

Steffen W. R. Werner

Curriculum Vitae as of February 11, 2026



Position and Contact

Job title Assistant professor
Mailing address Virginia Polytechnic Institute and State University
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Professional Experience

- since 05/2025 **Affiliate faculty member**, *Virginia Tech National Security Institute, Virginia Tech*, Blacksburg, VA 24061, USA
- since 08/2023 **Assistant professor**, *Department of Mathematics and Division of Computational Modeling and Data Analytics, Virginia Tech*, Blacksburg, VA 24061, USA
- 09/2021–08/2023 **Postdoctoral associate**, *Department of Computer Science, Courant Institute of Mathematical Sciences, New York University*, New York, NY 10012, USA
- 10/2016–08/2021 **Doctoral researcher**, *Computational Methods in Systems and Control Theory, Max Planck Institute for Dynamics of Complex Technical Systems*, Magdeburg, Germany
- 05/2016–09/2016, **Student employee**, *Computational Methods in Systems and Control Theory, Max Planck Institute for Dynamics of Complex Technical Systems*, Magdeburg, Germany
- 10/2014–01/2016
 - Development and maintenance of MATLAB toolboxes and codes
- 01/2016–04/2016 **Industrial intern**, *proALPHA Business Solutions GmbH*, Weilerbach, Germany
 - Analysis of modern version control systems
 - Application programming
- 10/2013–09/2014 **Student employee**, *Otto von Guericke University*, Magdeburg, Germany
 - Tutor for mathematical courses
 - Tutor for the consultation of the Department of Mathematics

Education

- 10/2016–08/2021 **Doctoral studies (doctor rerum naturalium)**, *Department of Mathematics, Otto von Guericke University, Magdeburg, Germany*, summa cum laude (excellent)
Thesis: *Structure-Preserving Model Reduction for Mechanical Systems* [51]
- 04/2017–08/2021: Associate researcher in the German Research Foundation (DFG) Research Training Group 2297 “Mathematical Complexity Reduction (MathCoRe)”, Magdeburg
 - 10/2016–09/2019: Project research in the German Research Foundation (DFG) Priority Program 1897 “Calm, Smooth and Smart – Novel Approaches for Influencing Vibrations by Means of Deliberately Introduced Dissipation”
- 10/2014–09/2016 **Master of Science**, *Department of Mathematics, Otto von Guericke University, Magdeburg, Germany*, very good with distinction
Thesis: *Hankel-Norm Approximation of Descriptor Systems* [52]
- 10/2011–09/2014 **Bachelor of Science**, *Department of Mathematics, Otto von Guericke University, Magdeburg, Germany*, very good with distinction
Thesis: *Numerische Berechnung der Eigenwerte großer Hamiltonisch-positiver Matrizen* [53]
- 07/2011 **Abitur (university entrance diploma)**, *Diesterweg-Gymnasium, Tangermünde-Havelberg, Germany*

Research Interests

scientific computing, model order reduction, data-driven modeling, scientific machine learning, numerical linear algebra, optimization and control, computational decision making, matrix equations, mathematical software

Awards and Honors

- 08/2025–08/2028 **Luther and Alice Hamlett Junior Faculty Fellow**, College of Science, Virginia Tech, Blacksburg, VA, USA
- 03/2020 **Best Paper Award Automatisierungstechnik**, *for the contribution "A comparison of second-order model order reduction methods for an artificial fishtail"*, at - Automatisierungstechnik, De Gruyter, Austria
- 06/2019 **SIAM Student Chapter Certificate of Recognition**, Society for Industrial and Applied Mathematics (SIAM), Philadelphia, PA, USA

External and Internal Funding for Research and Education

- 08/2025–08/2028 **Luther and Alice Hamlett Junior Faculty Fellow**, College of Science, Virginia Tech, Blacksburg, VA, USA
\$30,000 (for 3 years)
- 07/2024–07/2026 **New Faculty Mentoring Grant**, College of Science, Virginia Tech, Blacksburg, VA, USA
\$1,500 (for 2 years)

Professional Service

Editorial Service

- since 09/2024 **Co-editor**, *MORwiki*, The MORwiki Community (<http://modelreduction.org>)
- since 05/2023 **Associate editor for code reviews**, *Computational Science and Engineering*, Springer

Conference, Workshop and Program Organization

- 05/18/2026–05/22/2026 **27th Conference of the International Linear Algebra Society (ILAS 2026)**, Blacksburg, VA, USA, Co-organizers: Christopher Beattie, Paul Cazeaux, Eric de Sturler, Mark Embree, Serkan Gugercin, Agnieszka Miedlar, Mirjeta Pasha, Megan Wawro (Virginia Tech)
(one week conference)
- 02/02/2026–02/06/2026 **Workshop “Multifidelity Methods for Stochastic and Uncertain Problems”**, *Hausdorff Research Institute for Mathematics*, Bonn, Germany, Co-organizer: Emil Løvbak (Karlsruhe Institute of Technology)
(one week workshop)
- 01/19/2026–01/23/2026 **Winter School “Bridging multiscale, limited information, and low regularity in computational mathematics”**, *Hausdorff Research Institute for Mathematics*, Bonn, Germany, Co-organizers: Emil Løvbak (Karlsruhe Institute of Technology), Christian Döding (University of Bonn), Moritz Hauck (Heidelberg University)
(one week school)
- 01/12/2026–04/17/2026 **Junior Trimester Program “Computational multifidelity, multilevel, and multiscale methods”**, *Hausdorff Research Institute for Mathematics*, Bonn, Germany, Co-organizers: Christian Döding (University of Bonn), Moritz Hauck (Heidelberg University), Emil Løvbak (Karlsruhe Institute of Technology), Andreas Rupp (Saarland University), Johan Wärnegård (KTH Royal Institute of Technology)
(three months program)
- 11/04/2023 **Workshop “Model Reduction and Numerical Linear Algebra”**, Blacksburg, VA, USA, Co-organizers: Mark Embree, Serkan Gugercin, Agnieszka Miedlar (Virginia Tech)
(one day workshop)

