

Mark Embree

Curriculum Vitae · 26 May 2021

Department of Mathematics
Virginia Tech
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Blacksburg, Virginia 24061, USA

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Research Interests

Numerical analysis, numerical linear algebra, and spectral theory, especially the following areas:

- Analysis and applications of nonnormal matrices and operators
- Algorithms for large-scale linear systems, eigenvalue problems, and model reduction
- Spectral behavior of Schrödinger operators

Education

D.Phil. (Numerical Analysis), University of Oxford, 2000
Thesis: *Convergence of Krylov Subspace Methods for Non-Normal Matrices*
Advisor: Andrew J. Wathen

B.S. summa cum laude, in honors (Computer Science), Virginia Tech, 1996
B.S. summa cum laude (Mathematics), Virginia Tech, 1996
Minors in History and English

Appointments

Professor, Virginia Tech (January 2014 – present)
Department of Mathematics
Division Leader, Computational Modeling and Data Analytics (July 2015 – present)
Luther and Alice Hamlett Professor, Academy of Integrated Science (Fall 2019 – present)

Professor, Rice University (July 2009 – December 2013)
Associate Professor, Rice University (July 2007 – June 2009)
Assistant Professor, Rice University (July 2001 – June 2007)
Department of Computational and Applied Mathematics

John & Ann Doerr Professor (July 2010 – June 2013)
Director (July 2010 – August 2012), Co-Director (August 2012 – June 2013)
Rice Center for Engineering Leadership

Visiting Assistant Professor, University of Maryland, College Park (January 2005 – May 2005)
Department of Computer Science

Research Officer, Oxford University Computing Laboratory (October 1999 – December 2001)
Oxford Eigenvalue Project (advisor: Lloyd N. Trefethen)

Honors

Virginia Tech Alumni Award for Excellence in Teaching, 2021
Virginia Tech College of Science, Certificate of Teaching Excellence, 2020
Rice University Presidential Mentoring Award, 2013
Rice University George R. Brown Award for Excellence in Teaching, 2012
Rice University George R. Brown Award for Superior Teaching, 2010

National Academy of Engineering Frontiers of Engineering Education Symposium participant, 2010
Virginia Tech College of Science Outstanding Young Alumnus, 2007
Rice University Phi Beta Kappa Teaching Prize, 2004
Rhodes Scholar (Balliol College, Oxford), 1996–1999
Phi Beta Kappa (elected 1995)
Barry M. Goldwater Scholarship, 1995

University/Education Leadership and Service Activities

Virginia Tech (2014 – present)

Computational Modeling and Data Analytics (CMDA) division, Academy of Integrated Science

Virginia Tech's CMDA undergraduate major opened for enrollment in January 2015; the first majors graduated in May 2017; as of May 2021, more than 350 students have graduated with the CMDA major, and over 500 continuing students are pursuing the degree. The curriculum includes 10 new courses and more than 15 faculty from Computer Science, Economics, Mathematics, and Statistics.

- Division Leader (July 2015 – present)
- Member, Executive Committee (2014 – 2015)
- Faculty search committees (2014, 2016, 2018, 2019)

Department of Mathematics

- Instructor Executive Committee (Fall 2019 – Spring 2020)
- Executive Committee (Fall 2018 – Spring 2019)
- Personnel Committee (Fall 2015 – Spring 2016)
- Faculty search committees, 2015, 2017, 2018

Honors College / University Honors Program

- Calhoun Discovery Program design/faculty team (2018 – present)
- Faculty Working Group for curriculum design (2017)
- VT Nominating Committee, Rhodes & Marshall Scholarships (2014 – ; chair, 2017 – present)

Data Analytics and Decision Sciences Destination Area

- Stakeholder Committee (Fall 2016–Summer 2018)
- Steering Committee (Spring 2016), Design Team (Fall 2016)

University

- Search committee for Provost & Executive Vice President (Fall 2018)
- Search committee for Vice President & Dean for Graduate Education (Fall 2020 – present)

Rice University (2002–2013)

Rice Center for Engineering Leadership

The Rice Center for Engineering Leadership was established to encourage engineering majors to complement their technical education with skills in leadership, teamwork, design, communication, and entrepreneurship.

