

# Prof. Dr. Matthias Voigt

*Curriculum Vitae (August 04, 2023)*



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## Research Interests

Differential-algebraic equations, optimal and robust control, matrix equations and inequalities, numerical linear algebra (in particular, structured and nonlinear eigenvalue problems), numerical optimization, model order reduction, mathematical software, mathematics applications in engineering (mechanics, vibroacoustics)

## Teaching Interests

Systems and control theory, model order reduction, continuous optimization, (numerical) linear algebra, functional analysis, numerics and optimization of partial differential equations, ordinary differential equations, differential-algebraic equations

## Academic Degrees

- 05/2015 **Dr. rer. nat.**, Otto-von-Guericke-Universität Magdeburg, Germany  
07/2010 **Dipl.-Math.**, Technische Universität Chemnitz, Germany

## Education

- 10/2010–05/2015 **Doctoral studies in Mathematics**, *Otto-von-Guericke-Universität Magdeburg, Magdeburg, Germany.*
- 01/2011–05/2015: Doctoral student of the “International Max Planck Research School for Advanced Methods in Process and Systems Engineering”,
  - 02/2013–05/2013: Research stay at New York University, Courant Institute of Mathematical Sciences,
  - Thesis: “On Linear-Quadratic Optimal Control and Robustness of Differential-Algebraic Systems” (promoted by Peter Benner and Paul Van Dooren),
  - Final grade: “summa cum laude (excellent)”.
- 10/2004–07/2010 **Diplom studies in Mathematics**, *Technische Universität Chemnitz, Chemnitz, Germany.*
- Major: numerical mathematics, minor: physics,
  - 01/2008–05/2008: Exchange studies at the University of Helsinki,
  - Thesis: “ $\mathcal{L}_\infty$ -Norm Computation for Descriptor Systems” (promoted by Peter Benner and Vasile Sima),
  - Final grade: “very good”.
- 08/1992–07/2004 **Secondary education**, *Gymnasium „Prof. Dr. Max Schneider“, Lichtenstein, Germany.*
- 07/2004: Abitur (university entrance diploma),
  - Final grade: 1.3 (very good).

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## Professional Experience

- since 07/2021 **Assistant Professor with Tenure Track in Mathematics**, *UniDistance Suisse, Department of Mathematics and Computer Science, Brig, Switzerland.*
- 10/2020–09/2021, 04/2022–03/2023 **Visiting fellow**, *Shanghai University, School of Mechatronic Engineering and Automation, Shanghai, China.*
- 10/2014–06/2021 **Postdoctoral research associate**, *Technische Universität Berlin, Institute of Mathematics, Berlin, Germany.*
- 04/2019–03/2021 **Substitute W3 (Full) Professor in Optimization of Complex Systems**, *Universität Hamburg, Department of Mathematics, Hamburg, Germany.*
- 08/2010–08/2014 **Research associate**, *Max Planck Institute for Dynamics of Complex Technical Systems, Magdeburg, Germany.*
- 02/2011–12/2012 **Freelance software engineer**, *SynOptio GmbH, Berlin, Germany.*
- 10/2010–01/2011 **Graduate teaching assistant**, *Otto-von-Guericke-Universität Magdeburg, Faculty of Mathematics, Magdeburg, Germany.*
- 04/2007–07/2010 **Student research assistant**, *Technische Universität Chemnitz, Faculty of Mathematics, Chemnitz, Germany.*
- 08/2008–10/2008 **Guest student**, *Forschungszentrum Jülich GmbH, Institute of Advanced Simulation, Jülich, Germany.*
- 11/2007–12/2007 **Intern**, *Moscow Aviation Institute, Moscow, Russia.*
- 10/2005–03/2007 **Student teaching assistant**, *Technische Universität Chemnitz, Faculty of Mathematics, Chemnitz, Germany.*

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## Awards and Scholarships

- 06/2017 **Otto Hahn Medal for Young Academics of the Max Planck Society** (awarded with €7.500)
- 11/2015 **Award for the best doctoral dissertation in mathematics** at the Otto-von-Guericke-Universität Magdeburg (awarded with €1.000)
- 02/2013–05/2013 **DAAD short term scholarship** (€2.631) for a research stay with Michael Overton at New York University

# Research

## Publications

### Submitted Articles

- [1] J. Przybilla and M. Voigt. Model reduction of parametric differential-algebraic systems by balanced truncation, May 2023. Revision submitted for publication, preliminary version also available as Preprint arXiv:2108.08646v2.
- [2] P. Schwerdtner, T. Moser, V. Mehrmann, and M. Voigt. Optimization-based model order reduction of port-Hamiltonian descriptor systems, February 2023. Revision submitted for publication.
- [3] 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, January 2022. Revision submitted for publication, also available as Preprint arXiv:2010.06331v2.

### Refereed Journal Articles

- [4] P. Schwerdtner and M. Voigt. Fixed-order H-infinity controller design for port-Hamiltonian systems. *Automatica J. IFAC*, 152:110918, 2023.
- [5] P. Schwerdtner and M. Voigt. SOBMOR: Structured optimization-based model order reduction. *SIAM J. Sci. Comput.*, 45(2):A502–A529, 2023.
- [6] C. Schröder and M. Voigt. Balanced truncation model reduction with a priori error bounds for LTI systems with nonzero initial value. *J. Comput. Appl. Math.*, 420:114708, 2023.
- [7] R. Aziz, E. Mengi, and M. Voigt. Derivative interpolating subspace frameworks for nonlinear eigenvalue problems. *SIAM J. Sci. Comput.*, 44(4):A1833–A1858, 2022.
- [8] H. Mena, L.-M. Pfurtscheller, and M. Voigt. Discounted cost linear quadratic Gaussian control for descriptor systems. *Internat. J. Control*, 95(5):1349–1362, 2022.
- [9] I. Dorschky, T. Reis, and M. Voigt. Balanced truncation model reduction for symmetric second order systems – a passivity-based approach. *SIAM J. Matrix Anal. Appl.*, 42(4):1602–1635, 2021.
- [10] C. Jelich, S. K. Baydoun, M. Voigt, and M. Marburg. A greedy reduced basis algorithm for structural acoustic systems with parameter and implicit frequency dependence. *Internat. J. Numer. Methods Engrg.*, 122(24):7409–7430, 2021.
- [11] S. K. Baydoun, M. Voigt, B. Goderbauer, C. Jelich, and S. Marburg. A subspace iteration eigensolver based on Cauchy integrals for vibroacoustic problems in unbounded domains. *Internat. J. Numer. Methods Engrg.*, 122(16):4250–4269, 2021.
- [12] S. K. Baydoun, M. Voigt, and S. Marburg. Low-rank iteration schemes for the multi-frequency solution of acoustic boundary element equations. *J. Theor. Comput. Acoust.*, 29(3):2150004–1–2150004–22, 2021.
- [13] Z. Tomljanović and M. Voigt. Semi-active  $\mathcal{H}_\infty$  damping optimization by adaptive interpolation. *Numer. Linear Algebra Appl.*, 27(4):e2300, 2020.
- [14] N. Aliyev, P. Benner, E. Mengi, and M. Voigt. A subspace framework for  $\mathcal{H}_\infty$ -norm minimization. *SIAM J. Matrix Anal. Appl.*, 41(2):928–956, 2020.
- [15] S. K. Baydoun, M. Voigt, C. Jelich, and S. Marburg. A greedy reduced basis scheme for multi-frequency solution of structural acoustic systems. *Internat. J. Numer. Methods Engrg.*, 121(2):187–200, 2020.
- [16] D. Bankmann and M. Voigt. On linear-quadratic optimal control of implicit difference equations. *IMA J. Math. Control Inform.*, 36(3):779–833, 2019.

