufawad, IFP Energies nouvelles, France

3:20-3:35 The Truncation of Low-Rank Preconditioner Updates with Applications
Eric De Sturler, Ming Li, and Vishwas Rao, Virginia Tech, USA

3:40-3:55 Interpretation of Algebraic Preconditioning As Transformation of the Discretization Basis
Tomáš Gergelits, Jan Papez, and Zdenek Strakos, Charles University, Czech Republic

4:00-4:15 Reusing and Recycling Preconditioners for Sequences of Matrices
Arielle K. Grim Mcnally and Eric De Sturler, Virginia Tech, USA

4:20-4:35 Right Preconditioned MINRES using Eisenstat-SSOR for Positive Semidefinite Systems
Kota Sugihara, The Graduate University for Advanced Studies, Sokendai, Japan; Ken Hayami, National Institute of Informatics, Japan

4:40-4:55 Lu Preconditioners for Non-Symmetric Saddle Point Matrices with Application to the Incompressible Navier-Stokes Equations
Maxium Olshanskii, University of Houston, USA

Friday, October 30

Registration

7:30 AM-2:30 PM

Room:Embassy Hall Foyer - Lower Level 2

Closing Remarks

8:00 AM-8:15 AM

Room:International Ballroom - Lower Level 1

IP11

Low Rank Decompositions of Tensors and Matrices: Theory, Applications, Perspectives

8:15 AM-9:00 AM

Room:International Ballroom - Lower Level 1

Chair: James G. Nagy, Emory University, USA

Numerical data are frequently organized as d-dimensional matrices, also called tensors. However, only small values of d are allowed since the computer memory is limited. In the case of many dimensions, special representation formats are crucial, e.g. so called tensor decompositions. Recently, the known tensor decompositions have been considerably revisited and the two of them, previously used only in theoretical physics, are now recognized as the most adequate and useful tools for numerical analysis. These two are the Tensor-Train and Hierarchical-Tucker decompositions. Both are intrinsically related with low-rank matrices associated with a given tensor. We present these decompositions and the role of low-rank matrices for the construction of efficient numerical algorithms.

Eugene Tyrtyshnikov
Russian Academy of Sciences, Russia

Friday, October 30

IP12

Constrained Low Rank Approximations for Scalable Data Analytics

9:00 AM-9:45 AM

Room:International Ballroom - Lower Level 1

Chair: James G. Nagy, Emory University, USA

Constrained low rank approximations have been widely utilized in large-scale data analytics where the applications reach far beyond the classical areas of scientific computing. We discuss some fundamental properties of nonnegative matrix factorization (NMF) and introduce some of its variants for clustering, topic discovery in text analysis, and community detection in social network analysis. In particular, we show how a simple rank 2 NMF combined with a divide-and-conquer framework results in a simple yet significantly more effective and scalable method for topic discovery. This simple approach can be further generalized for graph clustering and community detection. Substantial experimental results illustrate significant improvements both in computational time as well as quality of solutions obtained.

Haesun Park
Georgia Institute of Technology, USA

Coffee Break

9:45 AM-10:15 AM

Room:Embassy Hall - Lower Level 2

Friday, October 30

MS49

Recent Advances in Numerical Linear Algebra for Inverse Problems - Part I of II

10:15 AM-12:15 PM

Room:International Ballroom North - Lower Level 1

For Part 2 see MS55

Being able to compute reliable solutions to inverse problems is integral in many scientific applications. However, inverse problems are typically large-scale and ill-posed, presenting significant mathematical and computational challenges. Numerical linear algebra has been and continues to be essential in the development of robust and scalable algorithms to tackle these challenges. This minisymposium will highlight state-of-the-art research on numerical linear algebra for solving inverse problems from a wide range of applications including image deblurring, tomographic reconstruction, and hyperspectral imaging.

