Steffen W. R. Werner

Curriculum Vitae as of December 8, 2020

Born September 6, 1992 in Stendal, Germany

Contact

Address Max Planck Institute for Dynamics of Complex Technical Systems
Sandtorstr. 1
39106 Magdeburg, Germany

Phone +49 (0)391 6110 484

Email werner@mpi-magdeburg.mpg.de

URL https://ninsteve.github.io/

ORCID 0000-0003-1667-4862

Google Scholar https://scholar.google.de/citations?user=F2v1uKAAAAAJ&hl=en

Education

since 10/2016 **Doctoral Studies, Mathematics**, *Otto von Guericke University*, Magdeburg, Germany.

- 10/2016–09/2019: Project research in the Priority Program 1897 "Calm, Smooth and Smart – Novel Approaches for Influencing Vibrations by Means of Deliberately Introduced Dissipation".
- since 04/2017: Associated researcher in the Research Training Group 2297 "MathCoRe", Magdeburg.

10/2014–09/2016 **Master of Science, Mathematics**, *Otto von Guericke University*, Magdeburg, Germany, very good with distinction.
Thesis: *Hankel-Norm Approximation of Descriptor Systems* [24]

10/2011–09/2014 **Bachelor of Science, Mathematics**, *Otto von Guericke University*, Magdeburg, Germany, very good with distinction.
Thesis: *Numerische Berechnung der Eigenwerte großer Hamiltonisch-positiver Matrizen [25]*

07/2011 **Abitur (university entrance diploma)**, *Diesterweg-Gymnasium*, Tangermünde-Havelberg, Germany.

Professional Experience

since 10/2016 **PhD student**, *Computational Methods in Systems and Control Theory, Max Planck Institute for Dynamics of Complex Technical Systems*, Magdeburg, Germany.

05/2016–09/2016, 10/2014–01/2016 **Student employee**, *Computational Methods in Systems and Control Theory, Max Planck Institute for Dynamics of Complex Technical Systems*, Magdeburg, Germany.
- Development and maintenance of MATLAB toolboxes and codes

01/2016–04/2016 **Industrial internship**, *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

Research Interests

model order reduction, mathematical software, differential-algebraic equations, mechanical systems, matrix equations, numerical linear algebra, scientific computing

Publications

Submitted

[1] 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. e-print 2010.06331, arXiv, 2020. math.OC. URL: https://arxiv.org/abs/2010.06331.

[2] P. Benner, S. Gugercin, and S. W. R. Werner. Structure-preserving interpolation for model reduction of parametric bilinear systems. e-print 2007.11269, arXiv, 2020. math.NA. URL: https://arxiv.org/abs/2007.11269.

[3] P. Benner, S. Gugercin, and S. W. R. Werner. Structure-preserving interpolation of bilinear control systems. e-print 2005.00795, arXiv, 2020. math.NA. URL: https://arxiv.org/abs/2005.00795.

[4] P. Benner and S. W. R. Werner. MORLAB – the Model Order Reduction LABoratory. e-print 2002.12682, arXiv, 2020. cs.MS. URL: https://arxiv.org/abs/2002.12682.

Journal Articles

[5] P. Benner and S. W. R. Werner. Frequency- and time-limited balanced truncation for large-scale second-order systems. *Linear Algebra Appl.*, 2020. article in press. doi:10.1016/j.laa.2020.06.024.

[6] 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.

[7] 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.

Conference Proceedings

[8] 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.

[9] 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. URL: http://www.control.tf.uni-kiel.de/files/gma/2019/Tagungsband2019.pdf.

[10] 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. URL: http://www.control.tf.uni-kiel.de/files/gma/2019/Tagungsband2019.pdf.

[11] 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.

[12] P. Benner, J. Heiland, and S. W. R. Werner. Robust controller versus numerical model uncertainties for stabilization of Navier-Stokes equations. *IFAC-PapersOnLine*, 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.

[13] 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.