- Interim Director (Fall 2009–June 2010)
- founding Director (July 2010–August 2012)
- Co-director (August 2012–June 2013)

Department of Computational and Applied Mathematics (CAAM)

- Graduate Committee (Fall 2002 – Spring 2004)
- Undergraduate Committee (Fall 2001 – Spring 2013); Chair (Fall 2005 – Spring 2013)
- Library Liaison (Spring 2003 – Spring 2013)
- Advisor, student chapter, Society for Industrial & Applied Math. (Fall 2004 – Spring 2007)

George R. Brown School of Engineering

- Chair, Curriculum Committee (Fall 2007 – Fall 2009)
- Engineering Education Forum (Spring 2006 – Spring 2007)

University Service

- Committee on Fellowships and Awards (Fall 2002 – Spring 2013)
- Faculty Advisory Board, Program for Writing and Communication (Fall 2011 – Spring 2013)
- Faculty Associate, Sid Richardson College (Fall 2002 – Spring 2006)
- Faculty Associate and Divisional Advisor, Will Rice College (Fall 2006 – Spring 2013)
 - Distinguished Faculty Associate (2007, 2008, 2009, 2011)
 - Outstanding Faculty Associate (2010, Will Rice/McMurtry)

Advisor, SIAM 100-Digit Challenge team (2002): *one of 20 winning teams internationally*

Advisor, Mathematical Contest in Modeling (2006, 2007, 2012–2019)
“Outstanding” team, MAA Prize winners (2006, 2016)

Oklahoma nominating committee for the Rhodes Scholarship (2003, 2004)

Teaching at Virginia Tech

CMDA 3606 Mathematical Modelling II (Spring 2014, Spring 2018, Spring 2019, Spring 2020)

CMDA 4604 Intermediate Topics in Mathematical Modelling (Fall 2014, Fall 2015)

CMDA 4864 Capstone Project course (Falls of 2016, 2017; 2018, 2019, 2020, Spring 2021; many w/F. Faltin)

MATH/CS 5466 Numerical Analysis (Spring 2016)

MATH 5524 Matrix Theory (Spring 2017)

UH 2984 Special Study: Quantitative/Computational Thinking and Global Leadership (Spring 2019)

Teaching at Rice University

CAAM 335 Matrix Analysis (Spring 2002, Spring 2003, Fall 2004, Spring 2008 (w/S. J. Cox), Fall 2013)

CAAM 336 Differential Equations in Science & Engineering (Spring 2006, Fall 2008, Fall 2010, Fall 2012)

CAAM 440 Applied Matrix Analysis (Spring 2010, Spring 2012)

CAAM 453 Numerical Analysis I (each Fall 2002, 2003, 2004, 2005, 2006, 2007, 2009)

CAAM 495–496 Senior Design Project I and II (AY 2009–2010, 2010–2011, 2011–2012, 2012–2013)

CAAM 540 Applied Functional Analysis (Spring 2004, Spring 2007, Fall 2008)

CAAM 651 Topics in Numerical Linear Algebra (Spring 2003, Spring 2008)

(Spring 2009, Spring 2011, Fall 2013 w/D. C. Sorensen)

Research Supervised at Virginia Tech

Jonathan Baker, PhD in progress (co-advised with Pablo Tarazaga)

PhD topic: Event localization and mode tracking in an instrumented building

Alan Garcia, MS 2019; PhD in progress

MS Thesis: A Parallel Aggregation Algorithm for Inter-Grid Transfer Operators in Algebraic Multigrid

PhD Topic: Algorithms for nonlinear eigenvalue problems and power systems

Sean Reiter, MS in progress (co-advised with Serkan Gugercin)