Organizer: Julianne Chung
Virginia Tech, USA

Organizer: Marco Donatelli
University of Insubria, Como, Italy

10:15-10:40 A Tensor-Based Dictionary Approach to Tomographic Image Reconstruction
Sara Soltani, Technical University of Denmark, Denmark; Misha E. Kilmer, Tufts University, USA; Per Christian Hansen, Technical University of Denmark, Denmark

10:45-11:10 Solving Sequential Strongly Underdetermined Systems Using Sherman-Morrison Iterations
Matthias Chung, Julianne Chung, and Joseph Slagel, Virginia Tech, USA

11:15-11:40 Efficient Iterative Methods for Quantitative Susceptibility Mapping
Lars Ruthotto, Emory University, USA

11:45-12:10 Some Inverse Problems in Optical Imaging for Remote Sensing
Robert Plemmons, Wake Forest University, USA

Friday, October 30

MS50

Innovative Methods for Eigenvalue Solutions - Part I of II

10:15 AM-12:15 PM

Room:International Ballroom South - Lower Level 1

For Part 2 see MS56

This minisymposium is concerned with innovative methods for eigenvalue solutions. Modern large-scale scientific computing and engineering simulations pose significant challenges to classical eigensolvers. New efficient and reliable methods are desired. In recent years, there are quite some exciting developments, such as those based on contour integrals, domain decompositions, stochastic methods, SS methods, structured techniques, etc. The minisymposium intends to discuss a wide spectrum of innovative eigensolvers, their analysis, and the related practical applications.

Organizer: Raymond H. Chan
Chinese University of Hong Kong, Hong Kong

Organizer: Jianlin Xia
Purdue University, USA

10:15-10:40 Domain Decomposition Algorithms for Large Hermitian Eigenvalue Problems
Yousef Saad, University of Minnesota, USA; Vasilis Kalantzis, University of Patras, Greece

10:45-11:10 A Contour Integral-based Parallel Eigensolver with Higher Complex Moments
Tetsuya Sakurai, Yasunori Futamura, and Akira Imakura, University of Tsukuba, Japan

11:15-11:40 On the Orthogonality of Eigenvectors Obtained from Parallel Spectral Projection Methods
Peter Tang, Intel Corporation, USA

11:45-12:10 A Contour-Integral Based Algorithm for Counting the Eigenvalues Inside a Region in the Complex Plane
Guojian Yin, Chinese Academy of Sciences, China

Friday, October 30

MS51

Preconditioning Techniques For Non-Symmetric or Symmetric Indefinite Matrices - Part I of II

10:15 AM-12:15 PM

Room:Piedmont - Atlanta Conference Level

For Part 2 see MS57

It is well-known that preconditioning is the key factor for the efficient solution of large sparse linear systems and eigenproblems. While for Symmetric Positive Definite matrices a number of robust and efficient algorithms are available for both sequential and parallel computations, the same does not hold true for Non-Symmetric and/or Symmetric Indefinite problems. The most frequent occurrence is the lack of robustness, with unstable numerical behaviors in both the preconditioner computation and application. This minisymposium aims at presenting the most recent advances on this topic, gathering worldwide experts to share experiences, challenges and new ideas.

Organizer: Massimiliano Ferronato
University of Padova, Italy

Organizer: Carlo Janna
University of Padova, Italy

Organizer: Miroslav Tuma
Czech Republic Academy of Science, Czech Republic

10:15-10:40 Iterative Construction of Non-Symmetric Factored Sparse Approximate Preconditioners
Carlo Janna, Massimiliano Ferronato, and Andrea Franceschini, University of Padova, Italy

10:45-11:10 Monte Carlo Synthetic Acceleration Methods for Sparse Linear Systems
Michele Benzi, Emory University, USA; Tom Evans and Steven Hamilton, Oak Ridge National Laboratory, USA; *Massimiliano Lupo Pasini*, Emory University, USA; Stuart Slattery, Oak Ridge National Laboratory, USA

continued on next page

Friday, October 30

MS51

Preconditioning Techniques For Non-Symmetric or Symmetric Indefinite Matrices - Part I of II

10:15 AM-12:15 PM

continued

11:15-11:40 Parallel Algorithms for Computing Functions of Matrix Inverses
Matthias Bollhoefer, TU Braunschweig, Germany

