

CV Peter Benner October 12, 2020

Affiliations

Primary:

Department "Computational Methods in Systems and Control Theory"
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Secondary 1:

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Secondary 2:

Research group
"Mathematics in Industry and Technology"
Department of Mathematics
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Education

- 2001 Habilitation (*venia legendi*) in Mathematics, University of Bremen (Germany)
- 1997 Dr. rer. nat. (Ph.D.) in Mathematics, Technische Universität Chemnitz-Zwickau (Germany)
- 1993 *Diplom* (similar to M.Sc.) in Mathematics with minor in Economics, RWTH Aachen (Germany)

Career

- 2021-2022, Managing Director of the Max Planck Institute for Dynamics of Complex Technical Systems, Magdeburg
- 2013-2014 Chair of Max Planck network "BiGmax: MaxNet on Big-Data-Driven Materials Science"
- since 2017 Member of the Management Board of the DFG Research Training Group 2297 "Mathematical Complexity Reduction", Magdeburg
- since 2011 *Honorary professor* (Adjunct Professor), Otto von Guericke University Magdeburg
- since 2010 Member of the Management Board of the International Max Planck Research School "ProEng - Advanced Methods in Process and Systems Engineering", Magdeburg
- since 2010 Director and Scientific Member of the Max Planck Institute for Dynamics of Complex Technical Systems, Magdeburg
- since 2010 Head of research group "Mathematics in Industry and Technology", TU Chemnitz
- 2003-2010 Full Professor for Mathematics in Industry and Technology, TU Chemnitz
- 2002-2003 Lecturer at the Institute for Mathematics, TU Berlin
- 2001-2002 Visiting Associate Professor, TU Hamburg-Harburg
- 1997-2001 Assistant Professor at the Center for Industrial Mathematics, University of Bremen
- 1994-1996 Research Assistant, Department of Mathematics, TU Chemnitz-Zwickau
- 1993 Graduate Teaching Assistant, Department of Mathematics, University of Kansas
- 1991-1993 Software developer, Hille Engineering GmbH, Aachen

Honors and Services to the Community

since 2020	Member of the Board of Trustees of the <i>Fraunhofer Institute for Industrial Mathematics</i> (ITWM), Kaiserslautern
2020–2023	Elected member of the DFG Review Board 312 “Mathematics”
since 2020	Member of the editorial board of <i>Calcolo</i>
since 2019	Member of the editorial board of <i>Mathematical Control and Related Fields</i>
since 2019	Member of the editorial board of <i>Numerical Algorithms</i>
since 2019	Member of SIAM Book Committee and editorial board of book series <i>SIAM Spotlights</i>
since 2018	Member of the SIAM Council
2017–2019	Member of the SIAM ¹ Fellows Selection Committee
2018	J. Tinsley Oden Faculty Fellow at University of Texas in Austin
since 2017	SIAM Fellow (Class of 2017)
since 2017	Member of the editorial board of <i>Electronic Transactions on Numerical Analysis</i>
since 2016	Member of the editorial board of <i>Advances in Computational Mathematics</i>
since 2015	Member of the editorial board of <i>ScienceOpen</i>
2015, 2016	Distinguished Professor, Shanghai University
2014–2017	Member of the selection committee for the SIAM W. T. and Idalia Reid Prize
since 2013	GAMM ² delegate, International Council for Industrial and Applied Mathematics (ICIAM)
2013	Lecturer at Gene Golub SIAM Summer School 2013, Shanghai
2012–2020	Member of the council of the European Mathematical Society (EMS)
2011–2016	Member of the GAMM Managing Board
2010	Guest Professorship Université du Littoral Côte d’Opale, Calais (France)
2009–2013	Chair of the GAMM Activity Group <i>Applied and Numerical Linear Algebra</i>
2008–2015	Member of the editorial board of <i>Numerical Linear Algebra with Applications</i>
2005–2019	Associate Editor of <i>SIAM Journal on Matrix Analysis and Applications</i>
2003–2008	Member of the editorial board of the SIAM book series <i>Fundamentals of Algorithms</i>
1996	DAAD Fellowship for research visits to University of Kansas in Lawrence and University of California at Davis
1994	Scholarship of the Saxonian Ministry of Science and Arts
1993	Springorum-Denk Münze of RWTH Aachen for excellent diploma thesis