- [17] T. Reis and M. Voigt. Linear-quadratic optimal control of differential-algebraic systems: The infinite time horizon problem with zero terminal state. *SIAM J. Control Optim.*, 57(3):1567–1596, 2019.
- [18] T. Reis and M. Voigt. Inner-outer factorization for differential-algebraic systems. *Math. Control Signals Systems*, 30(3):15:1–15:19, 2018.
- [19] P. Benner, R. Lowe, and M. Voigt.  $\mathcal{L}_\infty$ -norm computation for large-scale descriptor systems using structured iterative eigensolvers. *Numer. Algebra Control Optim.*, 8(1):119–133, 2018.
- [20] N. Aliyev, P. Benner, E. Mengi, P. Schwerdtner, and M. Voigt. Large-scale computation of  $\mathcal{L}_\infty$ -norms by a greedy subspace method. *SIAM J. Matrix Anal. Appl.*, 38(4):1496–1516, 2017.
- [21] P. Benner, V. Sima, and M. Voigt. Algorithm 961: Fortran 77 subroutines for the solution of skew-Hamiltonian/Hamiltonian eigenproblems. *ACM Trans. Math. Software*, 42(3):24:1–24:26, 2016.
- [22] T. Reis and M. Voigt. The Kalman-Yakubovich-Popov inequality for differential-algebraic systems: Existence of nonpositive solutions. *Systems Control Lett.*, 86:1–8, 2015.
- [23] T. Reis, O. Rendel, and M. Voigt. The Kalman-Yakubovich-Popov inequality for differential-algebraic systems. *Linear Algebra Appl.*, 485:153–193, 2015.
- [24] P. Benner and M. Voigt. A structured pseudospectral method for  $\mathcal{H}_\infty$ -norm computation of large-scale descriptor systems. *Math. Control Signals Systems*, 26(2):303–338, 2014.
- [25] P. Benner and M. Voigt. Spectral characterization and enforcement of negative imaginarity for descriptor systems. *Linear Algebra Appl.*, 439(4):1104–1129, 2013.
- [26] P. Benner, V. Sima, and M. Voigt.  $\mathcal{L}_\infty$ -norm computation for continuous-time descriptor systems using structured matrix pencils. *IEEE Trans. Automat. Control*, 57(1):233–238, 2012.
- [Refereed Book Chapters](#)
- [27] D. Kressner and M. Voigt. Distance problems for linear dynamical systems. In P. Benner, M. Bollhöfer, D. Kressner, C. Mehl, and T. Stykel, editors, *Numerical Algebra, Matrix Theory, Differential-Algebraic Equations and Control Theory – Festschrift in Honor of Volker Mehrmann*, chapter 20, pages 559–583. Springer, Cham, Switzerland, 2015.
- [28] P. Benner, P. Losse, V. Mehrmann, and M. Voigt. Numerical linear algebra methods for linear differential-algebraic equations. In A. Ilchmann and T. Reis, editors, *Surveys in Differential-Algebraic Equations III*, Differ.-Algebr. Equ. Forum, chapter 3, pages 117–175. Springer, Cham, Switzerland, 2015.
- [Refereed Conference Proceedings](#)
- [29] P. Schwerdtner and M. Voigt. Optimization-based structured reduced order modeling from frequency samples. In F. Breitenacker, W. Kemmetmüller, A. Körner, A. Kugi, and I. Troch, editors, *MATHMOD 2022 Discussion Contribution Volume*, volume 17 of *ARGESIM Reports*, pages 79–80. ARGESIM Publisher, Vienna, Austria, 2022.
- [30] P. Schwerdtner and M. Voigt. Adaptive sampling for structure-preserving model order reduction of port-Hamiltonian systems. *IFAC-PapersOnLine*, 54(19):143–148, 2021. 7th IFAC Workshop on Lagrangian and Hamiltonian Methods for Nonlinear Control, Berlin, Germany, 2021.
- [31] P. Schwerdtner, E. Mengi, and M. Voigt. Certifying global optimality for the  $\mathcal{L}_\infty$ -norm computation of large-scale descriptor systems. *IFAC-PapersOnLine*, 53(2):4279–4284, 2020. 21st IFAC World Congress, Berlin, Germany, 2020.
- [32] P. Schwerdtner and M. Voigt. Computation of the  $\mathcal{L}_\infty$ -norm using rational interpolation. *IFAC-PapersOnLine*, 51(25):84–89, 2018. Joint 9th IFAC Symposium on Robust Control Design and 2nd IFAC Workshop on Linear Parameter Varying Systems, Florianópolis, Brazil, 2018.

- [33] J. Saak and M. Voigt. Model reduction of constrained mechanical systems in M-M.E.S.S. *IFAC-PapersOnLine*, 51(2):661–666, 2018. 9th Vienna International Conference on Mathematical Modelling, Vienna, Austria, 2018.
- [34] N. Bajcinca and M. Voigt. Spectral conditions for symmetric positive real and negative imaginary systems. In *Proceedings of the 19th European Control Conference*, pages 809–814, Zurich, Switzerland, 2013.
- [35] P. Benner and M. Voigt. Numerical computation of structured complex stability radii of large-scale matrices and pencils. In *Proceedings of the 51th IEEE Conference on Decision and Control*, pages 6560–6565, Maui, Hawaii, USA, 2012.
- [36] T. Reis and M. Voigt. Linear-quadratic infinite time horizon optimal control for differential-algebraic equations - a new algebraic criterion. In *Proceedings of the 20th International Symposium on Mathematical Theory of Networks and Systems*, Melbourne, Australia, 2012.
- [37] P. Benner, V. Sima, and M. Voigt. Robust and efficient algorithms for  $\mathcal{L}_\infty$ -norm computation for descriptor systems. *IFAC Proceedings Volumes*, 45(13):195–200, 2012. 7th IFAC Symposium on Robust Control Design, Aalborg, Denmark, 2012.
- [Miscellaneous Conference Proceedings](#)
- [38] R. S. Beddig, P. Benner, I. Dorschky, T. Reis, P. Schwerdtner, M. Voigt, and S. W. R. Werner. Model reduction of second-order dynamical systems revisited. *PAMM Proc. Appl. Math. Mech.*, 19(1):e201900224, 2019.
- [39] S. K. Baydoun, L. Li, M. Voigt, and S. Marburg. A low-rank iteration scheme for multi-frequency acoustic problems. *INTER-NOISE and NOISE-CON Congress and Conference Proceedings*, 258(6):1387–1396, 2018.
- [40] N. Aliyev, P. Benner, E. Mengi, P. Schwerdtner, and M. Voigt. A greedy subspace method for computing the  $\mathcal{L}_\infty$ -norm. *PAMM. Proc. Appl. Math. Mech.*, 17(1):751–752, 2017.
- [41] T. Reis and M. Voigt. Inner-outer factorization via Lur’e equations. *PAMM. Proc. Appl. Math. Mech.*, 16(1):829–830, 2016.
- [42] T. Reis and M. Voigt. The Kalman-Yakubovich-Popov inequality for descriptor systems. *PAMM. Proc. Appl. Math. Mech.*, 15(1):645–646, 2015.
- [43] T. Reis and M. Voigt. Solution of descriptor Lur’e equations via even matrix pencils. *PAMM. Proc. Appl. Math. Mech.*, 14(1):925–926, 2014.
- [44] T. Reis and M. Voigt. The dissipation inequality for differential-algebraic systems. *PAMM. Proc. Appl. Math. Mech.*, 14(1):11–14, 2014.
- [45] P. Benner, R. Lowe, and M. Voigt. Computation of the  $\mathcal{H}_\infty$ -norm for large-scale systems. *Oberwolfach Rep.*, 10(4):3289–3291, 2013.
- [46] M. Voigt. Computation of the complex dissipativity radius. In O. Sawodny and J. Adamy, editors, *Tagungsband des GMA-Fachausschusses 1.30 „Modellbildung, Identifikation und Simulation in der Automatisierungstechnik“*, pages 10–19. Technische Universität Darmstadt, Institut für Automatisierungstechnik und Mechatronik, 2013.
- [47] J. Saak, M. M. Uddin, and M. Voigt. Modellreduktion für strukturierte Index-3-Systeme. In O. Sawodny and J. Adamy, editors, *Tagungsband des GMA-Fachausschusses 1.30 „Modellbildung, Identifikation und Simulation in der Automatisierungstechnik“*, pages 180–190. Technische Universität Darmstadt, Institut für Automatisierungstechnik und Mechatronik, 2013.
- [48] P. Benner and M. Voigt.  $\mathcal{H}_\infty$ -norm computation for large and sparse descriptor systems. *PAMM. Proc. Appl. Math. Mech.*, 12(1):797–800, 2012.
- [49] P. Benner and M. Voigt.  $\mathcal{L}_\infty$ -norm computation for discrete-time descriptor systems. In O. Sawodny and J. Adamy, editors, *Tagungsband des GMA-Fachausschusses 1.30 „Modellbildung,*