Minisymposium, Minitutorial and Special Session Organization

- 01/07/2026 **Minisymposium “Recent Advances in Model Order Reduction and Data-Driven Modeling: Theory and Computations”**, *Joint Mathematics Meetings (JMM 2026)*, Washington, D.C., USA, Co-organizer: Ionut-Gabriel Farcas (Virginia Tech)
(two sessions)
- 03/05/2025 **Minitutorial “Data-Driven Reduced Modeling in the Time and Frequency Domains: Fundamentals, Best Practices, and Implementation”**, *SIAM Conference on Computational Science and Engineering (CSE25)*, Fort Worth, TX, USA, Co-organizers: Ionut-Gabriel Farcas (Virginia Tech), Shane A. McQuarrie (Sandia National Labs)
(two sessions)
- 03/03/2025 **Minisymposium “Physics-Enhanced Data-Driven Control of Complex Systems”**, *SIAM Conference on Computational Science and Engineering (CSE25)*, Fort Worth, TX, USA
(two sessions)
- 02/20/2025 **Minisymposium “Recent Advances in Model Order Reduction and Data-driven Modelling”**, *11th Vienna International Conference on Mathematical Modelling MATHMOD 2025*, Vienna, Austria, Co-organizers: Hendrik Kleikamp (University of Münster), Sean Reiter (Virginia Tech), Jens Saak (MPI Magdeburg)
(three sessions)

- 07/23/2024 **Minisymposium “Modeling and learning of structured dynamical systems”, 16th World Congress on Computational Mechanics and 4th Pan American Congress on Computational Mechanics (WCCM-PANACM Vancouver 2024)**, Vancouver, British Columbia, Canada, Co-organizer: Serkan Gugercin (Virginia Tech)
(one session)
- 05/15/2024–
05/16/2024 **Minisymposium “Matrix and Tensor Equations in Action: Simulation, Model Reduction and Scientific Machine Learning”, SIAM Conference on Applied Linear Algebra (LA24)**, Paris, France, Co-organizer: Jens Saak (MPI Magdeburg)
(three sessions)
- 02/27/2023 **Minisymposium “Goal-Oriented and Context-Aware Scientific Machine Learning”, SIAM Conference on Computational Science and Engineering (CSE23)**, Amsterdam, The Netherlands, Co-organizer: Thomas O’Leary-Roseberry (UT Austin)
(two sessions)

Society Service

- since 04/2017 **Member of the Society for Industrial and Applied Mathematics (SIAM)**
- 04/2017–09/2020 **Student Chapter of SIAM Magdeburg, Germany**
- 04/2017–09/2018, 10/2019–09/2020: IT Officer
 - 10/2018–09/2019: President

Publications

Submitted

- [1] M. S. Ackermann, L. Balicki, S. Gugercin, and S. W. R. Werner. A refined nonlinear least-squares method for the rational approximation problem. e-print 2601.19813, arXiv, 2026. Numerical Analysis (math.NA). [doi:10.48550/arXiv.2601.19813](https://doi.org/10.48550/arXiv.2601.19813).
- [2] R. Smith and S. W. R. Werner. A tangential low-rank ADI method for solving indefinite Lyapunov equations. e-print 2512.04983, arXiv, 2025. Numerical Analysis (math.NA). [doi:10.48550/arXiv.2512.04983](https://doi.org/10.48550/arXiv.2512.04983).
- [3] S. Reiter and S. W. R. Werner. Data-driven balanced truncation for second-order systems with generalized proportional damping. e-print 2506.10118, arXiv, 2025. Numerical Analysis (math.NA). [doi:10.48550/arXiv.2506.10118](https://doi.org/10.48550/arXiv.2506.10118).
- [4] M. S. Ackermann, I. V. Gosea, S. Gugercin, and S. W. R. Werner. Second-order AAA algorithms for structured data-driven modeling. e-print 2506.02241, arXiv, 2025. Numerical Analysis (math.NA). [doi:10.48550/arXiv.2506.02241](https://doi.org/10.48550/arXiv.2506.02241).
- [5] S. W. R. Werner and B. Peherstorfer. An adaptive data sampling strategy for stabilizing dynamical systems via controller inference. e-print 2506.01816, arXiv, 2025. Optimization and Control (math.OC). [doi:10.48550/arXiv.2506.01816](https://doi.org/10.48550/arXiv.2506.01816).

Journal Articles

- [6] J. Heiland, Y. Kim, and S. W. R. Werner. Deep polytopic autoencoders for low-dimensional linear parameter-varying approximations and nonlinear feedback controller design. *Adv. Comput. Math.*, 51(6):55, 2025. [doi:10.1007/s10444-025-10269-1](https://doi.org/10.1007/s10444-025-10269-1).
- [7] S. W. R. Werner and B. Peherstorfer. System stabilization with policy optimization on

unstable latent manifolds. *Comput. Methods Appl. Mech. Eng.*, 433, Part A:117483, 2025. doi:10.1016/j.cma.2024.117483.