11:45-12:10 A Parallel Multifrontal Solver and Preconditioner Using Hierarchically Semiseparable Structured Matrices
Pieter Ghysels, Xiaoye Sherry Li, and Francois-Henry Rouet, Lawrence Berkeley National Laboratory, USA

Friday, October 30

MS52

Matrix Equations in Control Theory

10:15 AM-12:15 PM

Room:Spring - Atlanta Conference Level

Matrix equations play a fundamental role in control theory. Well known equations of the Lyapunov and Riccati types arise in the stability analysis and stabilization of control systems. In recent years, a large number of results on linear and nonlinear matrix equations have been developed. This mini symposium highlight recent advances and developments both analytical and numerical, of linear and nonlinear matrix equations with their applications in control systems analysis and design.

Organizer: Hermann Mena
University of Innsbruck, Austria

10:15-10:40 A Matrix Equation Approach for Incremental Linear Discriminant Analysis
Delin Chu, National University of Singapore, Republic of Singapore

10:45-11:10 Conditioning Number of Solutions of Matrix Equations in Stability Analysis
Mingqing Xiao, Southern Illinois University, Carbondale, USA

11:15-11:40 Splitting Schemes for Differential Riccati Equations
Tony Stillfjord, University of Gothenburg, Sweden

11:45-12:10 Riccati Equations Arising in Stochastic Control
Hermann Mena, University of Innsbruck, Austria

Friday, October 30

MS53

High-dimensional Approximation in Low Rank Tensor Formats - Part I of II

10:15 AM-12:15 PM

Room:Roswell - Atlanta Conference Level

For Part 2 see MS59

High-dimensional approximation has seen a revival since new linear algebra based low rank formats are available that scale linearly in the dimension. For these new formats, the Hierachical Tucker (HT) or Tensor Train (TT), there are many emerging hot topics like iterative approximation schemes and their convergence, completion for missing data, applications in uncertainty quantification, parametric model reduction, and many other directions of research. In this minisymposium we will present the theoretical foundation, new algorithms and analysis, and the use in applications.

Organizer: Lars Grasedyck
RWTH Aachen University, Germany

10:15-10:40 Kolmogorov Widths and Low-Rank Approximation of Parametric Problems
Markus Bachmayr and Albert Cohen, Université Pierre et Marie Curie, France

10:45-11:10 An Adaptive Tensor Method for High-Dimensional Parametric PDEs
Max Pfeffer, Technische Universität Berlin, Germany

11:15-11:40 A Greedy Method with Subspace Point of View for Low-Rank Tensor Approximation in Hierarchical Tucker Format
Loïc Giraldi and Anthony Nouy, Ecole Centrale de Nantes, France

11:45-12:10 Tensor Krylov Methods
Pieter Lietaert, Katholieke Universiteit Leuven, Belgium

Friday, October 30

MS54

Numerical Methods for Markov Chains and Stochastic Models

10:15 AM-12:15 PM

Room:Techwood - Atlanta Conference Level

Markov chains are a very popular modelling tool, and the research connected to their use is very close to linear algebra in its themes and techniques. Spectral theory, structured linear algebra, connectedness and reducibility properties are frequent topics. This minisymposium summarizes some recent advances in this area.

Organizer: Federico Poloni
University of Pisa, Italy

10:15-10:40 The Computation of the Key Properties of Markov Chains using a Variety of Techniques
Jeffrey J. Hunter, Auckland University of Technology, New Zealand

10:45-11:10 Complex Nonsymmetric Algebraic Riccati Equations Arising in Markov Modulated Fluid Flows
Changli Liu, Sichuan University, China; Jungong Xue, Fundan University, China

11:15-11:40 General Solution of the Poisson Equation for QBDs
Dario Bini, University of Pisa, Italy; Sarah Dendievel and Guy Latouche, Université Libre de Bruxelles, Belgium; *Beatrice Meini*, University of Pisa, Italy

11:45-12:10 Steady-state Analysis of a Multi-class MAP/PH/*c* Queue with Acyclic PH Retrials
Tugrul Dayar and M. Can Orhan, Bilkent University, Turkey