MS topic: Model reduction for power system models

Rebecah Storms, MS 2020 (co-advised with Jake Fillman)

Thesis: Spectra of Periodic Schrödinger Operators on the Octagonal Lattice

Michael Brennan, MS 2018 (co-advised with Serkan Gugercin)
Thesis: Rational Interpolation Methods for Nonlinear Eigenvalue Problems
Currently a Ph.D. student in MIT's Center for Computational Engineering

Jennifer Green, MS 2018
Thesis: Modeling Spider Webs as Multilinked Structures using Chebyshev Pseudospectral Collocation
Currently at Naval Surface Warfare Center Dahlgren Division

Undergraduate research supervised: Adrian Forster (2014); Mark Brandao (2014, w/S. Gugercin); Blake Keeler (2015); Evan Massaro (2015–2016); Sean Reiter (2018, w/J. Fillman); Brian Bennett (2020); Savannah Amos, Yash Joshi, Drew Klaubert (2020, w/Ed Gitre and Gizem Korkmaz)

Research Supervised at Rice University

Jonathan Baker, MA 2016
MA thesis: Nonnormality in Lyapunov Equations

Jeffrey Hokanson, MA 2009; PhD 2013 (both co-advised with S. J. Cox)
MA thesis: Magnetic Damping of an Elastic Conductor
PhD thesis: Numerically Stable and Statistically Efficient Algorithms for Large Scale Exponential Fitting
Currently a post-doctoral fellow, University of Colorado

Charles Puelz, MA 2013
Improved Spectral Calculations for Discrete Schrödinger Operators
Currently a post-doctoral fellow, New York University

A. J. Hergenroeder, MA 2012
Moment Matching and Modal Truncation for Linear Systems

Russell Carden, MA 2009; PhD 2011
MA thesis: Ritz Values and Arnoldi Convergence for Nonsymmetric Matrices
PhD thesis: Ritz Values and Arnoldi Convergence for Non-Hermitian Matrices
Currently a data scientist with Kibo Commerce

Gilbert Ymbert III, MS in Mathematics, Texas A&M Corpus Christi (co-chair), 2011
Convergence Bounds for Approximate Preconditioning
(Project sponsored via Rice's Alliance for Graduate Education and the Professoriate program)
Currently Instructor, Blinn College

Josef Sifuentes, MA 2006; PhD 2010
MA thesis: Preconditioning the Integral Formulation of the Helmholtz Equation via Deflation
PhD thesis: Preconditioned Iterative Methods for Inhomogeneous Acoustic Scattering Applications
Currently Assistant Professor of Mathematics, University of Texas Rio Grande Valley

John Sabino, PhD 2007
Solution of Large-Scale Lyapunov Equations via the Block Modified Smith Method
Currently with The Boeing Company, Seattle, Washington

Sean Hardesty, MA 2006
Energy Bounds on Point-wise Damped Wave Operators
Currently Computer Scientist, Sandia National Laboratories

Undergraduate research supervised at Rice University (many co-advised with Steven J. Cox): Gretchen Raff (2002), Anthony Kellems (2003, 2004), Andrew Gewitz (2003), Robert Mallery (AGEP 2003), Nicholas Henderson (2004), Shayla Miller (AGEP 2006), Jeremy Morrell (2006, 2007), Tessa Pearson (2006), Abraham Taicher (2006), Michael Weeks (2006), Sean Wilkinson (2006), Gilbert Ymbert (AGEP 2007),

Jeffrey Bridge (2009), Matthew Broussard (2009), Jordon Cavazos (2009), Aneeh Mehta (2009), Heather Williamson (2009), Anthony Austin (2010), John Vogelgesang (2010).