- [8] J. Saak and S. W. R. Werner. Using LDL^T factorizations in Newton's method for solving general large-scale algebraic Riccati equations. *Electron. Trans. Numer. Anal.*, 62:95–118, 2024. doi:10.1553/etna_vol62s95.
- [9] Q. Aumann and S. W. R. Werner. Adaptive choice of near-optimal expansion points for interpolation-based structure-preserving model reduction. *Adv. Comput. Math.*, 50(4):79, 2024. doi:10.1007/s10444-024-10166-z.
- [10] S. W. R. Werner and B. Peherstorfer. On the sample complexity of stabilizing linear dynamical systems from data. *Found. Comput. Math.*, 24(3):955–987, 2024. doi:10.1007/s10208-023-09605-y.
- [11] I. V. Gosea, S. Gugercin, and S. W. R. Werner. Structured barycentric forms for interpolation-based data-driven reduced modeling of second-order systems. *Adv. Comput. Math.*, 50(2):26, 2024. doi:10.1007/s10444-024-10118-7.
- [12] P. Benner, S. Gugercin, and S. W. R. Werner. Structured interpolation for multivariate transfer functions of quadratic-bilinear systems. *Adv. Comput. Math.*, 50(2):18, 2024. doi:10.1007/s10444-024-10109-8.
- [13] P. Benner, S. Gugercin, and S. W. R. Werner. A unifying framework for tangential interpolation of structured bilinear control systems. *Numer. Math.*, 155(3–4):445–483, 2023. doi:10.1007/s00211-023-01380-w.
- [14] J. Heiland and S. W. R. Werner. Low-complexity linear parameter-varying approximations of incompressible Navier-Stokes equations for truncated state-dependent Riccati feedback. *IEEE Control Syst. Lett.*, 7:3012–3017, 2023. doi:10.1109/LCSYS.2023.3291231.
- [15] S. W. R. Werner, M. L. Overton, and B. Peherstorfer. Multifidelity robust controller design with gradient sampling. *SIAM J. Sci. Comput.*, 45(2):A933–A957, 2023. doi:10.1137/22M1500137.
- [16] S. W. R. Werner and B. Peherstorfer. Context-aware controller inference for stabilizing dynamical systems from scarce data. *Proc. R. Soc. A: Math. Phys. Eng. Sci.*, 479(2270):20220506, 2023. doi:10.1098/rspa.2022.0506.
- [17] P. Benner, J. Heiland, and S. W. R. Werner. A low-rank solution method for Riccati equations with indefinite quadratic terms. *Numer. Algorithms*, 92(2):1083–1103, 2023. doi:10.1007/s11075-022-01331-w.
- [18] Q. Aumann and S. W. R. Werner. Structured model order reduction for vibro-acoustic problems using interpolation and balancing methods. *J. Sound Vib.*, 543:117363, 2023. doi:10.1016/j.jsv.2022.117363.
- [19] P. Benner, J. Heiland, and S. W. R. Werner. Robust output-feedback stabilization for incompressible flows using low-dimensional \mathcal{H}_∞ -controllers. *Comput. Optim. Appl.*, 82(1):225–249, 2022. doi:10.1007/s10589-022-00359-x.
- [20] P. Benner, Y. Filanova, D. Karachalios, S. Monem Abdelhafez, J. Przybilla, and S. W. R. Werner. Mathematische Komplexitätsreduktion: Modellreduktion dynamischer Systeme. *Mitteilungen der Deutschen Mathematiker-Vereinigung*, 29(4):198–204, 2021. doi:10.1515/dmvm-2021-0075.

- [21] R. Jendersie and S. W. R. Werner. A comparison of numerical methods for model reduction of dense discrete-time systems. *at-Automatisierungstechnik*, 69(8):683–694, 2021. doi:[10.1515/auto-2021-0035](https://doi.org/10.1515/auto-2021-0035).
- [22] P. Benner, S. Gugercin, and S. W. R. Werner. Structure-preserving interpolation for model reduction of parametric bilinear systems. *Automatica*, 132:109799, 2021. doi:[10.1016/j.automatica.2021.109799](https://doi.org/10.1016/j.automatica.2021.109799).
- [23] P. Benner, S. Gugercin, and S. W. R. Werner. Structure-preserving interpolation of bilinear control systems. *Adv. Comput. Math.*, 47(3):43, 2021. doi:[10.1007/s10444-021-09863-w](https://doi.org/10.1007/s10444-021-09863-w).
- [24] P. Benner and S. W. R. Werner. Frequency- and time-limited balanced truncation for large-scale second-order systems. *Linear Algebra Appl.*, 623:68–103, 2021. Special issue in honor of P. Van Dooren, Edited by F. Dopico, D. Kressner, N. Mastronardi, V. Mehrmann, and R. Vandebril. doi:[10.1016/j.laa.2020.06.024](https://doi.org/10.1016/j.laa.2020.06.024).
- [25] P. Benner and S. W. R. Werner. Hankel-norm approximation of large-scale descriptor systems. *Adv. Comput. Math.*, 46(3):40, 2020. doi:[10.1007/s10444-020-09750-w](https://doi.org/10.1007/s10444-020-09750-w).
- [26] J. Saak, D. Siebelts, and S. W. R. Werner. A comparison of second-order model order reduction methods for an artificial fishtail. *at-Automatisierungstechnik*, 67(8):648–667, 2019. doi:[10.1515/auto-2019-0027](https://doi.org/10.1515/auto-2019-0027).

Book Chapters

- [27] R. S. Beddig, P. Benner, I. Dorschky, T. Reis, P. Schwerdtner, M. Voigt, and S. W. R. Werner. Structure-preserving model reduction for dissipative mechanical systems. In P. Eberhard, editor, *Calm, Smooth and Smart*, volume 102 of *Lect. Notes Appl. Comput. Mech.*, pages 209–230. Springer, Cham, 2024. doi:[10.1007/978-3-031-36143-2_11](https://doi.org/10.1007/978-3-031-36143-2_11).
- [28] P. Benner and S. W. R. Werner. MORLAB—The Model Order Reduction LABoratory. In P. Benner, T. Breiten, H. Faßbender, M. Hinze, T. Stykel, and R. Zimmermann, editors, *Model Reduction of Complex Dynamical Systems*, volume 171 of *International Series of Numerical Mathematics*, pages 393–415. Birkhäuser, Cham, 2021. doi:[10.1007/978-3-030-72983-7_19](https://doi.org/10.1007/978-3-030-72983-7_19).
- [29] P. Benner and S. W. R. Werner. MORLAB – A model order reduction framework in MATLAB and Octave. In A. M. Bigatti, J. Carette, J. H. Davenport, M. Joswig, and T. de Wolff, editors, *Mathematical Software – ICMS 2020*, volume 12097 of *Lecture Notes in Comput. Sci.*, pages 432–441. Springer International Publishing, Cham, 2020. doi:[10.1007/978-3-030-52200-1_43](https://doi.org/10.1007/978-3-030-52200-1_43).

Proceedings

- [30] S. Reiter and S. W. R. Werner. Interpolatory model reduction of dynamical systems with root mean squared error. *IFAC-Pap.*, 59(1):385–390, 2025. 11th Vienna International Conference on Mathematical Modelling MATHMOD 2025. doi:[10.1016/j.ifacol.2025.03.066](https://doi.org/10.1016/j.ifacol.2025.03.066).
- [31] P. Benner, S. Gugercin, and S. W. R. Werner. Structure-preserving interpolation of quadratic-bilinear systems via regular multivariate transfer functions. *Proc. Appl. Math. Mech.*, 24(3):e202400048, 2024. doi:[10.1002/pamm.202400048](https://doi.org/10.1002/pamm.202400048).
- [32] S. W. R. Werner, I. V. Gosea, and S. Gugercin. Structured vector fitting framework for mechanical systems. *IFAC-Pap.*, 55(20):163–168, 2022. 10th Vienna International

Conference on Mathematical Modelling MATHMOD 2022. [doi:10.1016/j.ifacol.2022.09.089](https://doi.org/10.1016/j.ifacol.2022.09.089).