[14] P. Benner and S. W. R. Werner. Model reduction of descriptor systems with the MORLAB toolbox. *IFAC-PapersOnLine 9th Vienna International Conference on Mathematical Modelling MATHMOD 2018, Vienna, Austria, 21–23 February 2018*, 51(2):547–552, 2018. doi:10.1016/j.ifacol.2018.03.092.

[15] 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. URL: http://www.control.tf.uni-kiel.de/files/gma/2017/Tagungsband2017.pdf.

[16] 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.

Software

[17] P. Benner and S. W. R. Werner. SOMDDPA – Second-Order Modally-Damped Dominant Pole Algorithm (version 1.1), 2020. doi:10.5281/zenodo.3332706.

[18] P. Benner and S. W. R. Werner. Limited balanced truncation for large-scale sparse second-order systems (version 2.0), 2020. doi:10.5281/zenodo.3331592.

[19] P. Benner and S. W. R. Werner. MORLAB – Model Order Reduction LABoratory (version 5.0), 2019. see also: http://www.mpi-magdeburg.mpg.de/projects/morlab. doi:10.5281/zenodo.3332716.

[20] P. Benner and S. W. R. Werner. Limited balanced truncation for large-scale sparse second-order systems (version 1.0), 2019. doi:10.5281/zenodo.2553926.

[21] P. Benner and S. W. R. Werner. SOMDDPA – Second-Order Modally Damped Dominant Pole Algorithm (version 1.0), 2019. doi:10.5281/zenodo.2553902.

[22] P. Benner and S. W. R. Werner. MORLAB – Model Order Reduction LABoratory (version 4.0), 2018. see also: http://www.mpi-magdeburg.mpg.de/projects/morlab. doi:10.5281/zenodo.1574083.

[23] P. Benner and S. W. R. Werner. MORLAB-3.0 – model order reduction laboratory, 2017. see also: http://www.mpi-magdeburg.mpg.de/projects/morlab. doi:10.5281/zenodo.842659.

Theses

[24] S. Werner. Hankel-norm approximation of descriptor systems. Master's thesis, Otto-von-Guericke-Universität, Magdeburg, Germany, 2016. doi:10.25673/4507.

[25] S. Werner. Numerische Berechnung der Eigenwerte großer Hamiltonisch-positiver Matrizen. Bachelor's thesis, Otto-von-Guericke-Universität, Magdeburg, Germany, 2014.

Contributions to Projects

I made contributions to the following software projects/publications:

- J. Saak, M. Köhler, and P. Benner. M-M.E.S.S.-2.0.1 – the matrix equations sparse solvers library, February 2019. 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.

Presentations

16/07/2020 **MORLAB – A Model Order Reduction Framework in MATLAB & Octave**, *International Congress on Mathematical Software (ICMS 2020)*, Braunschweig, Germany, (online conference).

20/05/2020 **Structure-Preserving Interpolation for Bilinear Control Systems**, *Weekly Fellow Seminar Series of "MathCoRe"*, Magdeburg, Germany, (online seminar).

25/09/2019 **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.

25/09/2019 **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).

10/09/2019 **Limited Model Reduction for an Artificial Fishtail**, *Meeting of the European SIAM and GAMM Student Chapters (MESIGA 2019)*, Aachen, Germany.

30/08/2019 **Frequency- and Time-Limited Balanced Truncation for Second-Order Systems**, *4th Workshop on Model Reduction of Complex Dynamical Systems (MODRED 2019)*, Graz, Austria.

26/06/2019 **How to Reduce the Model of an Artificial Fishtail**, *Weekly Fellow Seminar Series of "MathCoRe"*, Magdeburg, Germany.

20/05/2019 **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).

28/02/2019 **H-Infinity Balanced Truncation for Feedback Control of Flow Problems**, *SIAM Conference on Computational Science and Engineering (CSE19)*, Spokane, Washington, USA, (invited minisymposium talk).