*Identifikation und Simulation in der Automatisierungstechnik*“, pages 228–240. Technische Universität Darmstadt, Institut für Automatisierungstechnik und Mechatronik, 2011.

- [50] P. Benner and M. Voigt. On the computation of particular eigenvectors of Hamiltonian matrix pencils. *PAMM. Proc. Appl. Math. Mech.*, 11(1):753–754, 2011.

#### Manuals

- [51] P. Benner, V. Sima, and M. Voigt. *SHHEIG Users' Guide*. ACM, 2016.

#### Technical Reports

- [52] P. Jiang and M. Voigt. MB04BV – A FORTRAN 77 subroutine to compute the eigenvectors associated to the purely imaginary eigenvalues of skew-Hamiltonian/Hamiltonian matrix pencils. SLICOT Working Note 2013-3, NICONET e.V., September 2013. Available from [http://slicot.org/objects/software/reports/SLWN2013\\_3.pdf](http://slicot.org/objects/software/reports/SLWN2013_3.pdf).

#### Theses

- [53] M. Voigt. *On Linear-Quadratic Optimal Control and Robustness of Differential-Algebraic Systems*. Logos-Verlag, Berlin, 2015. Also as Dissertation, Otto-von-Guericke-Universität Magdeburg, Fakultät für Mathematik, 2015.
- [54] M. Voigt.  $\mathcal{L}_\infty$ -Norm Computation for Descriptor Systems. Diplomarbeit, Technische Universität Chemnitz, Fakultät für Mathematik, July 2010. Available from <http://nbn-resolving.de/urn:nbn:de:bsz:ch1-201001050>.

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## Software

### FORTRAN

- SHHEIG – Subroutines for the solution of skew-Hamiltonian/Hamiltonian eigenvalue problems, published as Algorithm 961 within the Collected Algorithms of the ACM (CALGO)<sup>1</sup>, jointly developed with V. Sima, available from <https://calgo.acm.org/>, see also [21, 51].
- MB04BV – Computation of the eigenvectors associated with the imaginary eigenvalues of skew-Hamiltonian/Hamiltonian matrix pencils, jointly developed with P. Jiang, available from <http://www.tu-berlin.de/?191730&L=1>, see also [52].
- AB13HD – Computation of the  $\mathcal{L}_\infty$ -norm for descriptor systems, jointly developed with V. Sima, available from <http://www.tu-berlin.de/?191729&L=1>, see also [26].

### MATLAB

- BT\_INHOM v1.1 – Balanced truncation for systems with inhomogeneous initial conditions, available from <https://zenodo.org/record/6355512#.YjZ0TTwxmqJ>, see also [6].
- SOPRBT v1.2 – Passivity-preserving balanced truncation for second-order systems, jointly developed with I. Dorschky, available from <https://zenodo.org/record/4519721#.YClEneoxmTt>, see also [9].
- HINF DAMP OPT v1.1 – Semi-active  $\mathcal{H}_\infty$  damping optimization of mechanical systems, jointly developed with Z. Tomljanović, available from <https://zenodo.org/record/3634361#.YCFvFvB0oxmTs>, see also [13].
- HINF OPT v1.0 –  $\mathcal{H}_\infty$ -norm optimization of parameter-dependent systems, jointly developed with N. Aliyev and E. Mengi, available from <https://zenodo.org/record/3533086#.YCFve-oxmTs>, see also [14].
- LINORM\_SUBSP v1.3 –  $\mathcal{L}_\infty$ -norm computation for high-dimensional problems via rational approximation, jointly developed with N. Aliyev, E. Mengi, and P. Schwerdtner, available from <http://www.tu-berlin.de/?186267&L=1>, see also [20, 32].
- LINORM v1.1 –  $\mathcal{L}_\infty$ -norm computation for high-dimensional problems via optimization over level sets, jointly developed with R. Lowe, available from <http://www.tu-berlin.de/?186235&L=1>, see also [19].

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<sup>1</sup>A more recent version is contained in the software library SLICOT (<http://slicot.org/>).

- HINORM v1.0 –  $\mathcal{H}_\infty$ -norm computation for high-dimensional problems via optimization over structured pseudospectra, available from <http://www.tu-berlin.de/?178582&L=1>, see also [25].

## Talks Given at Conferences and Workshops and in Seminars

### Invited Keynote Talks

- 03/17/2021 **Numerical Methods for  $\mathcal{H}_\infty$ -Control of Large-Scale Systems**, 91st GAMM Annual Meeting, Section “Dynamics and Control”, Kassel, Germany (online section keynote talk).
- 03/26/2019 **Numerical Methods for  $\mathcal{H}_\infty$ -Control**, 13th Elgersburg Workshop, Elgersburg, Germany.

### Further Invited Conference and Workshop Talks (Incl. Minisymposia)

- 06/12/2023 **Balanced Truncation Model Reduction of Parametric Differential-Algebraic Systems**, 25th Conference of the International Linear Algebra Society, Invited Minisymposium: “Matrix Equations”, Madrid, Spain.
- 03/02/2023 **Model Reduction and Control of Dynamical Systems Based on Frequency Data**, SIAM Conference on Computational Science and Engineering, Minisymposium “System-Theoretic Learning Methods and Model Reduction”, Amsterdam, The Netherlands.
- 07/14/2022  **$\mathcal{H}_\infty$  Controller Design for Port-Hamiltonian Systems**, 15th Viennese Conference on Optimal Control and Dynamic Games, Minisymposium “Data-Driven and Learning-Based Control”, Vienna, Austria.
- 03/28/2022 **Structure-Preserving Balanced Truncation Model Reduction for Symmetric Second-Order Systems**, 3rd Workshop on Optimal Control of Dynamical Systems and Applications, Osijek, Croatia.
- 06/21/2021 **Interpolatory Model Reduction in  $\mathcal{H}_\infty$ -Controller Design**, 8th European Congress of Mathematics, Minisymposium “Rational Approximation for Data-Driven Modeling and Complexity Reduction of Linear and Nonlinear Dynamical Systems”, Portorož, Slovenia (online talk).
- 09/30/2019 **Interpolatory Methods for  $\mathcal{H}_\infty$ -Norm Computation and  $\mathcal{H}_\infty$ -Control**, European Numerical Mathematics and Advanced Applications Conference 2019, Minisymposium “Numerical Methods for Identification and Model Reduction of Nonlinear Systems”, Egmond aan Zee, The Netherlands.
- 09/14/2017 **Linear-Quadratic Optimal Control, Lur’e Equations, and Structured Matrix Pencils**, International Conference on Scientific Computation and Differential Equations, Minisymposium “Matrix Equations: Theory, Numerics and Applications”, Bath, United Kingdom.
- 09/29/2016 **Linear-Quadratic Control of DAEs with an Application to Flow Control Problems**, Sino-German Symposium “Modeling, Model Order Reduction, and Optimization of Flows”, Shanghai, China.
- 07/01/2016 **Computation of Robustness Measures for Descriptor Systems**, Symposium of SFB 910 “Computational Methods for Stability and Robust Stability of Dynamical Systems”, Berlin, Germany.
- 05/03/2016 **Existence of Nonpositive Solutions for the Kalman-Yakubovich-Popov Inequality**, Workshop “Computational Methods for High-Dimensional Problems”, Tegernsee, Germany.
- 11/21/2013 **Computation of the  $\mathcal{H}_\infty$ -Norm for Large-Scale Systems**, Oberwolfach Workshop: Numerical Solution of PDE Eigenvalue Problems, Oberwolfach, Germany.
- 10/09/2012 **Computational Methods Based on Structured Pseudospectra**, CIRM Workshop “Structured Matrix Computations in Non-Euclidean Geometries: Algorithms and Applications”, Luminy/Marseille, France.