Friday, October 30

CP15

Linear Algebra Theory: Part I

10:15 AM-12:15 PM

Room:Vinings - Atlanta Conference Level

Chair: Enide C. Andrade, University of Aveiro, Portugal

10:15-10:30 Ky Fan Theorem Applied to Randić Energy
Enide C. Andrade, University of Aveiro, Portugal; Ivan Gutman, University of Kragujevac, Serbia and State University of Novi Pazar, Serbia; María Robbiano and Bernardo Martín, Universidad Catolica del Norte, Chile

10:35-10:50 The Linear Transformation that Relates the Canonical and Coefficient Embeddings of Ideals in Cyclotomic Integer Rings
Scott C. Batson, North Carolina State University, USA

10:55-11:10 Coupled Sylvester-Type Matrix Equations and Block Diagonalization
Andrii Dmytryshyn and Bo T. Kågström, Umeå University, Sweden

11:15-11:30 Generalized Inverses of Copositive Matrices, Self-Conditional Positive Semidefinite Matrices and Inheritance Properties
Sivakumar K.C. and Kavita Bisht, Indian Institute of Technology Madras, India; Ravindran G., Indian Statistical Institute, India

11:35-11:50 The Principal Rank Characteristic Sequence and the Enhanced Principal Rank Characteristic Sequence
Xavier Martinez-Rivera, Iowa State University, USA

11:55-12:10 A Characterization of Minimal Surfaces in the Lorentz Group L3
Rodrigo R. Montes, Federal University of Paraná, Brazil

Friday, October 30

CP16

Numerical PDEs and Applications: Part I

10:15 AM-12:15 PM

Room:Marietta - Atlanta Conference Level

Chair: To Be Determined

10:15-10:30 On the Backward Stability of Chebyshev Rootfinding Via Colleague Matrix Eigenvalues
Javier Pérez Álvaro and Vanni Noferini, University of Manchester, United Kingdom

10:35-10:50 Companion Matrices of Hermite-Birkhoff Interpolants
Nikta Shayanfar, Technische Universität Braunschweig, Germany; Amir Amiraslani, University of Hawaii, USA

10:55-11:10 Linear Algebra Provides a Basis for Elasticity Without Stress Or Strain
Humphrey H. Hardy, Piedmont College, USA

11:15-11:30 Fixing Gauge and Rank Deficiency
Daniel Topa, Los Alamos National Laboratory, USA; Pedro Embid, University of New Mexico, USA

11:35-11:50 Iterative Method for Mildly Overdetermined Least-Squares Problems with a Helmholtz Block
Bas Peters, Chen Greif, and Felix J. Herrmann, University of British Columbia, Canada

11:55-12:10 Bounds on Algebraic, Discretization, and Total Numerical Approximation Errors for Linear Diffusion PDEs
Jan Papež, Charles University, Czech Republic; Martin Vohralík, INRIA Paris-Rocquencourt, France

Friday, October 30

CP17

Optimization

10:15 AM-12:15 PM

Room:University - Atlanta Conference Level

Chair: Hyun-Min Kim, Pusan National University, Busan (Pusan), Republic of Korea

10:15-10:30 Matrix-Free Krylov Subspace Methods for Solving a Riemannian Newton Equation
Kensuke Aihara and Hiroyuki Sato, Tokyo University of Science, Japan

10:35-10:50 Approximating the Cardinality of a Vector to Handle Cardinality Constraints in Optimization
Agnes Bialecki, EDF, France; Laurent El Ghaoui, University of California, Berkeley, USA; Riadh Zorgati, EDF, France

10:55-11:10 Primal and Dual Algorithms for the Ball Covering Problem
Akshay Gupte and Lin Dearing, Clemson University, USA

11:15-11:30 Finding the Nearest Valid Covariance Matrix: a Fx Market Case
Aleksei Minabutdinov, National Research University Higher School of Economics, Russia

11:35-11:50 Convergence of Newton Iterations for Order-Convex Matrix Functions
Sang-Hyup Seo, Pusan National University, Busan (Pusan), Republic of Korea; Jong-Hyeon Seo, Daegu Gyeongbuk Institute of Science and Technology, Korea; Hyun-Min Kim, Pusan National University, Busan (Pusan), Republic of Korea