Organization of Conferences and Workshops (selected activities)

- Steering Committee of the *Matrix Equations and Tensor Techniques (METT)* workshops, METT IX will be held in Perugia (2021).
- Steering Committee of the *Model Reduction of Complex Dynamical Systems (MODRED)* workshops, 2010 (Berlin), Magdeburg (2013), Odense (2017), Graz (2019)
- Executive and Scientific Committees of the *Model Reduction of Parametrized Systems (MoRePaS)* workshops, Günzburg (2012), Trieste (2015), Nantes (2018)
- Scientific Advisory and Programme Committee of the *European Conference on Computational Optimization (EUCCO)*, Chemnitz (2013), Leuven (2016), Trier (2018)
- Scientific Committee of the *European Conference on Numerical Mathematics and Advanced Applications (ENUMATH)*, Lausanne (2013), Ankara (2015), Voss (2017), Egmond aan Zee (2019), Lisbon (2021)
- Scientific Committee of the 2012 *SIAM Conference on Applied Linear Algebra*, Valencia
- Co-chair of the 17th Conference of the International Linear Algebra Society (ILAS), 2011, Braunschweig

¹ SIAM – Society for Industrial and Applied Mathematics

² GAMM – *Gesellschaft für Angewandte Mathematik und Mechanik* (International Association for Applied Mathematics and Mechanics)

Research Interests

- Scientific Machine Learning
- Numerical Linear and Multilinear Algebra, in particular
 - linear and nonlinear eigenvalue problems,
 - preconditioning of linear systems with block structure,
 - matrix equations
 - low-rank tensor approximation and calculus;
- Model Order Reduction and Reduced-order Modeling;
- Numerical Methods in Systems and Control Theory;
- PDE Constrained Optimization;
- High-performance and Power-aware Computing.

Application areas include Computational Nanoelectronics/Circuit Simulation, Computational Electromagnetics, Micro-Electro-Mechanical Systems (MEMS), Computational Fluid Dynamics, Process Engineering, Machine Tool Design, Energy Networks, and Computational Physics/Chemistry.

Publications

More than 480, including 8 edited books, 1 research monograph, 215 articles in journals with peer review, 42 book chapters, and more than 220 articles in conference proceedings (mostly with peer review), a full list is available at

<https://www.mpi-magdeburg.mpg.de/csc/publications/benner>

Citation Indices

h-index: 50 (Google scholar, 12,024 citations), 29 (Scopus, 4,077 citations), 27 (WoS, 3,342 citations)

10 Selected Papers (chronological order)

- Peter Benner, Venera Khoromskaia, Boris N. Khoromskij, *Range-Separated Tensor Format for Many-Particle Modeling*, SIAM Journal on Scientific Computing, **40**, No. 2 (2017), A1034–A1062.
- Peter Benner, Serkan Gugercin, Karen Willcox, *A Survey of Projection-Based Model Reduction Methods for Parametric Dynamical Systems*, SIAM Review **57**, No. 4 (2015), 483–531.
[WoS Highly Cited Paper]
- Eberhard Bänsch, Peter Benner, Jens Saak, Heiko K. Weichelt, *Riccati-Based Boundary Feedback Stabilization of Incompressible Navier-Stokes Flow*, SIAM Journal on Scientific Computing **37**, No. 2 (2015), A832–A858.
- Peter Benner, Tobias Breiten, *Two-Sided Projection Methods for Nonlinear Model Order Reduction*, SIAM Journal on Scientific Computing, **37**, No. 2 (2015), B239–B260.
- Peter Benner, Tobias Damm, *Lyapunov Equations, Energy Functionals, and Model Order Reduction of Bilinear and Stochastic Systems*, SIAM Journal on Control and Optimization **49**, No. 2 (2011), 686–711.
- Peter Benner, Jing-Rebecca Li, Thilo Penzl, *Numerical Solution of Large Lyapunov Equations, Riccati Equations, and Linear-Quadratic Control Problems*, Numerical Linear Algebra with Applications **15**, No. 9 (2008), 755–777.
- Peter Benner, *Solving Large-Scale Control Problems*, IEEE Control Systems Magazine **24**, No. 1 (2004), 44–59.
- Peter Benner, Enrique S. Quintana-Ortí, *Solving Stable Generalized Lyapunov Equations with the Matrix Sign Function*, Numerical Algorithms **20**, No. 1 (1999), 75–100.
- Peter Benner, Volker Mehrmann, Hongguo Xu, *A Numerically Stable, Structure Preserving Method for Computing the Eigenvalues of Real Hamiltonian or Symplectic Pencils*, Numerische Mathematik **78**, No. 3 (1998), 329–358.
- Peter Benner, Heike Faßbender, *An Implicitly Restarted Symplectic Lanczos Method for the Hamiltonian Eigenvalue Problem*, Linear Algebra and its Applications **263** (1997), 75–111.