### Invited Seminar and Colloquium Talks

- 05/08/2023 **Structure-Preserving Model Order Reduction of Dynamical Systems**, Mathematical Colloquium, University of Bern, Bern, Switzerland.
- 01/17/2023 **Numerical Methods for Large-Scale Nonlinear Eigenvalue Problems**, Mathematical Colloquium, Technische Universität Ilmenau, Ilmenau, Germany.

- 06/09/2022 **Advances in Structure-Preserving Model Reduction**, *Seminar for Numerical Mathematics and Scientific Computing*, University of Zagreb, Zagreb, Croatia.
- 05/10/2022 **Structure-Preserving Balanced Truncation Model Reduction for Symmetric Second-Order Systems**, *Senior Seminar Numerical Mathematics/Numerics of Stochastic Differential Equations*, Martin Luther University of Halle-Wittenberg, Halle, Germany.
- 04/22/2022 **Structure-Preserving Model Reduction for Symmetric Second-Order Systems**, *Seminar in Numerical Analysis*, University of Basel, Basel, Switzerland.
- 05/27/2021 **Structure-Preserving Balanced Truncation Model Reduction for Symmetric Second-Order Systems**, *Online Seminar on Linear Algebra and Operator Theory*, (online talk).
- 09/30/2020 **Balanced Truncation Model Reduction with A Priori Error Bounds for LTI Systems with Nonzero Initial Value**, *Research Seminar, Shanghai University, School of Mechatronic Engineering and Automation*, Shanghai, China (online talk).
- 06/03/2020 **Towards  $\mathcal{H}_\infty$ -Controller Design for Systems of Large State-Space Dimension**, *Control Engineering Seminar, TU Munich*, Munich, Germany (online talk).
- 12/05/2019 **Numerical Methods for  $\mathcal{H}_\infty$ -Control of Large-Scale Systems**, *NUMA Seminar, KU Leuven*, Leuven, Belgium.
- 09/21/2018 **Interpolatory Methods for Robust Control of Dynamical Systems**, *Numerical Analysis and Scientific Computing Seminar, New York University, Courant Institute of Mathematical Sciences*, New York City, New York, USA.
- 09/17/2018 **Classical Results and Recent Advances in  $\mathcal{H}_\infty$ -Control**, *Applied Numerical Analysis Seminar, Virginia Polytechnic Institute and State University*, Blacksburg, Virginia, USA.
- 03/15/2018  **$\mathcal{H}_\infty$ -Control: Classical Results and Recent Advances**, *Mathematical Colloquium Osijek, Josip Juraj Strossmayer University of Osijek*, Osijek, Croatia.
- 03/15/2017 **A Greedy Subspace Method for Computing the  $\mathcal{H}_\infty$ -Norm**, *Seminar on Optimization and Applications, Josip Juraj Strossmayer University of Osijek*, Osijek, Croatia.
- 01/13/2016 **Inner-Outer Factorization for Differential-Algebraic Systems**, *Seminar on Optimization and Applications, Josip Juraj Strossmayer University of Osijek*, Osijek, Croatia.
- 10/31/2013 **New Approaches to Compute the  $\mathcal{H}_\infty$ -Norm of Large-Scale Systems**, *Graduate Seminar "Numerical Mathematics", Technische Universität Berlin*, Berlin, Germany.
- 09/12/2012  **$\mathcal{H}_\infty$ -Norm Computation for Large-Scale Descriptor Systems**, *Seminar on Optimization and Applications, Josip Juraj Strossmayer University of Osijek*, Osijek, Croatia.

#### Contributed and Other Talks

- 06/02/2023 **Fixed-Order  $\mathcal{H}_\infty$  Control of Port-Hamiltonian Systems**, *93rd GAMM Annual Meeting, Section "Dynamics and Control"*, Dresden, Germany.
- 06/16/2022  **$\mathcal{H}_\infty$ -Control of Port-Hamiltonian Systems**, *Householder Symposium XXI on Numerical Linear Algebra, Section "Methods for Hamiltonian Systems"*, Selva di Fasano, Italy.
- 11/26/2021 **Structured Optimization-Based Model Order Reduction**, *Workshop of the GAMM Activity Group "Dynamics and Control Theory"*, (online talk).
- 09/16/2021 **SOBMOR: Structured Optimization-Based Model Order Reduction**, *GAMM Workshop Applied and Numerical Linear Algebra*, Potsdam, Germany.
- 09/13/2021 **SOBMOR: Structured Optimization-Based Model Order Reduction**, *Swiss Numerics Day*, Lausanne, Switzerland.
- 07/19/2019 **A Subspace Framework for  $\mathcal{H}_\infty$ -Norm Minimization**, *9th International Congress on Industrial and Applied Mathematics, Minisymposium "Eigenvalue Optimization"*, Valencia, Spain.
- 03/22/2019 **A Subspace Framework for  $\mathcal{H}_\infty$ -Norm Minimization**, *90th GAMM Annual Meeting, Section "Applied and Numerical Linear Algebra"*, Vienna, Austria.
- 09/03/2018 **Computation of the  $\mathcal{L}_\infty$ -Norm Using Rational Interpolation**, *Joint 9th IFAC Symposium on Robust Control Design and 2nd IFAC Workshop on Linear Parameter Varying Systems, Section " $\mathcal{H}_2$  and  $\mathcal{H}_\infty$  Control"*, Florianópolis, Brazil.