- [33] P. Benner and S. W. R. Werner. Frequenz- und zeitbeschränktes balanciertes Abschneiden für Systeme zweiter Ordnung. In T. Meurer and F. Woittennek, editors, *Tagungsband GMA-FA 1.30 'Modellbildung, Identifikation und Simulation in der Automatisierungstechnik' und GMA-FA 1.40 'Systemtheorie und Regelungstechnik', Workshops in Anif, Salzburg, 23.-27.09.2019*, pages 460–474, 2019.
- [34] P. Benner and S. W. R. Werner. MORLAB – Model Order Reduction LABoratory. In T. Meurer and F. Woittennek, editors, *Tagungsband GMA-FA 1.30 'Modellbildung, Identifikation und Simulation in der Automatisierungstechnik' und GMA-FA 1.40 'Systemtheorie und Regelungstechnik', Workshops in Anif, Salzburg, 23.-27.09.2019*, pages 337–342, 2019.
- [35] R. S. Beddig, P. Benner, I. Dorschky, T. Reis, P. Schwerdtner, M. Voigt, and S. W. R. Werner. Model reduction for second-order dynamical systems revisited. *Proc. Appl. Math. Mech.*, 19(1):e201900224, 2019. [doi:10.1002/pamm.201900224](https://doi.org/10.1002/pamm.201900224).
- [36] P. Benner, J. Heiland, and S. W. R. Werner. Robust controller versus numerical model uncertainties for stabilization of Navier-Stokes equations. *IFAC-Pap.*, 52(2):25–29, 2019. 3rd IFAC/IEEE CSS Workshop on Control of Systems Governed by Partial Differential Equation CPDE 2019. [doi:10.1016/j.ifacol.2019.08.005](https://doi.org/10.1016/j.ifacol.2019.08.005).
- [37] P. Benner and S. W. R. Werner. Balancing related model reduction with the MORLAB toolbox. *Proc. Appl. Math. Mech.*, 18(1):e201800083, 2018. [doi:10.1002/pamm.201800083](https://doi.org/10.1002/pamm.201800083).
- [38] P. Benner and S. W. R. Werner. Model reduction of descriptor systems with the MORLAB toolbox. *IFAC-Pap.*, 51(2):547–552, 2018. 9th Vienna International Conference on Mathematical Modelling MATHMOD 2018. [doi:10.1016/j.ifacol.2018.03.092](https://doi.org/10.1016/j.ifacol.2018.03.092).
- [39] P. Benner and S. W. R. Werner. MORLAB - Modellreduktion in MATLAB. In T. Meurer and F. Woittennek, editors, *Tagungsband GMA-FA 1.30 'Modellierung, Identifikation und Simulation in der Automatisierungstechnik' und GMA-FA 1.40 'Theoretische Verfahren der Regelungstechnik', Workshop in Anif, Salzburg, 18.-22.09.2017*, pages 508–517, 2017.
- [40] P. Benner and S. W. R. Werner. On the transformation formulas of the Hankel-norm approximation. *Proc. Appl. Math. Mech.*, 17(1):823–824, 2017. [doi:10.1002/pamm.201710379](https://doi.org/10.1002/pamm.201710379).

Software

- [41] P. Benner, J. Saak, and S. W. R. Werner. MORLAB – Model Order Reduction LABoratory (version 6.0), September 2023. See also: <https://www.mpi-magdeburg.mpg.de/projects/morlab>. [doi:10.5281/zenodo.7072831](https://doi.org/10.5281/zenodo.7072831).
- [42] P. Benner and S. W. R. Werner. SOLBT – Limited balanced truncation for large-scale sparse second-order systems (version 3.0), April 2021. [doi:10.5281/zenodo.4600763](https://doi.org/10.5281/zenodo.4600763).
- [43] P. Benner and S. W. R. Werner. SOMDDPA – Second-Order Modally-Damped Dominant Pole Algorithm (version 2.0), April 2021. [doi:10.5281/zenodo.3997649](https://doi.org/10.5281/zenodo.3997649).
- [44] P. Benner and S. W. R. Werner. SOMDDPA – Second-Order Modally-Damped Dominant Pole Algorithm (version 1.1), January 2020. [doi:10.5281/zenodo.3332706](https://doi.org/10.5281/zenodo.3332706).

- [45] P. Benner and S. W. R. Werner. Limited balanced truncation for large-scale sparse second-order systems (version 2.0), January 2020. doi:10.5281/zenodo.3331592.
- [46] P. Benner and S. W. R. Werner. MORLAB – Model Order Reduction LABoratory (version 5.0), August 2019. see also: <https://www.mpi-magdeburg.mpg.de/projects/morlab>. doi:10.5281/zenodo.3332716.
- [47] P. Benner and S. W. R. Werner. Limited balanced truncation for large-scale sparse second-order systems (version 1.0), February 2019. doi:10.5281/zenodo.2553926.
- [48] P. Benner and S. W. R. Werner. SOMDDPA – Second-Order Modally Damped Dominant Pole Algorithm (version 1.0), February 2019. doi:10.5281/zenodo.2553902.
- [49] P. Benner and S. W. R. Werner. MORLAB – Model Order Reduction LABoratory (version 4.0), December 2018. see also: <https://www.mpi-magdeburg.mpg.de/projects/morlab>. doi:10.5281/zenodo.1574083.
- [50] P. Benner and S. W. R. Werner. MORLAB-3.0 – model order reduction laboratory, September 2017. see also: <https://www.mpi-magdeburg.mpg.de/projects/morlab>. doi:10.5281/zenodo.842659.

Theses

- [51] S. W. R. Werner. *Structure-Preserving Model Reduction for Mechanical Systems*. Dissertation, Otto-von-Guericke-Universität, Magdeburg, Germany, 2021. doi:10.25673/38617.
- [52] S. Werner. Hankel-norm approximation of descriptor systems. Master's thesis, Otto-von-Guericke-Universität, Magdeburg, Germany, 2016. doi:10.25673/4507.
- [53] S. Werner. Numerische Berechnung der Eigenwerte großer Hamiltonisch-positiver Matrizen. Bachelor's thesis, Otto-von-Guericke-Universität, Magdeburg, Germany, 2014.