Professional Service: Editorial Work

Editorial Board for Book Reviews, *Bulletin of the American Mathematical Society* (January 2015 – present)

Associate Editor, *SIAM Journal on Matrix Analysis and Applications*,
(January 2017 – present; January 2007 – December 2009)

Editorial Board for *Operators and Matrices* (May 2015 – June 2020)

Editorial Board, *SIAM Fundamental of Algorithms* book series (September 2007 – December 2013)

Associate Editor, *SIAM Review*, Problems and Techniques/Expository Research Papers section
(January 2006 – December 2011)

Professional Service: Conference Organization and Professional Organizations

Organizing Committee, SIAM Annual Meeting (July 2021)

Organizing Committee, SIAM Conference on Applied Linear Algebra (May 2021)

SIAM Block Lecture Selection Committee (for 2019 and 2020 SIAM Annual meetings)

Chair, Local Organizing Committee, Householder Symposium on Numerical Linear Algebra (June 2017)

Organizing Committee, American Institute of Mathematics workshop on “Crouzeix’s Conjecture” (July 2017)
(with Anne Greenbaum and Michael Overton)

SIAM Activity Group on Linear Algebra, selection committee for SIAM Linear Algebra Prize (2015)

SIAM Committee on the Gene Golub Summer School (January 2011 – December 2014)

Organizing Committee, SIAM Conference on Applied Linear Algebra (October 2009)

Member, American Mathematical Society (AMS)

Member, Society for Industrial and Applied Mathematics (SIAM)

Professional Service: Proposal, Manuscript, and Department Evaluation

Proposal review for the National Science Foundation, Department of Energy, Czech Academy of Sciences, Research Foundation Flanders, Swiss National Science Foundation.

Book proposal review for Academic Press, Addison Wesley, CRC/Taylor and Francis, Princeton University Press, Springer, SIAM.

External review committee for Department of Mathematics, Tufts University (2019).

Support for Research and Teaching

Virginia Tech Data & Decisions Destination Area

Employing Interpolative Matrix Decompositions for Extracting Insights
from Historical Textual Data (Co-PI)

\$14,000 (Summer 2020)

NSF grant DMS-1923221

AMPS: Model Reduction for Analysis, Identification, and Optimal Design of Power Networks (Co-PI)

\$341,661 (August 2019 – July 2022)

Socially Determined (industrial)
 Socially Determined Exploratory Data Analysis (Co-PI)
 \$44,484 (May 2017 – October 2017)

NSF grant DMS-1720257
 Algorithms for Large-Scale Nonlinear Eigenvalue Problems:
 Interpolation, Stability, Transient Dynamics (PI)
 \$399,999 (May 2017 – April 2020)

NSF grant DMS-1719217
 Early-Career and Student Support for the XX Householder Symposium (Co-PI)
 \$20,000 (May 2017 – April 2018)

GAiTE LLC (industrial; subcontract under NSF grant SBIR-1621994)
 SBIR Phase I: Increasing Infrastructure IQ: Developing the Internet of Livable Spaces
 for Older Adults (Co-PI)
 \$54,500 (September 2016 – August 2017)

NSF grant DGE-1545362
 UrbComp: Data Science for Modeling, Understanding, and Advancing Urban Populations (Co-PI)
 \$2,999,328 (September 2015 – August 2020)

NSF grant OCI-1041396
 Collaborative Research: CI-Team Implementation Project:
 The Signal Processing Education Network (Co-PI)
 \$481,250 (October 2010 – September 2013)

Hewlett Packard Technology for Teaching Grant 2397728
 Enrichment of Collaborative Engineering Design Projects Using HP Tablets
 for Undergraduate Education, Outreach and Service (Co-PI)
 \$20,000, with approximately \$57,000 of Hewlett Packard technology (August 2008)

NSF Career Award, grant DMS-0449973
 Design and Analysis of Restarted Iterative Methods for Linear Systems,
 Eigenvalue Problems, and Model Reduction (PI)
 \$439,680 (September 2005 – August 2010)

NSF grant DMS-0505893
 Design and Identification of Dissipative Bodies (PI)
 Co-PI: Steven J. Cox
 \$122,947 (September 2005 – August 2008)