- 06/21/2018 **Balanced Truncation Model Reduction for Systems with Nonzero Initial Condition**, *International Workshop on Optimal Control of Dynamical Systems and Applications*, Osijek, Croatia.
- 04/20/2018 **Balanced Truncation Model Reduction for Systems with Nonzero Initial Condition**, *Workshop of the GAMM Activity Group "Dynamics and Control Theory"*, Berlin, Germany.
- 06/22/2017 **Linear-Quadratic Optimal Control of Differential-Algebraic Equations**, *Householder Symposium XX on Numerical Linear Algebra, Section "Optimization"*, Blacksburg, Virginia, USA.
- 03/09/2017 **A Greedy Subspace Method for Computing the  $\mathcal{H}_\infty$ -Norm**, *88th GAMM Annual Meeting, Section "Applied and Numerical Linear Algebra"*, Weimar, Germany.
- 07/21/2016 **Inner-Outer Factorization for Differential-Algebraic Equations**, *7th European Congress of Mathematics, Minisymposium "Analysis, Numerics, and Control of Differential-Algebraic Equations"*, Berlin, Germany.
- 03/09/2016 **Inner-Outer Factorization for Differential-Algebraic Equations**, *Joint DMV and GAMM Annual Meeting, Section "Dynamics and Control"*, Braunschweig, Germany.
- 12/01/2015 **Inner-Outer Factorization for Differential-Algebraic Systems**, *DAE Day Workshop HU/TU*, Berlin, Germany.
- 10/01/2015 **Existence of Nonpositive Solutions for the Kalman-Yakubovich-Popov Inequality**, *Workshop of the GAMM Activity Group "Dynamics and Control Theory"*, Duisburg, Germany.
- 08/11/2015 **The Kalman-Yakubovich-Popov Lemma for Differential-Algebraic Equations**, *8th International Congress on Industrial and Applied Mathematics, Section "Control and Systems Theory"*, Beijing, China.
- 03/26/2015 **The Kalman-Yakubovich-Popov Inequality for Differential-Algebraic Equations**, *86th GAMM Annual Meeting, Section "Dynamics and Control"*, Lecce, Italy.
- 10/07/2014 **Linear-Quadratic Optimal Control of Differential-Algebraic Equations**, *Workshop of the DAAD Project "Optimal Damping of Vibrating Systems"*, Osijek, Croatia.
- 06/26/2014 **Singular Linear-Quadratic Optimal Control of DAEs and Descriptor Lur'e Equations**, *Tegernsee Workshop*, Tegernsee, Germany.
- 03/13/2014 **Singular Linear-Quadratic Optimal Control of Differential-Algebraic Equations**, *85th GAMM Annual Meeting, Section "Dynamics and Control"*, Erlangen, Germany.
- 03/03/2014 **Berechnung des komplexen Dissipativitätsradius**, *9th Elgersburg Workshop*, Elgersburg, Germany.
- 09/18/2013 **Computation of the Complex Dissipativity Radius**, *Workshop of the GMA Activity Group 1.30 "Modeling, Identification and Simulation in Automation Engineering"*, Anif/Salzburg, Austria.
- 09/10/2013 **Computation of the Complex Dissipativity Radius**, *GAMM Workshop Applied and Numerical Linear Algebra*, Wuppertal, Germany.
- 08/16/2013 **The Singular Linear-Quadratic Optimal Control Problem for Differential-Algebraic Systems**, *2nd Symposium of the German SIAM Student Chapters*, Heidelberg, Germany.
- 02/13/2013 **The Kalman-Yakubovich-Popov Lemma for Differential-Algebraic Equations with Applications**, *8th Elgersburg Workshop*, Elgersburg, Germany.
- 12/13/2012 **Numerical Computation of Structured Complex Stability Radii of Large-Scale Matrices and Pencils**, *51st IEEE Conference on Decision and Control, Section "Stability of Linear Systems"*, Maui, Hawaii, USA.
- 09/19/2012  **$\mathcal{H}_\infty$ -Norm Computation for Large-Scale Descriptor Systems**, *Workshop of the GAMM Activity Group "Dynamics and Control Theory"*, Anif/Salzburg, Austria.
- 08/16/2012  **$\mathcal{H}_\infty$ -Norm Computation for Large-Scale Descriptor Systems via Optimization over Structured Pseudospectra**, *Compact Course "Optimization with Differential Equations"*, Magdeburg, Germany.

- 06/20/2012 **Robust and Efficient Algorithms for  $\mathcal{L}_\infty$ -Norm Computation for Descriptor Systems**, 7th IFAC Symposium on Robust Control Design, Section "Robustness Analysis", Aalborg, Denmark.
- 03/27/2012  **$\mathcal{H}_\infty$ -Norm Computation for Large Sparse Descriptor Systems**, 83rd GAMM Annual Meeting, Young Researchers' Minisymposium "Differential-Algebraic Equations: Theory, Numerics and Applications", Darmstadt, Germany.
- 03/09/2012 **Kalman-Yakubovich-Popov Lemma for Differential-Algebraic Equations**, Workshop of the GAMM Activity Group "Dynamics and Control Theory", Stuttgart, Germany.
- 10/13/2011 **Solution of Computational Problems for Descriptor Systems**, Summer School "Numerical Linear Algebra for Dynamical and High-Dimensional Problems", Trogir, Croatia.
- 09/23/2011  **$\mathcal{L}_\infty$ -Norm Computation for Discrete-Time Descriptor Systems**, Workshop of the GMA Activity Group 1.30 "Modeling, Identification and Simulation in Automation Engineering", Anif/Salzburg, Austria.
- 09/16/2011 **SLICOT Software for Structured Matrix Pencils**, General Assembly of NICONET e. V., Berlin, Germany.
- 08/23/2011 **On Negative Imaginary Descriptor Systems**, 17th ILAS Conference, Section "Control", Braunschweig, Germany.
- 04/19/2011 **On the Computation of Particular Eigenvectors of Hamiltonian Matrix Pencils for Passivity Enforcement of Descriptor Systems**, 82nd GAMM Annual Meeting, Section "Applied and Numerical Linear Algebra", Graz, Austria.
- 03/18/2011 **Passivity Enforcement of Descriptor Systems via Structured Perturbation of Hamiltonian Matrix Pencils**, Workshop of the GAMM Activity Group "Dynamics and Control Theory", Linz, Austria.
- 04/16/2010  **$\mathcal{L}_\infty$ -Norm Computation for Descriptor Systems**, Workshop of the GAMM Activity Group "Dynamics and Control Theory", Berlin, Germany.

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## Posters Presented at Conferences and Workshops

- 08/11/2015 **The Linear-Quadratic Optimal Control Problem for Differential-Algebraic Equations**, 8th International Congress on Industrial and Applied Mathematics, Beijing, China.
- 05/07/2015 **The Linear-Quadratic Optimal Control Problem Revisited**, Conference "Numerical Algebra, Matrix Theory, Differential-Algebraic Equations, and Control Theory" in Honor of Volker Mehrmann on the Occasion of his 60th Birthday, Berlin, Germany.
- 06/10/2014 **Numerical Methods to Compute the  $\mathcal{H}_\infty$ -Norm of Large-Scale Descriptor Systems**, Householder Symposium XIX on Numerical Linear Algebra, Spa, Belgium.
- 05/07/2012 **Analysis and Numerical Solution of Structured Descriptor System Problems**, Workshop on Nonlinear Model Order Reduction, Tegernsee, Germany.
- 05/07/2012 **Development of the Systems and Control Library SLICOT**, Workshop on Nonlinear Model Order Reduction, Tegernsee, Germany.
- 06/27/2010 **Computation of the Eigenvalues of Skew-Hamiltonian/Hamiltonian Pencils in SLICOT**, 8th International Workshop on Accurate Solution of Eigenvalue Problems, Berlin, Germany.