Teaching

- Courses taught at University of Kansas, University of Bremen, TU Hamburg-Harburg, TU Berlin, TU Chemnitz, Otto von Guericke University Magdeburg, including
 - Linear Algebra I + II (for mathematicians)
 - Numerical Analysis (introductory courses for mathematician, computer scientists, engineers)
 - Numerical Methods for Ordinary / Partial Differential Equations
 - Numerical Linear Algebra / Advanced Numerical Linear Algebra
 - Geometric Integration Methods
 - Model Order Reduction
 - Mathematical Systems and Control Theory
 - Optimal Control
 - Engineering Mathematics I – III
- Lecturer at various summer schools, including the Gene Golub SIAM Summer School 2013 “Matrix Functions and Matrix Equation”, Fudan University, Shanghai (China) and the LMS-EPSC Durham Symposium 2017 “Model Order Reduction”; tutorials during ICERM special semester “Model and dimension reduction in uncertain and dynamic systems” 2020.

Supervision

- 21 Diplom/Master theses
- 25 Ph.D. theses, 7 on-going; 17 external reviews
- 1 Habilitation (Martin Stoll, 2016), 2 external reviews
- 30 PostDocs

Selected Key Projects

- 2020-2025 NFDI4Cat – NFDI für Wissenschaften mit Bezug zur Katalyse (Research Data Infrastructure for Digital Catalysis), funded by BMBF³, 390,000€ (of 12.4 M€ in total)
- 2017-2022 BiGmax: MaxNet on “Big-Data-Driven Materials Science”, funded by Max Planck Society, 6 M€ in total **[chair]**
- 2017-2021 DFG Research Training Group 2297 “Mathematical Complexity Reduction”, 3.3 M€ in total
- 2016-2021 MathEnergy: *Mathematical Key Technologies for Energy Networks*, funded by BMWi⁴, 600,000€ (of 6 M€ in total)
- 2016-2019 *Structure-Preserving Model Reduction for Dissipative Mechanical Systems*, funded by DFG (German Science Foundation), within Special Priority Program 1897 “Calm, Smooth and Smart”, ca. 200,000€
- 2014-2018 EU-MORNET: *European Model Reduction Network*, funded by COST (European Co-operation in Science and Technology), 500,000€ for networking activities **[co-chair]**
- 2013-2016 nanoCOPS: *Nanoelectronic Coupled Problems Solutions*, funded by EU FP7, 348,000€ (of 3.5 M€ in total)
- 2011-2023 Sub-project A6 “Model Order Reduction” within DFG Collaborative Research Center TR96, “Thermo-Energetic Design of Machine Tools”, funded by DFG, ca. 920,000€
- 2010-2014 MoreSim4Nano: *Model Reduction for fast Simulation of new Semiconductor Structures within Nanotechnology and Microsystems Technology*, funded by BMBF, 155,000€ (of 930,000€ in total) **[network coordinator]**
- 2007-2010 SyreNe: *System Reduction for Nanoscale IC Design*, funded by BMBF, ca. 150,000€ (of 911,000€ in total) **[network coordinator]**

³ BMBF - German Ministry of Research and Education

⁴ BMWi - German Ministry for Economics and Energy