DOE Career Award, grant DE-FG03-02ER25531
 Nonnormality in Large Scale Eigenvalue Problems (PI)
 \$124,736 (August 2002 – August 2005)

Los Alamos Computer Science Institute: Computational Science, Numerical Linear Algebra (Co-PI)
 Department of Energy/Los Alamos National Laboratory
 \$96,687.22 (October 2001 – September 2002)
 \$96,793.00 (October 2002 – September 2003)
 \$113,717.00 (October 2003 – September 2004)

Book

- L. N. Trefethen and M. Embree
Spectra and Pseudospectra: The Behavior of Nonnormal Matrices and Operators
Princeton University Press, Princeton, 2005.
xvii+606 pp. ISBN-13: 978-0-691-11946-5.

Journal Publications

- S. Becker, M. Embree, J. Wittsten, and M. Zworski
Spectral characterization of magic angles in twisted bilayer graphene
Phys. Rev. B 103 (2021) 165113 (5 pages).
- M. Embree, J. A. Loe and R. B. Morgan
Polynomial Preconditioned Arnoldi with Stability Control
SIAM J. Sci. Comp. 43 (2021) A1–A25.
- M. Embree and J. Fillman
Spectra of discrete two-dimensional periodic Schrödinger operators with small potentials
J. Spectral Theory 9 (2019) 1063–1087.
- M. Embree
Unstable modes in projection-based reduced-order models:
How many can there be, and what do they tell you?
Systems Control Lett. 124 (2019) 49–59. Published online 26 December 2018.
- M. Embree, R. B. Morgan, and H. Nguyen
Weighted inner products for GMRES and GMRES-DR
SIAM J. Sci. Comp. 39 (2017) S610–S632.
- M. Embree and B. Keeler
Pseudospectra of matrix pencils for transient analysis of differential-algebraic equations
SIAM J. Matrix Anal. Appl. 38 (2017) 1028–1054.
- D. C. Sorensen and M. Embree
A DEIM induced CUR factorization
SIAM J. Sci. Comp. 38 (2016) A1454–A1482.
- J. Baker, M. Embree, and J. Sabino
Fast singular value decay for Lyapunov solutions with nonnormal coefficients
SIAM J. Matrix Anal. Appl. 36 (2015) 656–668.
- C. Puelz, M. Embree, and J. Fillman
Spectral approximation for quasiperiodic Schrödinger operators
Integral Equations Operator Theory 82 (2015) 533–554.
- J. A. Sifuentes, M. Embree, and R. B. Morgan
GMRES convergence for perturbed coefficient matrices, with application
to approximate deflation preconditioning
SIAM J. Matrix Anal. Appl. 34 (2013) 1066–1088.
- R. Carden and M. Embree
Ritz value localization for non-Hermitian matrices
SIAM J. Matrix Anal. Appl. 33 (2012) 1320–1338.
- M. Embree, J. A. Sifuentes, K. M. Soodhalter, D. B. Szyld, and F. Xue
Short-term recurrence Krylov subspace methods for nearly-Hermitian matrices
SIAM J. Matrix Anal. Appl. 33 (2012) 480–500.