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## Research Visits (from 3 Days)

- 01/2023 **Technische Universität Ilmenau**, Ilmenau, Germany (2 weeks)
- 05/2022 **Martin Luther University of Halle-Wittenberg**, Halle, Germany (4 days)
- 09/2018 **New York University**, New York City, New York, USA (3 days)
- 09/2018 **Virginia Polytechnic Institute and State University**, Blacksburg, Virginia, USA (1 week)
- 03/2018 **Josip Juraj Strossmayer University of Osijek**, Osijek, Croatia (1 week)
- 04/2017 **Max Planck Institute for Dynamics of Complex Technical Systems**, Magdeburg, Germany (3 days)

- 03/2017 **Josip Juraj Strossmayer University of Osijek**, Osijek, Croatia (1 week)
- 04/2016 **Koç University**, Istanbul, Turkey (1 week)
- 01/2016 **Josip Juraj Strossmayer University of Osijek**, Osijek, Croatia (1 week)
- 09/2013–10/2013 **Josip Juraj Strossmayer University of Osijek**, Osijek, Croatia (1 week)
- 02/2013–05/2013 **New York University**, New York City, New York, USA (3.5 months)
- 09/2012 **Josip Juraj Strossmayer University of Osijek**, Osijek, Croatia (1 week)

## Third-Party Funding

### Submitted Project Proposals

- 09/2022 **Numerical Methods for Efficient Acoustic Metamaterial Design.**
  - **submitted to:** Swiss National Science Foundation within the framework of Weave
  - **partner:** Steffen Marburg (TU Munich)
  - **requested support:** 1 doctoral student, 1 student research assistant (25%), and direct costs, own share CHF 247.478

### As Principal Investigator

- 01/2020–03/2023 **Interpolation-Based Numerical Algorithms in Robust Control.**
  - **supported by:** German Research Foundation (Research Grants – Individual Proposal)
  - **support:** 1 position E13 TV-L (100%, 36 months), 1 student research assistant (40 hours per month, 36 months), and direct costs, own share €300.966 (incl. overhead)
- 01/2017–12/2018 **Robustness Optimization of Damped Mechanical Systems.**
  - **supported by:** German Academic Exchange Service within the framework of a project-related personal exchange (PPP) with Croatia
  - **partner:** Zoran Tomljanović (Josip Juraj Strossmayer University of Osijek)
  - **support:** travel and guest funds, own share €10.974
- 09/2016–08/2019 **Structure-Preserving Model Reduction for Dissipative Mechanical Systems.**
  - **supported by:** German Research Foundation within the framework of the Priority Program 1897: “Calm, Smooth and Smart - Novel Approaches for Influencing Vibrations by Means of Deliberately Introduced Dissipation”
  - **partners:** Peter Benner (MPI for Dynamics of Complex Technical Systems) und Timo Reis (Universität Hamburg)
  - **support:** 1 student research assistant (41 hours per month, 36 months) and direct costs, own share €32.751 (incl. overhead)
- 06/2013–08/2013 **Computation of Norms for Large-Scale Dynamical Systems.**
  - **supported by:** German Academic Exchange Service within the framework of the RISE program
  - **support:** 1 intern (10 weeks), own share €1.625
- 05/2012–08/2012 **Structure-Preserving Computation of Particular Eigenvectors of skew-Hamiltonian/Hamiltonian Pencils.**
  - **supported by:** German Academic Exchange Service within the framework of the RISE program
  - **support:** 1 intern (12 weeks), own share €1.950

### As Associated/Co-Principal Investigator

- 01/2019–12/2021 **Energy-Based Modeling, Simulation, and Optimization of Power Systems under Uncertainty.**
  - **supported by:** German Research Foundation within the framework of the Cluster of Excellence: Berlin Mathematics Research Center MATH+
  - **partners:** Volker Mehrmann (TU Berlin) and Caren Tischendorf (HU Berlin)
  - **support:** 1 shared position E13 TV-L (75%, 36 months, employed with Volker Mehrmann) and direct costs
- 11/2018–10/2021 **Randomized Techniques for Model Reduction.**
  - **supported by:** German Research Foundation within the framework of the Research and Training Group 2433: “Differential Equation- and Data-driven Models in Life Sciences and Fluid Dynamics (DAEDALUS)”
  - **partners:** Gitta Kutyniok and Volker Mehrmann (TU Berlin)
  - **support:** 1 shared position E13 TV-L (100%, 36 months, employed with Volker Mehrmann) and direct costs

06/2017–12/2018 **Data Assimilation for Port-Hamiltonian Power Network Models.**

- **supported by:** Einstein Foundation Berlin within the framework of the Einstein Center for Mathematics (ECMath)
- **partners:** Raphael Kruse and Volker Mehrmann (TU Berlin)
- **support:** 1 shared position E13 TV-L (100%, 19 months, employed with Volker Mehrmann) and direct costs

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## Further Third-Party Funding

05/2022 **Workshop “Trends on Dissipativity in Systems and Control” in Brig, Switzerland.**

- **supported by:** Swiss National Science Foundation (Scientific Exchanges)
- **support:** workshop funds, own share CHF 9.200
- **further support:** Fonds für Forschung, Entwicklung und Kooperation of UniDistance Suisse, own share CHF 4.400

# Teaching

## Delivered Courses

At [UniDistance Suisse](#)

since FS 2022 **Calculus II** (lectures)

since HS 2021 **Calculus I** (lectures)

HS 2021–FS 2022 **Undergraduate Seminar I** (responsibility)

At [Universität Hamburg](#)

WS 2020/21 **Model Reduction** (lectures and exercise classes)

**Optimization for Computer Science Students** (lectures and exercise classes)

**Undergraduate Seminar on Mathematics** (responsibility)

**Research Seminar Systems Theory** (responsibility, together with Timo Reis)

SS 2020 **Introduction to Mathematical Modeling** (lectures)

**Advanced Optimization** (lectures)

**Robust Control** (lectures and exercise classes)

WS 2019/20 **Optimization of Complex Systems** (lectures and exercise classes)

**Mathematical Systems and Control Theory** (lectures and exercise classes)

**Research Seminar on Systems Theory** (responsibility, together with Timo Reis)

SS 2019 **Optimization** (lectures)

**Model Reduction** (lectures and exercise classes)

**Research Seminar on Systems Theory** (responsibility, together with Timo Reis)

At [Technische Universität Berlin](#)

WS 2018/19 **Numerical Mathematics II for Engineering** (lectures)

**Model Reduction** (lectures)

**Graduate Seminar Numerical Mathematics** (coordination)

SS 2018 **Graduate Seminar Numerical Mathematics** (coordination)

WS 2017/18 **Model Reduction** (lectures)

**Linear Algebra I for Mathematicians** (tutorial classes)

**Graduate Seminar Numerical Mathematics** (coordination)

**Early Bird II (Calculus II for Engineering)** (assistance)

SS 2017 **Matrix Equations** (lectures)

**Linear Algebra I for Mathematicians** (homework supervision)

**Graduate Seminar Numerical Mathematics** (coordination)

WS 2016/17 **Linear Algebra II for Mathematicians** (assistance together with exercise and tutorial classes)

SS 2016 **Linear Algebra I for Mathematicians** (assistance together with exercise and tutorial classes)

WS 2015/16 **Linear Algebra II for Mathematicians** (assistance together with exercise classes)

At [Otto-von-Guericke-Universität Magdeburg](#)

WS 2010/11 **Mathematics I – Elementary Course for Engineering Economists** (2 exercise groups)

[Summer Schools, Compact Courses, etc.](#)

08/2019 **SIAM Chapter Compact Course on Robust Control**, *Otto-von-Guericke-Universität Magdeburg, Germany.*

## Lecture Notes

“**Calculus II**”, translation and revision of the lecture notes of Christian Mehl, last update: FS 2023.

“**Calculus I**”, translation and revision of the lecture notes of Christian Mehl, last update: FS 2023.

“**Model Reduction**”, last update: WS 2020/21.

“**Mathematical Systems and Control Theory**”, translation and revision of the lecture notes of Peter Benner, last update: WS 2019/20.

“**Numerical Mathematics II for Engineering**”, revision of the lecture notes of Raphael Kruse and Jörg Liesen, last update: WS 2018/19.

“**Matrix Equations**”, based on a draft of Patrick Kürschner, last update: SS 2017.