Contributions to Other Projects

I made contributions to the content of the following software projects:

- J. Saak, M. Köhler, and P. Benner. M-M.E.S.S. – The Matrix Equations Sparse Solvers Library (version 3.1), February 2025. See also: <https://www.mpi-magdeburg.mpg.de/projects/mess>. doi:10.5281/zenodo.14929081.
- J. Saak, M. Köhler, and P. Benner. M-M.E.S.S. – The Matrix Equations Sparse Solvers Library (version 3.0), September 2023. See also: <https://www.mpi-magdeburg.mpg.de/projects/mess>. doi:10.5281/zenodo.7701424.
- J. Saak, M. Köhler, and P. Benner. M-M.E.S.S.-2.2 – The Matrix Equations Sparse Solvers Library, February 2022. see also: <https://www.mpi-magdeburg.mpg.de/projects/mess>. doi:10.5281/zenodo.5938237.
- J. Saak, M. Köhler, and P. Benner. M-M.E.S.S.-2.1 – The Matrix Equations Sparse Solvers Library, April 2021. see also: <https://www.mpi-magdeburg.mpg.de/projects/mess>. doi:10.5281/zenodo.4719688.
- J. Saak, M. Köhler, and P. Benner. M-M.E.S.S.-2.0.1 – The Matrix Equations Sparse Solvers Library, February 2020. see also: <https://www.mpi-magdeburg.mpg.de/projects/mess>. doi:10.5281/zenodo.3606345.
- J. Saak, M. Köhler, and P. Benner. M-M.E.S.S.-2.0 – The Matrix Equations Sparse Solvers Library, August 2019. see also: <https://www.mpi-magdeburg.mpg.de/projects/mess>. doi:10.5281/zenodo.3368844.

- J. Saak, M. Köhler, and P. Benner. M-M.E.S.S.-1.0.1 – The Matrix Equations Sparse Solvers Library, April 2016. see also: <https://www.mpi-magdeburg.mpg.de/projects/mess>. doi:10.5281/zenodo.50575.

Conference Contributions

Oral Presentations

- 02/02/2026 **Interpolatory Model Reduction for Structured Stochastic and Nonlinear Systems**, *Multifidelity Methods for Stochastic and Uncertain Problems*, Hausdorff Research Institute for Mathematics, Bonn, Germany, (invited plenary talk)
- 01/07/2026 **Structured Nonlinear Model Reduction Via Multivariate Interpolation**, *Joint Mathematics Meetings (JMM 2026)*, Washington, D.C., USA, (invited minisymposium talk)
- 01/04/2026 **Learning Mechanical Systems Via Data-driven Balanced Truncation**, *Joint Mathematics Meetings (JMM 2026)*, Washington, D.C., USA, (invited minisymposium talk)
- 11/11/2025 **Data-driven Balanced Truncation for Learning Mechanical Systems**, *Reduced Order and Surrogate Modeling for Digital Twins*, IMSI, Chicago, IL, USA, (invited plenary talk, online)
- 10/22/2025 **Computational Methods for Learning Interpretable Models and Reliable Decision Making**, *Virginia Tech National Security Institute Technical Seminar*, Virginia Tech, Blacksburg, VA, USA, (invited seminar talk)
- 09/08/2025 **Data-driven Balanced Truncation for Mechanical Systems**, *Applied Numerical Analysis Seminar*, Virginia Tech, Blacksburg, VA, USA
- 06/26/2025 **Efficiently Solving Nonstandard Riccati Equations Via Indefinite Factorizations**, *26th Conference of the International Linear Algebra Society (ILAS 2025)*, National Sun Yat-sen University, Kaohsiung, Taiwan, (invited minisymposium talk)
- 06/24/2025 **Reduced-order modeling of mechanical systems via structured barycentric forms**, *26th Conference of the International Linear Algebra Society (ILAS 2025)*, National Sun Yat-sen University, Kaohsiung, Taiwan, (invited minisymposium talk)
- 06/10/2025 **Structured Representations of Rational Functions for Learning Mechanical Dynamical Systems: A Barycentric Approach**, *Householder Symposium XXII*, Cornell University, Ithaca, NY, USA, (invited talk)
- 04/10/2025 **Multivariate Rational Function Interpolation For Structured Nonlinear Model Reduction**, *Challenges, Opportunities, and New Horizons in Rational Approximation*, Banff International Research Station, Banff, AB, Canada, (invited plenary talk)
- 03/03/2025 **Data Efficient Low-Dimensional Controller Inference Via Adaptive Sampling**, *SIAM Conference on Computational Science and Engineering (CSE25)*, Fort Worth, TX, USA, (invited minisymposium talk)
- 01/07/2025 **From Data to Structure: Learning Mechanical Systems Via Rational Functions**, *Computational Learning for Model Reduction*, ICERM, Providence, RI, USA, (invited plenary talk)
- 10/21/2024 **Learning Mechanical Systems Via a Structured AAA Algorithm**, *SIAM Conference on Mathematics of Data Science (MDS24)*, Atlanta, GA, USA, (invited minisymposium talk)
- 09/30/2024 **Adaptive data sampling for low-dimensional controller inference**, *Applied Numerical Analysis Seminar*, Virginia Tech, Blacksburg, VA, USA