- S. J. Cox, M. Embree, and J. M. Hokanson
 One can hear the composition of a string: experiments with an inverse eigenvalue problem
SIAM Review **54** (2012) 157–178
 In Chinese: *Mathematical Advance in Translation*, **31** (2014) 203–212 and 300–308.
- S. J. Cox and M. Embree
 Reconstructing an even damping from a single spectrum
Inverse Problems **27** (2011) 035012 (18pp).
- M. Embree and R. B. Lehoucq
 Dynamical systems and non-Hermitian iterative eigensolvers
SIAM J. Numerical Anal. **47** (2009) 1445–1473.
- Z. Castillo, X. Xie, D. C. Sorensen, M. Embree, and M. Pasquali
 Parallel solution of large-scale free surface viscoelastic flows
 via sparse approximate inverse preconditioning
J. Non-Newtonian Fluid Mech. **157** (2009) 44–54.
- M. Embree
 The Arnoldi eigenvalue iteration with exact shifts can fail
SIAM J. Matrix Anal. Appl. **31** (2009) 1–10.
- D. Damanik, M. Embree, A. Gorodetski, and S. Tcheremchantsev
 The fractal dimension of the spectrum of the Fibonacci Hamiltonian
Commun. Math. Phys. **280** (2008) 499–516.
- T. Warburton and M. Embree
 The role of the penalty in the local discontinuous Galerkin method for Maxwell’s eigenvalue problem
Comput. Methods Appl. Mech. Engrg. **195** (2006) 3205–3223.
- C. A. Beattie, M. Embree, and D. C. Sorensen
 Convergence of polynomial restart Krylov methods for eigenvalue computations
SIAM Review **47** (2005) 492–515.
- C. Beattie, M. Embree, and J. Rossi
 Convergence of restarted Krylov subspaces to invariant subspaces
SIAM J. Matrix Anal. Appl. **25** (2004) 1074–1109.
- M. Embree
 The tortoise and the hare restart GMRES
SIAM Review **45** (2003) 259–266.
- A. Böttcher, M. Embree, and V. I. Sokolov
 The spectra of large Toeplitz band matrices with a randomly perturbed entry
Math. Comp. **72** (2003) 1329–1348.
- A. Böttcher, M. Embree, and V. I. Sokolov
 On large Toeplitz band matrices with an uncertain block
Linear Algebra Appl. **366** (2003) 87–97.
- A. Böttcher, M. Embree, and L. N. Trefethen
 Piecewise continuous Toeplitz matrices and operators: slow approach to infinity
SIAM J. Matrix Anal. Appl. **24** (2002) 484–489.
- A. Böttcher, M. Embree, and M. Lindner
 Spectral approximation of banded Laurent matrices with localized random perturbations
Integral Equations Operator Theory **42** (2002), 142–165.
- A. Böttcher, M. Embree, and V. I. Sokolov
 Infinite Toeplitz and Laurent matrices with localized impurities
Linear Algebra Appl. **343–344** (2002), 101–118.

- L. N. Trefethen, M. Contedini and M. Embree
Spectra, pseudospectra, and localization for random bidiagonal matrices
Comm. Pure Appl. Math. **54** (2001), 595–623.
- M. Embree and L. N. Trefethen
Generalizing eigenvalue theorems to pseudospectra theorems
SIAM J. Sci. Comp. **23** (2001), 583–590.
- M. Embree and L. N. Trefethen
Growth and decay of random Fibonacci sequences
Proc. Roy. Soc. London Series A **445** (1999), 2471–2485.
- M. Embree and L. N. Trefethen
Green’s functions for multiply connected domains via conformal mapping
SIAM Review **41** (1999), 745–761.

Technical Reports and Preprints

- M. Brennan, M. Embree, and S. Gugercin
Contour integral methods for nonlinear eigenvalue problems: a systems theoretic approach
arXiv:2012.14979 (December, 2020).
- S. Reiter, M. Embree, and S. Gugercin
The balanced truncation bound is tight for SISO systems when the truncated system
is state-space symmetric
arXiv:2011.07170 (November, 2020).
- S. Becker, M. Embree, J. Wittsten, and M. Zworski
Mathematics of magic angles in a model of twisted bilayer graphene
arXiv:2008.08489 (August, 2020).
- M. Embree
How descriptive are GMRES convergence bounds?
Oxford University Computing Laboratory Numerical Analysis Report 99/08 (June 1999).