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## Supervision of Students

### Doctoral Students

in progress **Andrea Angino (UniDistance Suisse)**, *primary supervisor, jointly supervised with Rolf Krause*.  
Working title: “Efficient Numerical Linear Algebra Methods in Vibroacoustics”

in progress **Ines Ahrens (TU Berlin)**, *supported by the DFG Research Training Group 2433, secondary supervisor, jointly supervised with Volker Mehrmann*.  
Working title: “Randomized Techniques for Model Reduction”

01/2023 **Paul Schwerdtner (Dr. rer. nat., TU Berlin)**, *supported by a DFG individual grant and a BIMO S PhD Fellowship, primary supervisor, jointly supervised with Volker Mehrmann*.  
“Structured Optimization-Based Reduction, Identification, and Control”

### Diplom and Master Students

06/2022 **Sebastian Wenke (M. Sc. in Business Mathematics, Universität Hamburg)**, *primary supervisor, jointly supervised with Christina Brandt*.  
“Modellreduktion dynamischer System mithilfe von Deep Learning”

10/2021 **Simon Michael Bäse (M. Sc. in Mathematics, TU Berlin)**, *primary supervisor, jointly supervised with Volker Mehrmann*.  
“Time-Limited Balanced Truncation Model Order Reduction for Descriptor Systems”

08/2021 **Amon Lahr (M. Sc. in Scientific Computing, TU Berlin)**, *primary supervisor, jointly supervised with Volker Mehrmann*.  
“ $H_\infty$ -Control for Large-Scale Linear Systems”

12/2020 **Vishnu Sanjay (M. Sc. in Mathematical Modelling in Engineering, Universität Hamburg)**, *secondary supervisor, jointly supervised with Tobias Breiten*.  
“Value Function Approximations for Nonlinear Finite-Horizon Optimal Control Problems”

12/2020 **Kamal Kishor Sharma (M. Sc. in Mathematical Modelling in Engineering, Universität Hamburg)**.  
“Robust Optimization of Elliptic PDEs”

12/2020 **Mona M.k. Ismail (M. Sc. in Mathematical Modelling in Engineering, Universität Hamburg)**.  
“The ADI Method for Quadratic-Bilinear Lyapunov Equations”

07/2020 **Rebekka Salome Beddig (M. Sc. in Scientific Computing, TU Berlin)**.  
“ $H_2 \otimes L_\infty$ -Optimal Model Order Reduction”

12/2019 **Jennifer Przybilla (M. Sc. in Industrial Mathematics, TU Berlin)**.  
“Model Reduction of Differential-Algebraic Systems by Parametric Balanced Truncation”

06/2019 **Pia Marie Lutum (M. Sc. in Mathematics, TU Berlin)**.  
“Numerical Computation of the Real Structured Stability Radius”

04/2018 **Paul Schwerdtner (M. Sc. in Engineering Science, TU Berlin)**.  
“On Fixed Order  $H_\infty$ -Controller Design for Delay Systems”

12/2015 **Daniel Bankmann (M. Sc. in Industrial Mathematics, TU Berlin)**.  
“On Linear-Quadratic Control Theory of Implicit Difference Equations”

### Bachelor Students

02/2021 **Sarah Heinrich (B. Sc. in Mathematics, Universität Hamburg)**.  
“Mathematische Modellierung der COVID-19 Pandemie”

- 02/2021 **Benjamin Renz (B. Sc. in Business Mathematics, Universität Hamburg)**.  
"Konvergenzanalyse der stochastischen Gradienten-Methode"
- 12/2019 **Aleksandar Svetozarević (B. Sc. in Business Mathematics, Universität Hamburg)**.  
"Computing Stability Radii with Sparsity Constraints"
- 12/2018 **Heinrich Walter Ellmann (B. Sc. in Mathematics, TU Berlin)**.  
"Numerical Solution of the Discrete-Time Linear Quadratic Optimal Control Problem using the Palindromic Laub Trick"

#### Student Research Assistants

- 04/2020–08/2021 **Amon Lahr (TU Berlin)**, supported by a DFG individual grant.  
Implementation and testing of novel algorithms for robust control
- 06/2018–08/2019 **Rebekka Salome Beddig (TU Berlin)**, supported by the DFG Priority Program 1897.  
Implementation and testing of algorithms for structure-preserving model reduction of mechanical systems
- 11/2016–04/2018 **Paul Schwerdtner (TU Berlin)**, supported by the DFG Priority Program 1897.  
Implementation and testing of algorithms for the efficient computation of the  $\mathcal{L}_\infty$ -norm

#### Visiting Doctoral Students

- 07/2019–11/2019 **Lena-Maria Pfurtscheller (University of Innsbruck)**, supported by a DAAD short term scholarship.  
LQG control for descriptor systems

#### Interns

- 05/2022–09/2022 **Nicola Sabbadini (TU Berlin)**, secondary supervisor, jointly supervised with Paul Schwerdtner.  
Implementation of a benchmark collection for port-Hamiltonian systems
- 06/2017–08/2017 **Tiphaine Bonniot de Ruisselet (ENSEEIH Toulouse)**.  
Parametric model reduction for damping optimization
- 06/2013–08/2013 **Ryan Lowe (Queen's University)**, supported by the DAAD RISE program.  
Computation of the  $\mathcal{L}_\infty$ -norm for descriptor systems of high dimension
- 05/2012–08/2012 **Peihong Jiang (University of Rochester)**, supported by the DAAD RISE program.  
Efficient implementation of an algorithm for the structure-exploiting computation of particular eigenvectors of skew-Hamiltonian/Hamiltonian pencils in FORTRAN 77
- 05/2012–07/2012 **Maximilian Bremer (University of Texas at Austin)**.  
Fast computation and visualization of structured pseudospectra

## Refereeing of Theses (without Supervision Responsibilities)

### Doctoral Theses

- under review **Tim Fabian Moser (TU Munich)**.  
"Structure-Preserving Model Reduction of Port-Hamiltonian Descriptor Systems"
- 11/2022 **Christopher Jelich (Dr.-Ing., TU Munich)**.  
"Fast Multipole Boundary Element Techniques for Acoustic and Vibroacoustic Problems"
- 02/2020 **Luca Fenzi (Doctor of Engineering Science (PhD): Computer Science, KU Leuven)**.  
"Looking for Stability: Advances on spectrum-based stability and stabilization of uncertain linear time-delay systems"

### Diplom and Master Theses

- 05/2021 **Marie Krause (M. Sc. in Industrial Mathematics, TU Berlin)**.  
"Numerical methods for computing the distance to singularity, instability and higher index for port-Hamiltonian systems"
- 03/2021 **Thorben Abel (M. Sc. in Industrial Mathematics, Universität Hamburg)**.  
"Shearlet-based Approach to Dynamic Computed Tomography"
- 12/2020 **Dorothea Hinsens (M. Sc. in Mathematics, TU Berlin)**.  
"A Port-Hamiltonian Approach for the Modeling of Power Networks including the Telegraph Equations"

- 05/2020 **Linus Johnson (M. Sc. in Computer Simulations for Science and Engineering, TU Berlin).**  
"Optimization of Lyapunov Exponents for Large Scale Systems"
- 12/2019 **Yannick Meyer (M. Sc. in Mathematics, Universität Hamburg).**  
"PDE-bedingte Optimierung mit Kontroll- und Zustandsbedingungen erster Ordnung"
- 11/2019 **Sofiya Onyshkevych (M. Sc. in Mathematical Modelling in Engineering, Universität Hamburg).**  
"Aerodynamic Shape Optimization in Stokes Flows"
- 05/2019 **Felix Black (M. Sc. in Mathematics, TU Berlin).**  
"Model Order Reduction for Transport Phenomena"  
[Bachelor Theses](#)
- 12/2021 **Nikolas Thelenberg (B. Sc. in Mathematics, TU Berlin).**  
"Trajectory Tracking by Model Predictive Control with Applications to Robot Manipulators"
- 11/2020 **Yigit Yazici (B. Sc. in Mathematics, Universität Hamburg).**  
"Parameterschätzung in Differentialgleichungen"
- 05/2019 **Christian Benjamin Früchtenicht (B. Sc. in Business Mathematics, TU Berlin).**  
"Optimalsteuerung linearer port-Hamiltonischer Systeme mit konstanten Koeffizienten"
- 06/2018 **David Noben (B. Sc. in Mathematics, TU Berlin).**  
"Ein adaptiver Algorithmus zur Regelung von Modell- und Diskretisierungsfehlern mittels sukzessiver linearer Programmierung"