11:55-12:10 Modulus-Type Inner Outer Iterative Methods for Nonnegative Constrained Least Squares Problems
Ning Zheng, The Graduate University for Advanced Studies, Sokendai, Japan; Ken Hayami, National Institute of Informatics, Japan; Junfeng Yin, Tongji University, China

Lunch Break

12:15 PM-1:45 PM

Attendees on their own

Friday, October 30

MS55

Recent Advances in Numerical Linear Algebra for Inverse Problems - Part II of II

1:45 PM-3:45 PM

Room:International Ballroom North - Lower Level 1

For Part 1 see MS49
Being able to compute reliable solutions to inverse problems is integral in many scientific applications. However, inverse problems are typically large-scale and ill-posed, presenting significant mathematical and computational challenges. Numerical linear algebra has been and continues to be essential in the development of robust and scalable algorithms to tackle these challenges. This minisymposium will highlight state-of-the-art research on numerical linear algebra for solving inverse problems from a wide range of applications including image deblurring, tomographic reconstruction, and hyperspectral imaging.

Organizer: Julianne Chung
Virginia Tech, USA

Organizer: Marco Donatelli
University of Insubria, Como, Italy

1:45-2:10 SVD Approximations for Large Scale Imaging Problems
James G. Nagy, Emory University, USA

2:15-2:40 Structure Preserving Reblurring Preconditioners for Image Deblurring
Pietro Dell'Acqua, University of Genova, Italy; Marco Donatelli, University of Insubria, Como, Italy; Claudio Estatico, University of Genoa, Italy; Mariarosa Mazza, University of Insubria, Como, Italy

2:45-3:10 Recovering Sparsity in a Krylov Subspace Framework
Silvia Gazzola, University of Padova, Italy; James G. Nagy, Emory University, USA; Paolo Novati, University of Trieste, Italy

3:15-3:40 Arnoldi Methods for Image Deblurring with Anti-Reflective Boundary Conditions
Marco Donatelli, University of Insubria, Como, Italy; David Martin and *Lothar Reichel*, Kent State University, USA

Friday, October 30

MS56

Innovative Methods for Eigenvalue Solutions - Part II of II

1:45 PM-3:45 PM

Room:International Ballroom South - Lower Level 1

For Part 1 see MS50
This minisymposium is concerned with innovative methods for eigenvalue solutions. Modern large-scale scientific computing and engineering simulations pose significant challenges to classical eigensolvers. New efficient and reliable methods are desired. In recent years, there are quite some exciting developments, such as those based on contour integrals, domain decompositions, stochastic methods, SS methods, structured techniques, etc. The minisymposium intends to discuss a wide spectrum of innovative eigensolvers, their analysis, and the related practical applications.

Organizer: Raymond H. Chan
Chinese University of Hong Kong, Hong Kong

Organizer: Jianlin Xia
Purdue University, USA

1:45-2:10 The Use of Stochastic Collocation Methods to Understand Pseudo-Spectra in Linear Stability Analysis
Howard C. Elman, University of Maryland, College Park, USA; David Silvester, University of Manchester, United Kingdom

2:15-2:40 Large-Scale Eigenvalue Calculations in Scientific Problems
Esmond G. Ng, Lawrence Berkeley National Laboratory, USA

2:45-3:10 Accurate Computations of Eigenvalues of Diagonally Dominant Matrices with Applications to Differential Operators
Qiang Ye, University of Kentucky, USA

3:15-3:40 Convergence of the Truncated Lanczos Approach for the Trust-Region Subproblem
Leihong Zhang, Shanghai University of Finance and Economics, China; Ren-Cang Li, University of Texas at Arlington, USA

Friday, October 30

MS57

Preconditioning Techniques For Non-Symmetric or Symmetric Indefinite Matrices - Part II of II

1:45 PM-3:45 PM

Room:Piedmont - Atlanta Conference Level

For Part 1 see MS51

It is well-known that preconditioning is the key factor for the efficient solution of large sparse linear systems and eigenproblems. While for Symmetric Positive Definite matrices a number of robust and efficient algorithms are available for both sequential and parallel computations, the same does not hold true for Non-Symmetric and/or Symmetric Indefinite problems. The most frequent occurrence is the lack of robustness, with unstable numerical behaviors in both the preconditioner computation and application. This mini-symposium aims at presenting the most recent advances on this topic, gathering worldwide experts to share experiences, challenges and new ideas.