Contributed Sections in Books

- M. Embree and A. C. Ioniță
Pseudospectra of Loewner Matrix Pencils
To appear in *Realization and Model Reduction of Dynamical Systems: A Festschrift in Honor of
the 70th Birthday of Thanos Antoulas* (preprint: arXiv:1910.12153 [math.NA])
C. A. Beattie, P. Benner, M. Embree, S. Gugercin, S. Lefteriu, eds.
- D. Damanik, M. Embree, and A. Gorodetski
Spectral properties of Schrödinger operators arising in the study of quasicrystals
In *Mathematics of Aperiodic Order* (pages 307–370)
Johannes Kellendonk, Daniel Lenz, and Jean Savinien, eds., Birkhäuser, 2015.
- M. Embree
Pseudospectra
In *Handbook of Linear Algebra*, (pages 16-1 – 16-16)
Leslie Hogben, ed., Chapman & Hall/CRC, Boca Raton, FL, 2007.
Revised for second edition, 2013.

Papers in Conference Proceedings

- M. Kasarda, P. Tarazaga, M. Embree, S. Gugercin, A. Woolard, B. Joyce, and J. Hamilton
Detection and identification of firearms upon discharge using floor-based accelerometers
In *Special Topics in Structural Dynamics*, vol 6, (pages 45–53)
Conference Proceedings of the Society for Experimental Mechanics Series
D. Di Miao, P. Tarazaga, and P. Castellini, eds., Springer, 2016
- A. Saterbak, M. Embree, and M. Oden
Client-based projects in freshman design
In *American Society of Engineering Education Conference Proceedings*,
Paper AC 2012-4037, San Antonio, Texas, 2012.
- M. Embree and C. Ribbens
On the scalability of parallel Krylov subspace methods
In *Proceedings of the Eighth SIAM Conference on Parallel Processing for Scientific Computing*,
CD-ROM, SIAM, Philadelphia, 1997.

Book Review

- M. Embree
Review of *Krylov Subspace Methods: Principles and Analysis* by J. Liesen and Z. Strakoš
Bull. AMS **52** (2015) 151–158.

Web Site

- M. Embree and L. N. Trefethen
Pseudospectra Gateway, 2000
<http://www.cs.ox.ac.uk/pseudospectra>.

Major Presentations

- Contour Integral Methods for Nonlinear Eigenvalue Problems*
Invited online presentation, broadcast on Zoom and YouTube
E-NLA Online Seminar Series on Numerical Linear Algebra
June 2020
- Nonlinear Eigenvalue Problems: Interpolatory Algorithms and Transient Dynamics*
Invited presentation
SIAM Conference on Applied Linear Algebra
Hong Kong, May 2018
- Spectral Calculations for Quasiperiodic Schrödinger Operators*
Plenary Speaker
International Workshop on Operator Theory and Applications (IWOTA 2017)
Chemnitz, Germany, August 2017
- The Life Cycle of an Eigenvalue Problem: From Data to Numerics*
Invited presentation
SIAM Annual Meeting
Boston, Massachusetts, July 2016
- Approximation Theory for Model Reduction*
Invited speaker
New Directions in Numerical Computation
Oxford, England, August 2015

CUR Factorization via Discrete Empirical Interpolation

Invited speaker
Workshop on Modern Massive Data Sets
Berkeley, California, June 2014

Stability of GMRES Convergence with Applications to Inexact Preconditioning

Plenary talk
18th Householder Symposium on Numerical Linear Algebra
Tahoe, California, June 2011

An Inverse Eigenvalue Problem for a Damped Vibrating String

Invited speaker
VIIth Pan-American Workshop, Applied and Computational Mathematics
Choroní, Venezuela, June 2010

Spectral Calculations for Quasiperiodic Schrödinger Operators

Invited speaker
Seventh International Workshop on the Accurate Solution of Eigenvalue Problems
Dubrovnik, Croatia, June 2008

Damped Mechanical Systems: Spectra, Pseudospectra, Structured Perturbations

Plenary talk
17th Householder Symposium on Numerical Linear Algebra
Zeuthen, Germany, June 2008