# Service

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## Editorial Work

### Editorial Board Memberships

- since 03/2021 **Associate Editor**, *Journal of Industrial and Management Optimization* (American Institute of Mathematical Sciences).
- since 10/2020 **Review Editor**, *Frontiers in Control Engineering – Control Theory* (Frontiers Media S. A.).
- since 09/2020 **Review Editor**, *Frontiers in Control Engineering – Networked Control* (Frontiers Media S. A.).
- 08/2020–12/2021 **Associate Editor**, *Numerical Algebra, Control and Optimization* (American Institute of Mathematical Sciences).

### Special Issues handled as Guest Editor

- since 09/2022 **Recent Advances on Dissipativity in Systems and Control**, *Mathematics of Control, Signals, and Systems* (Springer), jointly edited with Timm Faulwasser and Benjamin Unger.
- 11/2020–06/2022 **Matrix Equations and Symmetry**, *Symmetry (MDPI)*, jointly edited with Patrick Kürschner.

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## Refereeing

### Grant Proposals and Final Reports

- Funding Bayerische Forschungsstiftung (3×)
- Bodies Swiss National Science Foundation

### Research Manuscripts

- Book Series Differential-Algebraic Equations Forum
- Journals Advances in Computational Mathematics
- Applied Mathematics and Computation (4×)
- Applied Mathematics and Optimization (2×)
- at – Automatisierungstechnik (2×)
- Automatica (4×)
- BIT Numerical Mathematics (4×)
- Computer Methods in Applied Mechanics and Engineering (2×)
- Control & Cybernetics
- Foundations of Data Science (2×)
- Frontiers in Applied Mathematics and Statistics
- Hacettepe Journal of Mathematics and Statistics
- IEEE Control Systems Letters (2×)
- IEEE Transactions on Automatic Control (14×)
- IMA Journal of Mathematical Control and Information (6×)
- IMA Journal of Numerical Analysis (3×)
- International Journal of Control (2×)
- International Journal of Modelling, Identification and Control
- International Journal of Robust and Nonlinear Control
- International Journal of Systems Science
- ISA Transactions
- Journal of Computational and Applied Mathematics (5×)
- Journal of Industrial and Management Optimization (2×)
- Journal of Optimization Theory and Applications
- Linear Algebra and its Applications (10×)
- Mathematics of Control, Signals, and Systems (5×)

Nonlinear Analysis: Real World Applications  
 Nonlinear Dynamics  
 Numerical Algorithms (3×)  
 Numerical Linear Algebra with Applications (2×)  
 Numerische Mathematik  
 Optimal Control, Applications and Methods  
 SIAM Journal on Control and Optimization (2×)  
 SIAM Journal on Matrix Analysis and Applications (14×)  
 SIAM Journal on Numerical Analysis (3×)  
 SIAM Journal on Scientific Computing  
 Systems & Control Letters (22×, **07/2017: outstanding reviewer**)  
 The Journal of the Acoustical Society of America  
 Conferences American Control Conference  
 Australian Control Conference  
 IEEE Conference on Decision and Control (2×)  
 IFAC Symposium on Robust Control Design  
 International Symposium on Mathematical Theory of Networks and Systems (4×)  
 Vienna International Conference on Mathematical Modelling

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## Administrative and Committee Work

since 08/2023 **Professors' representative (German speaking)**, *Academic Council, UniDistance Suisse.*  
 since 05/2022 **Permanent member**, *Faculty Senate, Department of Mathematics and Computer Science, UniDistance Suisse.*  
 since 07/2021 **Local node co-leader**, *Swiss Reproducibility Network (together with Michael Kurschilgen).*  
 10/2022–01/2023 **Member**, *Search committee for the vice rector for research, UniDistance Suisse.*  
 04/2019–03/2021 **Deputy member**, *Institute council, Institute of Mathematics, TU Berlin.*  
 03/2018–04/2019 **Member**, *Search committee for Mathematics – Mathematical Image Communication, TU Berlin.*  
 05/2006–07/2010 **Member**, *Student Accreditation Pool.*  
 Reviewer in one accreditation procedure  
 04/2005–10/2007 **Member**, *Student council, Faculty of Mathematics, TU Chemnitz.*  
 Involvement in different committees including budget, Bachelor/Master, and study program committee, and one search committee (Numerical Mathematics (Partial Differential Equations))

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## Outreach Activities

10/2022 **Children's University "The World of Secret Messages: Encoding and Decoding Secrets"** at UniDistance Suisse  
 08/2008–07/2010 Coordination of the **Correspondence Circle for Mathematics** at TU Chemnitz

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## Organization of Conferences and Minisymposia

03/2024 **Minisymposium "Matrix Nearness Problems and Applications"** at the 94th GAMM Annual Meeting in Magdeburg, Germany (together with Tim Mitchell)  
 (accepted)  
 05/2022 **Workshop Trends on Dissipativity in Systems and Control** in Brig, Switzerland (together with Timm Faulwasser and Benjamin Unger)  
 07/2019 **Minisymposium "Eigenvalue Optimization"** at the 9th International Congress on Industrial and Applied Mathematics in Valencia, Spain (together with Emre Mengi)  
 04/2018 **Workshop of the GAMM Activity Group "Dynamics and Control Theory"** in Berlin, Germany (together with Sergio Lucia)

- 07/2016 **Minisymposium “Analysis, Numerics, and Control of Differential-Algebraic Equations”** at the 7th European Congress of Mathematics in Berlin, Germany
- 08/2015 **Minisymposium “Distance Problems for Dynamical Systems”** at the 8th International Congress on Industrial and Applied Mathematics in Beijing, China
- 03/2015 **Section S20: “Dynamics and Control”** at the 86th GAMM Annual Meeting in Lecce, Italy (together with Thomas Berger and Fabio Ancona)
- 09/2013 **Workshop of the GAMM Activity Group “Dynamics and Control Theory”** in Magdeburg, Germany
- 03/2012 **Young Researchers’ Minisymposium MA-2: “Differential-Algebraic Equations: Theory, Numerics and Applications”** at the 83rd GAMM Annual Meeting in Darmstadt, Germany (together with Stephan Trenn)

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## Memberships in Professional Societies

- since 2021 **DHV – Deutscher Hochschulverband (German Association of University Professors and Lecturers)**
- since 2012 **SIAM – Society for Industrial and Applied Mathematics**, member of the activity groups “Control and Systems Theory”, “Dynamical Systems”, and “Linear Algebra”, 2013–2015: member of the SIAM Student Chapter Magdeburg
- since 2011 **GAMM – Gesellschaft für angewandte Mathematik und Mechanik (International Association for Applied Mathematics and Mechanics)**, elected member of the activity group “Dynamics and Control Theory”, member of the activity group “Applied and Numerical Linear Algebra”
- 2012–2023 **NICONET e. V. – The Numerics in Control Network**, association to promote the development and use of numerical methods for systems and control theory in science, engineering, and economics