Organizer: Massimiliano Ferronato
University of Padova, Italy

Organizer: Carlo Janna
University of Padova, Italy

Organizer: Miroslav Tuma
Czech Republic Academy of Science, Czech Republic

1:45-2:10 Preconditioned Iterative Methods for Solving Indefinite Linear Systems

Miroslav Tuma, Czech Republic Academy of Science, Czech Republic; Jennifer Scott, Rutherford Appleton Laboratory, United Kingdom

2:15-2:40 An Algebraic Multigrid Method for Nonsymmetric Linear Systems

Daniel Osei-Kuffuor, Lu Wang, and Robert Falgout, Lawrence Livermore National Laboratory, USA

continued in next column

2:45-3:10 Aggressive Accelerator-Enabled Local Smoothing Via Incomplete Factorization, with Applications to Preconditioning of Stokes Problems with Heterogeneous Viscosity Structure

Patrick Sanan, Università della Svizzera italiana, Switzerland; Karl Rupp, Vienna University of Technology, Austria; Olaf Schenk, Università della Svizzera italiana, Switzerland

3:15-3:40 Low-Rank Approximation Preconditioners for Symmetric and Nonsymmetric Systems

Ruipeng Li and Yousef Saad, University of Minnesota, USA

Friday, October 30

MS58

Approaches to Reducing Communication in Krylov Subspace Methods

1:45 PM-3:45 PM

Room:Spring - Atlanta Conference Level

Communication - the movement of data between levels of memory hierarchy or between processors over a network - is the most expensive operation in terms of both time and energy at all scales of computing. Achieving scalable performance in terms of time and energy thus requires a dramatic shift in the field of algorithmic design. Solvers for sparse linear algebra problems, ubiquitous throughout scientific codes, are often the bottlenecks in application performance due to a low computation/communication ratio. This minisymposium includes four presentations detailing advances in reducing data movement costs in Krylov subspace methods.

Organizer: Erin C. Carson
New York University, USA

Organizer: Laura Grigori
INRIA, France

1:45-2:10 The s-Step Lanczos Method and its Behavior in Finite Precision

Erin C. Carson, New York University, USA; James W. Demmel, University of California, Berkeley, USA

2:15-2:40 Enlarged Krylov Subspace Methods for Reducing Communication

Sophie M. Moufawad, IFP Energies nouvelles, France; Laura Grigori, INRIA, France; Frederic Nataf, Laboratoire Jacques-Louis Lions, France

2:45-3:10 Preconditioning Communication-Avoiding Krylov Methods

Siva Rajamanickam, Sandia National Laboratories, USA; Ichitaro Yamazaki, University of Tennessee, Knoxville, USA; Andrey Prokopenko, Erik G. Boman, and Michael Heroux, Sandia National Laboratories, USA; Jack J. Dongarra, University of Tennessee, Knoxville, USA

continued on next page

Friday, October 30

MS58

Approaches to Reducing Communication in Krylov Subspace Methods

1:45 PM-3:45 PM

continued

3:15-3:40 Sparse Approximate Inverse Preconditioners for Communication-Avoiding Bicgstab Solvers

Maryam Mehri Dehnavi, Massachusetts Institute of Technology, USA; Erin Carson, University of California, Berkeley, USA; Nicholas Knight, New York University, USA; James W. Demmel, University of California, Berkeley, USA; David Fernandez, McGill University, Canada

Friday, October 30

MS59

High-dimensional Approximation in Low Rank Tensor Formats - Part II of II

1:45 PM-3:45 PM

Room:Roswell - Atlanta Conference Level

For Part 1 see MS53

High-dimensional approximation has seen a revival since new linear algebra based low rank formats are available that scale linearly in the dimension. For these new formats, the Hierachical Tucker (HT) or Tensor Train (TT), there are many emerging hot topics like iterative approximation schemes and their convergence, completion for missing data, applications in uncertainty quantification, parametric model reduction, and many other directions of research. In this minisymposium we will present the theoretical foundation, new algorithms and analysis, and the use in applications.