- 09/13/2024 **An adaptive data sampling scheme for low-dimensional controller inference**, *Model Reduction and Surrogate Modeling (MORe2024)*, La Jolla, California, USA
- 07/23/2024 **Adaptive choice of near-optimal interpolation points for structure-preserving model reduction**, *16th World Congress on Computational Mechanics and 4th Pan American Congress on Computational Mechanics (WCCM-PANACM Vancouver 2024)*, Vancouver, British Columbia, Canada, (invited minisymposium talk)
- 05/15/2024 **Using Indefinite Low-Rank Factorizations for Solving Large-Scale Riccati Equations**, *SIAM Conference on Applied Linear Algebra (LA24)*, Paris, France, (invited minisymposium talk)
- 03/22/2024 **Structure-Preserving Interpolation of Quadratic-Bilinear Systems via Regular Multivariate Transfer Functions**, *94th GAMM Annual Meeting, Section "Dynamics and Control"*, Magdeburg, Germany
- 03/05/2024 **Solving large-scale linear and nonlinear algebraic matrix equations**, *Center for Hierarchical and Robust Modeling of Non-Equilibrium Transport (CHaRMNET)*, (invited online talk)
- 03/01/2024 **Structure-Preserving Interpolation of Quadratic-Bilinear Systems**, *Applied Numerical Analysis Seminar, Virginia Tech*, Blacksburg, VA, USA
- 09/08/2023 **Learning mechanical systems using structured barycentric forms**, *Applied Numerical Analysis Seminar, Virginia Tech*, Blacksburg, VA, USA
- 06/26/2023 **Context-aware learning for stabilizing dynamical systems from scarce data**, *Applied Mathematics Seminar, FernUni Schweiz*, Brig-Glis, Switzerland, (invited seminar talk)
- 05/25/2023 **Context-aware learning for stabilizing dynamical systems from scarce data**, *Workshop and Conference on Nonlinear Model Reduction for Control*, Blacksburg, VA, USA
- 02/27/2023 **Context-Aware Learning of Stabilizing Controllers in the Scarce Data Regime**, *SIAM Conference on Computational Science and Engineering (CSE23)*, Amsterdam, The Netherlands, (invited minisymposium talk)
- 01/30/2023 **Context-aware learning of controllers for stabilizing dynamical systems**, *Virginia Tech*, Blacksburg, VA, USA, (invited talk)
- 01/04/2023 **Learning mechanical systems using structured barycentric forms**, *Joint Mathematics Meetings (JMM 2023)*, Boston, MA, USA, (invited minisymposium talk)
- 09/27/2022 **Stabilizing Dynamical Systems in the Scarce Data Regime**, *SIAM Conference on Mathematics of Data Science (MDS22)*, San Diego, CA, USA, (invited minisymposium talk)
- 09/23/2022 **Context-aware learning of low-dimensional stabilizing controllers in the scarce data regime**, *Model Reduction and Surrogate Modeling (MORe)*, Berlin, Germany
- 07/27/2022 **Structured Vector Fitting Framework for Mechanical Systems**, *10th Vienna International Conference on Mathematical Modelling (MATHMOD)*, Vienna, Austria, (invited minisymposium talk)
- 07/02/2022 **Stabilizing Dynamical Systems in the Scarce Data Regime**, *Workshop on New Trends in Computational Science in Engineering and Industrial Mathematics*, Magdeburg, Germany, (invited minisymposium talk)
- 06/01/2022 **Stabilizing Dynamical Systems in the Scarce Data Regime**, *ICERM Spring 2020 Reunion Event*, Providence, RI, USA, (invited talk)

- 04/22/2022 **Stabilizing Dynamical Systems in the Scarce Data Regime**, *Numerical Analysis and Scientific Computing Seminar, Courant Institute of Mathematical Sciences, New York University, New York, NY, USA*, (invited seminar talk)
- 04/15/2022 **Context-Aware Learning of Stabilizing Controllers from Data**, *SIAM Conference on Uncertainty Quantification (UQ22)*, Atlanta, GA, USA, (invited minisymposium talk)
- 03/29/2022 **A New Tangential Interpolation Framework for Model Reduction of Bilinear Systems**, *3rd Workshop on Optimal Control of Dynamical Systems and Applications*, Osijek, Croatia, (invited talk, hybrid conference)
- 07/20/2021 **Robust Output-Feedback Stabilization for Incompressible Flows using Low-Dimensional H-Infinity Controllers**, *SIAM Conference on Control and Its Applications (CT21)*, Spokane, WA, USA, (invited minisymposium talk, online conference)
- 06/24/2021 **Structure-Preserving Interpolation for Bilinear Systems**, *8th European Congress of Mathematics (8ECM)*, Portorož, Slovenia, (invited minisymposium talk, online conference)
- 03/16/2021 **Structure-Preserving Model Reduction for Bilinear Systems**, *91st GAMM Annual Meeting, Section "Dynamics and Control" (GAMM 2020@21)*, Kassel, Germany, (online conference)
- 01/11/2021 **Model Reduction of Parametric Bilinear Mechanical Systems**, *14th World Congress in Computational Mechanics and ECCOMAS Congress (WCCM-ECCOMAS 2020)*, Paris, France, (online conference)
- 07/16/2020 **MORLAB – A Model Order Reduction Framework in MATLAB & Octave**, *International Congress on Mathematical Software (ICMS 2020)*, Braunschweig, Germany, (online conference)
- 05/20/2020 **Structure-Preserving Interpolation for Bilinear Control Systems**, *Weekly Fellow Seminar Series of "MathCoRe"*, Magdeburg, Germany, (online seminar)
- 09/25/2019 **Frequenz- und zeitbeschränktes balanciertes Abschneiden für Systeme zweiter Ordnung**, *Meeting of the GMA Fachausschuss 1.30 "Modellbildung, Identifikation und Simulation in der Automatisierungstechnik" and GMA Fachausschuss 1.40 "Systemtheorie und Regelungstechnik"*, Anif, Austria
- 09/25/2019 **MORLAB – Model Order Reduction LABoratory**, *Meeting of the GMA Fachausschuss 1.30 "Modellbildung, Identifikation und Simulation in der Automatisierungstechnik" and GMA Fachausschuss 1.40 "Systemtheorie und Regelungstechnik"*, Anif, Austria, (interactive software session)
- 09/10/2019 **Limited Model Reduction for an Artificial Fishtail**, *Meeting of the European SIAM and GAMM Student Chapters (MESIGA 2019)*, Aachen, Germany
- 08/30/2019 **Frequency- and Time-Limited Balanced Truncation for Second-Order Systems**, *4th Workshop on Model Reduction of Complex Dynamical Systems (MODRED 2019)*, Graz, Austria
- 06/26/2019 **How to Reduce the Model of an Artificial Fishtail**, *Weekly Fellow Seminar Series of "MathCoRe"*, Magdeburg, Germany
- 05/20/2019 **Robust Controller versus Numerical Model Uncertainties for Stabilization of Navier-Stokes Equations**, *3rd IFAC/IEEE CSS Workshop on Control of Systems Governed by Partial Differential Equations CPDE and XI Workshop Control of Distributed Parameter Systems, CDPS 2019*, Oaxaca, Mexico, (invited session talk)
- 02/28/2019 **H-Infinity Balanced Truncation for Feedback Control of Flow Problems**, *SIAM Conference on Computational Science and Engineering (CSE19)*, Spokane, WA, USA, (invited minisymposium talk)