22/02/2019 **H-Infinity Balanced Truncation for Feedback Control of Flow Problems**, *Applied Numerical Analysis Seminar, Virginia Polytechnic Institute and State University*, Blacksburg, Virginia, USA, (invited seminar talk).

21/09/2018 **MORLAB – A Model Reduction Framework in MATLAB & Octave**, *Meeting of the European SIAM and GAMM Student Chapters (MESIGA 2018)*, Berlin, Germany.

16/05/2018 **Model Reduction of Linear Dynamical Systems with the MORLAB Toolbox**, *Weekly Fellow Seminar Series of "MathCoRe"*, Magdeburg, Germany.

20/04/2018 **MORLAB – A Framework for Model Reduction in MATLAB & OCTAVE**, *GAMM-Fachausschuss Dynamik und Regelungstheorie*, Berlin, Germany.

21/03/2018 **Balancing Related Model Reduction with the MORLAB Toolbox**, *89th GAMM Annual Meeting, Section "Dynamics and Control"*, Munich, Germany.

22/02/2018 **Model Reduction of Descriptor Systems with the MORLAB Toolbox**, *9th Vienna International Conference on Mathematical Modeling (MATHMOD 2018)*, Vienna, Austria.

22/09/2017 **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.

17/05/2017 **Model Reduction for Linear Systems**, *Weekly Fellow Seminar Series of "MathCoRe"*, Magdeburg, Germany.

09/03/2017 **Hankel-Norm Approximation of Descriptor Systems**, *88th GAMM Annual Meeting, Section "Dynamics and Control"*, Weimar, Germany.

12/01/2017 **Hankel-Norm Approximation of Descriptor Systems**, *3rd Workshop on Model Reduction of Complex Dynamical Systems (MODRED 2017)*, Odense, Denmark.

Posters

07/11/2019 **Solving Matrix Equations with the MORLAB Toolbox**, *METT VIII – 8th Workshop on Matrix Equations and Tensor Techniques*, Magdeburg, Germany.

28/08/2019 **MORLAB – Model Order Reduction LABoratory**, *4th Workshop on Model Reduction of Complex Dynamical Systems (MODRED 2019)*, Graz, Austria.

27/02/2019 **MORLAB – Model Order Reduction LABoratory**, *SIAM Conference on Computational Science and Engineering (CSE19)*, Spokane, Washington, USA, (invited poster).

12/04/2018 **Computing the Hankel-Norm Approximation of Large-Scale Descriptor Systems**, *Model Reduction of Parametrized Systems IV (MoRePaS 2018)*, Nantes, France.

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

Conference/Workshop Participation without Contribution

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

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

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

Research Stays

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

Teaching

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**, *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**, *Exercise tutor*, Otto von Guericke University, Magdeburg, Germany.

Winter term 2013/2014 **Explorative Datenanalyse**, *Exercise tutor*, Otto von Guericke University, Magdeburg, Germany.

Supervised Students

Bachelor students

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

Interns

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

Awards

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, USA.

Language Skills

German **mother tongue**

English **advanced**

French **elementary**

Programming Skills

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

Additional Qualification

21/10/2020–23/10/2020 **Good Scientific Practice**, *Course held by Helga Nolte (CoachInScience)*, Magdeburg, Germany.
- Course content: scientific practice, data management, scientific misconduct

23/09/2020–25/09/2020 **Leadership Skills**, *Course held by Sabine Lerch (Soft Skills for Science)*, Magdeburg, Germany.
- Course content: leadership models, critical feedback, mediation

10/12/2019–11/12/2019 **Presentation Skills**, *Course held by the National Institute for Science Communication*, Karlsruhe, Germany.
- Course content: body language, presentation structures, art of persuasion

Further Activities

since 10/2016 **Student Chapter of SIAM Magdeburg, Germany**.
- 04/2017–09/2018, since 10/2019: IT officer
- 10/2018–09/2019: President