Organizer: Lars Grasedyck
RWTH Aachen University, Germany

1:45-2:10 Low Rank Approximation of High Dimensional Functions Using Sparsity Inducing Regularization

Prashant Rai, Sandia National Laboratories, USA; Mathilde Chevreuil, Université de Nantes, France; Loic Giraldi and Anthony Nouy, Ecole Centrale de Nantes, France

2:15-2:40 A Variant of Alternating Least Squares Tensor Completion in TT-Format

Sebastian Kraemer, Lars Grasedyck, and Melanie Kluge, RWTH Aachen University, Germany

2:45-3:10 Riemannian Optimization for High-Dimensional Tensor Completion

Michael Steinlechner, EPFL, Switzerland

3:15-3:40 Low-rank Tensor Approximation of Singular Functions

Vladimir Kazeev and Christoph Schwab, ETH Zürich, Switzerland

Friday, October 30

MS60

Structured Matrices and Applications

1:45 PM-3:45 PM

Room:Techwood - Atlanta Conference Level

The study of structured matrices has led to many efficient linear algebra subroutines that make large-scale problems feasible. This minisymposium introduces recent advances in fast algorithms for computing data-sparse approximations of structured matrices based on randomization techniques, hierarchical matrix structure, FMM, etc. These data-sparse approximations give linear or quasi-linear time methods for eigendecomposition, matrix factorization, and multiplication with applications in fast solvers for high dimensional PDE's, integral transforms (e.g., Fourier integral operators) and special function transforms.

Organizer: Haizhao Yang
Duke University, USA

Organizer: James Vogel
Purdue University, USA

1:45-2:10 Butterfly Factorizations

Yingzhou Li, Stanford University, USA; Haizhao Yang, Duke University, USA; Eileen R. Martin, Kenneth L. Ho, and Lexing Ying, Stanford University, USA

2:15-2:40 Approximation of Real Eigenvalues of Some Structured Nonsymmetric Matrices

Victor Pan, City University of New York, USA

2:45-3:10 Rank-Structured PDE Solvers

David Bindel, Cornell University, USA

3:15-3:40 Linear Time Eigendecomposition and SVD Algorithms

James Vogel and Jianlin Xia, Purdue University, USA

Friday, October 30

CP18

Linear Algebra Theory: Part II

1:45 PM-3:05 PM

Room:Vinings - Atlanta Conference Level

Chair: Peter Semrl, University of Ljubljana, Slovenia

1:45-2:00 Coherency Preservers
Peter Semrl, University of Ljubljana, Slovenia

2:05-2:20 A Connection Between Comrade Matrices and Reachability Matrices
Maryam Shams Solary, Payam Noor University, Iran

2:25-2:40 Maximal Lower Bounds in Loewner Order
Nikolas Stott, INRIA, France; Xavier Allamigeon and Stéphane Gaubert, INRIA and CMAP, Ecole Polytechnique, France

2:45-3:00 Tropical Bounds for the Eigenvalues of Block Structured Matrices
Marianne Akian, Stephane Gaubert, and Andrea Marchesini, INRIA and CMAP, Ecole Polytechnique, France

Friday, October 30

CP19

Numerical PDEs and Applications: Part II

1:45 PM-3:45 PM

Room:Marietta - Atlanta Conference Level

Chair: To Be Determined

1:45-2:00 Coupled Preconditioners for the Incompressible Navier-Stokes Equations
Xin He and Kees Vuik, Delft University of Technology, Netherlands

2:05-2:20 On Some Algebraic Issues of Domain Decomposition Approaches
Valery P. Il'in, Russian Academy of Sciences, Russia

2:25-2:40 Robust Incomplete Factorization Preconditioner with Mixed-Precision for Parallel Finite Element Analysis
Naoki Morita, Gaku Hashimoto, and Hiroshi Okuda, University of Tokyo, Japan

2:45-3:00 Efficient Simulation of Fluid-Structure Interactions Using Fast Multipole Method
Minghao W. Rostami and Sarah D. Olson, Worcester Polytechnic Institute, USA

3:05-3:20 Block Preconditioners for An Incompressible Magnetohydrodynamics Problem
Michael P. Wathen, Chen Greif, and Dominik Schotzau, University of British Columbia, Canada

3:25-3:40 The WR-HSS Method and Its Subspace Acceleration for the Unsteady Elliptic Problem
XI Yang, Nanjing University of Aeronautics and Astronautics, China

Notes

LA15 Abstracts

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Abstracts are printed as submitted by the authors.