- 02/22/2019 **H-Infinity Balanced Truncation for Feedback Control of Flow Problems**, *Applied Numerical Analysis Seminar, Virginia Polytechnic Institute and State University*, Blacksburg, VA, USA, (invited seminar talk)
- 09/21/2018 **MORLAB – A Model Reduction Framework in MATLAB & Octave**, *Meeting of the European SIAM and GAMM Student Chapters (MESIGA 2018)*, Berlin, Germany
- 05/16/2018 **Model Reduction of Linear Dynamical Systems with the MORLAB Toolbox**, *Weekly Fellow Seminar Series of “MathCoRe”*, Magdeburg, Germany
- 04/20/2018 **MORLAB – A Framework for Model Reduction in MATLAB & OCTAVE**, *GAMM-Fachausschuss Dynamik und Regelungstheorie*, Berlin, Germany
- 03/21/2018 **Balancing Related Model Reduction with the MORLAB Toolbox**, *89th GAMM Annual Meeting, Section “Dynamics and Control”*, Munich, Germany
- 02/22/2018 **Model Reduction of Descriptor Systems with the MORLAB Toolbox**, *9th Vienna International Conference on Mathematical Modelling (MATHMOD 2018)*, Vienna, Austria
- 09/22/2017 **MORLAB – Modellreduktion in MATLAB**, *Meeting of the GMA Fachausschuss 1.30 “Modellbildung, Identifikation und Simulation in der Automatisierungstechnik” and GMA Fachausschuss 1.40 “Systemtheorie und Regelungstechnik”*, Anif, Austria
- 05/17/2017 **Model Reduction for Linear Systems**, *Weekly Fellow Seminar Series of “MathCoRe”*, Magdeburg, Germany
- 03/09/2017 **Hankel-Norm Approximation of Descriptor Systems**, *88th GAMM Annual Meeting, Section “Dynamics and Control”*, Weimar, Germany
- 01/12/2017 **Hankel-Norm Approximation of Descriptor Systems**, *3rd Workshop on Model Reduction of Complex Dynamical Systems (MODRED 2017)*, Odense, Denmark

Presented Posters

- 09/10/2024 **Model reduction of large-scale sparse systems in MATLAB and Octave with the MORLAB toolbox**, *Model Reduction and Surrogate Modeling (MORE2024)*, La Jolla, California, USA
- 05/13/2024 **Efficiently Computing Solutions to Matrix Equations in MATLAB and Octave**, *SIAM Conference on Applied Linear Algebra (LA24)*, Paris, France
- 06/06/2023 **CaCI: Context-aware Controller Inference for Stabilizing Dynamical Systems**, *Mathematical and Scientific Machine Learning (MSML)*, Providence, RI, USA
- 09/28/2022 **Structure-Preserving Learning of Mechanical Systems**, *SIAM Conference on Mathematics of Data Science (MDS22)*, San Diego, CA, USA
- 09/21/2022 **Balancing-related model reduction of large-scale sparse systems in MATLAB and Octave with the MORLAB toolbox**, *Model Reduction and Surrogate Modeling (MORE)*, Berlin, Germany
- 11/07/2019 **Solving Matrix Equations with the MORLAB Toolbox**, *METT VIII – 8th Workshop on Matrix Equations and Tensor Techniques*, Magdeburg, Germany
- 08/28/2019 **MORLAB – Model Order Reduction LABoratory**, *4th Workshop on Model Reduction of Complex Dynamical Systems (MODRED 2019)*, Graz, Austria
- 02/27/2019 **MORLAB – Model Order Reduction LABoratory**, *SIAM Conference on Computational Science and Engineering (CSE19)*, Spokane, WA, USA, (invited poster)
- 04/12/2018 **Computing the Hankel-Norm Approximation of Large-Scale Descriptor Systems**, *Model Reduction of Parametrized Systems IV (MoRePaS 2018)*, Nantes, France

06/01/2017 **Hankel-Norm Approximation of Descriptor Systems**, *Gene Golub SIAM Summer School: Data Sparse Approximations and Algorithms*, Berlin, Germany

Additional Participation

06/29/2023 **Dynamics of Complex Technical Systems: Current Status and Future Perspectives (25 Years Max Planck Institute Magdeburg)**, *Magdeburg, Germany*

06/12/2022–
06/17/2022 **Householder Symposium XXI**, *Selva di Fasano, Italy*
(invited participation)

06/20/2018–
06/22/2018 **International Workshop on Optimal Control of Dynamical Systems and Applications**, *Osijek, Croatia*

02/26/2018–
03/01/2018 **12th Elgersburg Workshop**, *Elgersburg, Germany*

09/06/2017–
09/08/2017 **2nd MOR PhD Students Workshop**, *Munich, Germany*

Research Stays

01/11/2026–
04/17/2026 **Hausdorff Research Institute for Mathematics**, *Bonn, Germany*, as part of the Junior Trimester Program “Computational multifidelity, multilevel, and multiscale methods”
(3 months)

06/19/2023–
06/28/2023 **FernUni Schweiz**, *Thun, Switzerland*, local collaborator: Matthias Voigt
(1.5 weeks)

07/04/2022–
07/08/2022 **Max Planck Institute for Dynamics of Complex Technical Systems**, *Magdeburg, Germany*, local collaborators: Quirin Aumann, Peter Benner, Jens Saak
(1 week)

02/01/2019–
04/30/2019 **Virginia Polytechnic Institute and State University**, *Blacksburg, VA, USA*, local supervisors: Christopher Beattie, Serkan Gugercin
(3 months)

Teaching Experience

Fall term 2025 **CMDA 3605 (Mathematical Modeling: Methods and Tools I)**, *Lecturer (self-directed)*, Virginia Tech, Blacksburg, USA

Spring term 2025 **MATH 5414 (TS: Learning Dynamical Systems: From Data to Models)**, *Lecturer (self-directed)*, Virginia Tech, Blacksburg, USA

Fall term 2024 **CMDA 3605 (Mathematical Modeling: Methods and Tools I)**, *Lecturer (self-directed)*, Virginia Tech, Blacksburg, USA

Spring term 2024 **CMDA 3605 (Mathematical Modeling: Methods and Tools I)**, *Lecturer (self-directed)*, Virginia Tech, Blacksburg, USA

Fall term 2023 **CMDA 3605 (Mathematical Modeling: Methods and Tools I)**, *Lecturer (self-directed)*, Virginia Tech, Blacksburg, USA