Potential Theory and Practical Aspects of the Solution of Lyapunov Equations

ILAS plenary talk (ILAS = International Linear Algebra Society)
Harrachov 2007: Computational Methods with Applications
Harrachov, Czech Republic, August 2007

Transient Behavior of Differential–Algebraic Equations via Pseudospectra of Matrix Pencils

Invited presentation
GAMM-SIAM Conference on Applied Linear Algebra
Düsseldorf, Germany, July 2006

Misconvergence of Arnoldi Eigenvalue Iterations

Invited speaker
Sixth International Workshop on the Accurate Solution of Eigenvalue Problems
University Park, Pennsylvania, May 2006

Decay Bounds for Singular Values of Solutions to Lyapunov Equations

Plenary talk
16th Householder Symposium on Numerical Linear Algebra
Champion, Pennsylvania, May 2005

Restarted GMRES Dynamics

Plenary talk
15th Householder Symposium on Numerical Linear Algebra
Peebles, Scotland, June 2002

Talks at Invited Workshops

Contour Integral Methods for Linear and Nonlinear Eigenvalue Problems: Learning from Sketches of the Resolvent

Workshop on Randomized Numerical Linear Algebra, Statistics, and Optimization
DIMACS (Center for Discrete Mathematics and Theoretical Computer Science), Rutgers, September 2019

Convergence Theory for Iterative Eigensolvers

Workshop on Randomized Numerical Linear Algebra and Applications
Simons Institute for the Theory of Computing, UC Berkeley, September 2018

Spectral Calculations for Two-Dimensional Quasicrystals

Workshop on Spectral Structures and Topological Methods in Mathematical Quasicrystals
Mathematical Research Institute, Oberwolfach, Germany, October 2017

Gleaning Insight from Vibrations: Examples from Musical Strings and an Instrumented Building

Workshop on The Mathematics of Data (research program)
Park City Mathematics Institute, Midway, Utah, July 2016

Spectral Calculations for Discrete Schrödinger Operators with Quasiperiodic Potentials

Workshop on Spectral Properties of Quasicrystals via Analysis, Dynamics
and Geometric Measure Theory
Casa Matemática Oaxaca – Banff International Research Station, Oaxaca, Mexico, September 2015

Functions of Nonnormal Matrices and the Behavior of Dynamical Systems

Workshop on Mathematical Aspects of Physics with Non-Self-Adjoint Operators
American Institute of Mathematics, San Jose, California, June 2015

Nonnormality and the Solution of Matrix Equations

Workshop on Pseudospectra of Operators: Spectral Singularities, Semiclassics, Pencils,
and Random Matrices
International Centre for Mathematical Sciences, Edinburgh, UK, September 2014

The Life-Cycle of an Eigenvalue Problem

Mathematical Research Institute, Oberwolfach, Germany, November 2013

Spectral Calculations for Fibonacci Hamiltonians

Mathematical Research Institute, Oberwolfach, Germany, January 2011

Definitions of the Pseudospectrum for Analyzing Behavior of Dynamical Systems

Spectral Instability and Microanalysis Workshop, Lund, Sweden, June 2010

Inverse Spectral Computations for Damped Wave Operators

Mathematical Research Institute, Oberwolfach, Germany, August 2009

Convergence and Shifting Strategies for Arnoldi's Method

Workshop on Theoretical and Computational Aspects of Matrix Algorithms
Schloß Dagstuhl, Germany, October 2003

Short Courses

Pseudospectra and the Dynamics of Non-Self-Adjoint Operators

NOSEVOL Summer School
Nonselfadjoint Operators, Semiclassical Analysis and Evolution Problems
Berder, France, July 2013

Pseudospectra and Nonnormal Dynamical Systems

4th Elgersburg School
Elgersburg, Germany, March 2012

Pseudospectra and the Behavior of Dynamical Systems

Summer School on Numerical Linear Algebra for Dynamical and High-Dimensional Problems
Trogir, Croatia, October 2011