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LA15 Organizer and Speaker Index

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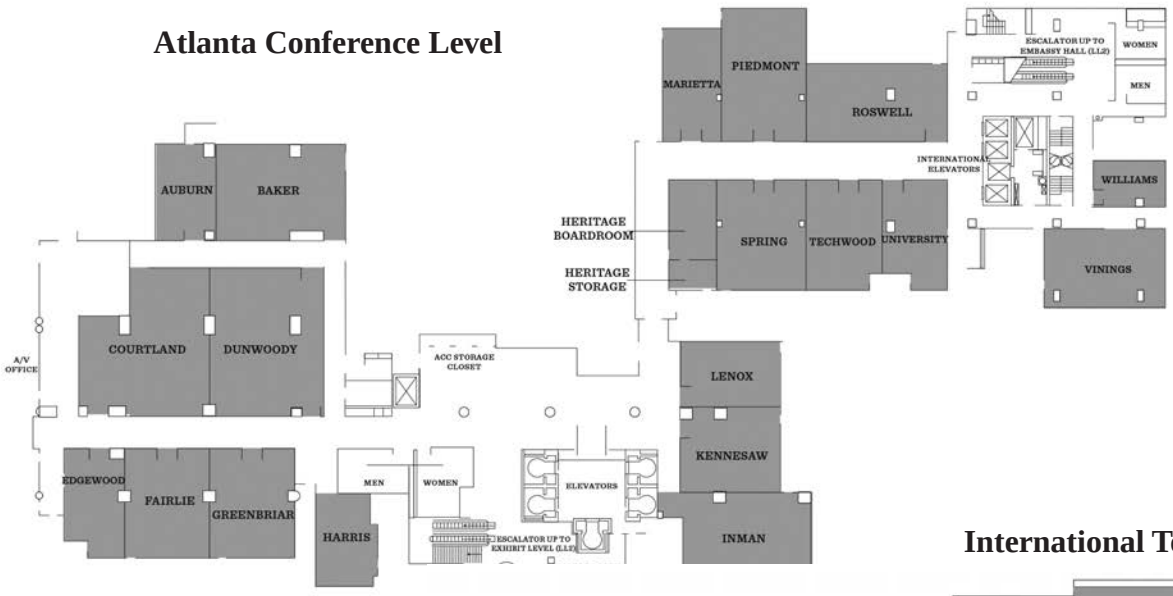
LA15 Conference Budget

Conference Budget
SIAM Conference on Applied Linear Algebra
October 26 - 30, 2015
Atlanta, Georgia

Expected Paid Attendance		300	
Revenue			
Registration Income			$115,050
	Total		$115,050
Expenses			
Printing			$2,500.00
Organizing Committee			$3,600.00
Invited Speakers			$15,000.00
Food and Beverage			$35,900.00
AV Equipment and Telecommunication			$18,700.00
Advertising			$5,200.00
Conference Labor (including benefits)			$56,529.00
Other (supplies, staff travel, freight, misc.)			$8,700.00
Administrative			$17,286.00
Accounting/Distribution & Shipping			$9,217.00
Information Systems			$16,619.00
Customer Service			$6,277.00
Marketing			$9,860.00
Office Space (Building)			$6,236.00
Other SIAM Services			$6,587.00
	Total		$218,211
Net Conference Expense			($103,161)
Support Provided by SIAM			$103,161
			$0
Estimated Support for Travel Awards not included above:			
Early Career and Students		31	$22,000

Hyatt Regency Atlanta Floor Plan

Atlanta Conference Level



International Tower Level