11/2019 **Introduction to MATLAB**, *Lecturer (self-directed)*, Max Planck Institute for Dynamics of Complex Technical Systems, Magdeburg, Germany, (one week compact course)

Winter term
2017/2018 **Funktionentheorie (Complex Analysis)**, *Co-lecturer together with Jan Heiland*, Otto von Guericke University, Magdeburg, Germany

- Summer term 2014 **Consultation hour for the Department of Mathematics**, *Tutor*, Otto von Guericke University, Magdeburg, Germany
- Summer term 2014 **Stochastik für Ingenieure (Stochastic for Engineers)**, *Exercise tutor*, Otto von Guericke University, Magdeburg, Germany
- Winter term 2013/2014 **Explorative Datenanalyse (Exploratory Data Analysis)**, *Exercise tutor*, Otto von Guericke University, Magdeburg, Germany

Student Supervision

Current Graduate Students

- since 2024 **Mike Ackermann**, *Co-advised with Serkan Gugercin*
- since 2024 **Rudi Smith**, *Co-advised with Agnieszka Miedlar*

Bachelor Students

- 06/13/2019 **Robert Jendersie**, *Thesis: "Model Order Reduction of Linear Discrete-Time Systems"*, Co-advisor: Christian Lessig, Otto von Guericke University, Magdeburg, Germany

Undergraduate Research Projects

- 01/2025–05/2025 **Ethan Crouse**, *"Stabilization of dynamical systems with manifold reinforcement learning"*, Virginia Tech, Blacksburg, USA
- 01/2025–05/2025 **Theodore Li**, *"Subspace identification used to establish dynamics in time-sensitive ICU patient data"*, Virginia Tech, Blacksburg, USA
(Winner of the Layman Prize Competition for Undergraduate Research in Math 2025)
- 01/2025–05/2025 **Yejin Moon**, *"Analyzing Virginia Tech's Sport Statistics with Linear Algebra"*, Virginia Tech, Blacksburg, USA
(Received CMDA Undergraduate Research Award for Spring Term 2025)
- 10/2024–12/2024 **Yejin Moon**, *"Model Development for Virginia Tech Baseball Performance"*, Virginia Tech, Blacksburg, USA
- 01/2024–05/2024 **Surya Veluguri**, *"Data-driven modeling of dynamical systems in the time domain"*, Virginia Tech, Blacksburg, USA
(Received CMDA Undergraduate Research Award for Spring Term 2024)
- 01/2024–05/2024 **Levi Walker**, *"Data-driven modeling of dynamical systems in the frequency domain"*, Virginia Tech, Blacksburg, USA
(Received CMDA Undergraduate Research Award for Spring Term 2024)
- 09/2023–11/2023 **Isha Singh**, *"Reinforcement learning for stabilizing dynamical processes"*, Virginia Tech, Blacksburg, USA
- 11/2022–04/2023 **Rahul Manavalan**, *"Simulation and stabilization of hall thrusters"*, Co-Advisor: Benjamin Peherstorfer, TU Munich, Munich, Germany

Interns

- 11/2018–03/2019 **Robert Jendersie**, *Implementations in the MORLAB toolbox and other MATLAB related coding tasks*

Additional Qualification

- 05/26/2025–06/27/2025 **Pre-Stonewall Queer US History Elective**, *Workshop held by Ashleigh “Bing” Bingham (Virginia Tech)*, Blacksburg, VA, USA
○ Workshop content: history of LGBTQ+ identities and issues in the U.S. before 1969
- 03/17/2025–04/25/2025 **VirTual Trans Safe Zone**, *Workshop held by Haleigh Wallace (Virginia Tech)*, Blacksburg, VA, USA
○ Workshop content: introduction to trans identities and issues
- 02/03/2025–03/06/2025 **VirTual Safe Zone 101**, *Workshop held by Haleigh Wallace (Virginia Tech)*, Blacksburg, VA, USA
○ Workshop content: introduction to minority groups, LGBTQ+ identities and issues
- 01/16/2024–05/08/2024 **Proposal Development Institute**, *Workshop held in the College of Science, Virginia Tech*, Blacksburg, VA, USA
○ Workshop content: research proposal writing step by step
- 08/10/2023–05/12/2024 **Faculty Academy**, *Workshop series held in the College of Science, Virginia Tech*, Blacksburg, VA, USA
○ Workshop content: time management, leadership skills, grant application, university resource usage
- 12/07/2023 **Professional Development Network Reading Day**, *Workshop held by the Technology-enhanced Learning and Online Strategies (Virginia Tech)*, Blacksburg, VA, USA
○ Workshop content: generative AI for teaching, iThenticate usage, website hosting for students and faculty, LinkedIn Learning
- 10/11/2023 **How People Learn**, *Course held by the Center for Excellence in Teaching and Learning (Virginia Tech)*, Blacksburg, VA, USA
○ Course content: biology of human learning, strategies to increase student learning
- 10/04/2023 **Developing Assessment and Grading Strategies to Promote Student Learning**, *Course held by the Center for Excellence in Teaching and Learning (Virginia Tech)*, Blacksburg, VA, USA
○ Course content: general and alternative assessment strategies for student learning
- 11/12/2021, 11/05/2021 **Responsible Conduct of Research**, *Course held by Christine Ponder (Senior Director of Research Affairs, NYU)*, New York, NY, USA
○ Course content: scientific practice, data management, scientific misconduct
- 10/21/2020–10/23/2020 **Good Scientific Practice**, *Course held by Helga Nolte (CoachInScience)*, Magdeburg, Germany
○ Course content: scientific practice, data management, scientific misconduct
- 09/23/2020–09/25/2020 **Leadership Skills**, *Course held by Sabine Lerch (Soft Skills for Science)*, Magdeburg, Germany
○ Course content: leadership models, critical feedback, mediation
- 12/10/2019–12/11/2019 **Presentation Skills**, *Course held by the National Institute for Science Communication*, Karlsruhe, Germany
○ Course content: body language, presentation structures, art of persuasion

Language Skills

- German Mother tongue
English Advanced
French Elementary

Programming Skills

Expert	MATLAB, LaTeX
Advanced	Python
Intermediate	Julia, Shell, Java, C, Progress
Basic	BASIC, C++, CSS, Delphi, Haskell, HTML, Javascript, Maple, Pascal, PHP, Prolog