PETAR MLINARIĆ

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EXPERIENCE

Virginia Polytechnic Institute and State University Sep 2021–present
Postdoctoral associate *Blacksburg, VA, United States*

· Postdoctoral Associate in the Department of Mathematics at Virginia Tech.
· Developing data-driven, optimization-based, reduced-order modeling methods.
· Contributing to the pyMOR package.

Max Planck Institute for Dynamics of Complex Technical Systems Sep 2014–Jul 2021
Research assistant, postdoctoral researcher *Magdeburg, Germany*

· Started as a Ph.D. student at the Otto von Guericke University of Magdeburg and the graduate program "International Max Planck Research School (IMPRS) for Advanced Methods in Process and Systems Engineering (Magdeburg)".
· In January 2020, defended the Ph.D. thesis titled "Structure-preserving model order reduction for network systems", supervised by Prof. Dr. Peter Benner.
· Contributed to the pyMOR package since 2015, became a maintainer in September 2016.
· From January 2019, working within the "pyMOR—Sustainable Software for Model Order Reduction" project under the DFG call "Sustainability of Research Software".
· Co-supervised three undergraduate students contributing to pyMOR.

EDUCATION

Otto von Guericke University of Magdeburg, *Ph.D. in Applied Mathematics* Oct 2014–Jan 2020
Thesis: Structure-Preserving Model Order Reduction for Network Systems
Supervisor: Prof. Dr. Peter Benner

University of Zagreb, *M.Sc. in Applied Mathematics* Oct 2012–Jul 2014
Thesis: Approximation of Linear Dynamical Systems in $\mathcal{H}_2^{p \times m}(\mathbb{C}_+)$
Supervisor: Prof. Dr. Zlatko Drmač

University of Zagreb, *B.Sc. in Mathematics* Oct 2009–Jul 2012

PREPRINTS

P. Mlinarić, P. Benner, and S. Gugercin, Interpolatory necessary optimality conditions for reduced-order modeling of parametric linear time-invariant systems, *submitted*, January 2024

P. Mlinarić, C. A. Beattie, Z. Drmač, and S. Gugercin, IRKA is a Riemannian gradient descent method, *provisionally accepted*, November 2023

P. Mlinarić, P. Benner, and S. Gugercin, Interpolatory $\mathcal{H}_2$-optimality conditions for structured linear time-invariant systems, *provisionally accepted*, October 2023

JOURNAL PUBLICATIONS

P. Mlinarić and S. Gugercin, A unifying framework for interpolatory $\mathcal{L}_2$-optimal reduced-order modeling, *SIAM Journal on Numerical Analysis*, September 2023

P. Mlinarić and S. Gugercin, $\mathcal{L}_2$-optimal reduced-order modeling using parameter-separable forms, *SIAM Journal on Scientific Computing*, April 2023

M. Hund, T. Mitchell, P. Mlinarić, and J. Saak, Optimization-based parametric model order reduction via $\mathcal{H}_2 \otimes \mathcal{L}_2$ first-order necessary conditions, *SIAM Journal on Scientific Computing*, June 2022

H.-J. Jongsma, P. Mlinarić, S. Grundel, P. Benner, and H. L. Trentelman, Model reduction of linear multi-agent systems by clustering with $\mathcal{H}_2$ and $\mathcal{H}_\infty$ error bounds, *Mathematics of Control, Signals, and Systems*, April 2018

BOOK CHAPTERS

P. Mlinarić, S. Rave, and J. Saak, Parametric model order reduction using pyMOR, In: P. Benner, T. Breiten, H. Faßbender, M. Hinze, T. Stykel, R. Zimmermann (eds), *Model Reduction of Complex Dynamical Systems*, August 2021

P. Benner, S. Grundel, and P. Mlinarić, Clustering-based model order reduction for nonlinear network systems, In: P. Benner, T. Breiten, H. Faßbender, M. Hinze, T. Stykel, R. Zimmermann (eds), *Model Reduction of Complex Dynamical Systems*, August 2021

CONFERENCE PROCEEDINGS PUBLICATIONS

L. Balicki, P. Mlinarić, S. Rave, and J. Saak, System-theoretic model order reduction with pyMOR, *Proceedings in Applied Mathematics and Mechanics*, November 2019

M. Hund, P. Mlinarić, and J. Saak, An $\mathcal{H}_2 \otimes \mathcal{L}_2$-optimal model order reduction approach for parametric linear time-invariant systems, *Proceedings in Applied Mathematics and Mechanics*, December 2018

P. Mlinarić, T. Ishizaki, A. Chakrabortty, S. Grundel, P. Benner, and J. Imura, Synchronization and aggregation of nonlinear power systems with consideration of bus network structures, *Proceedings of the European Control Conference (ECC)*, June 2018

P. Benner, S. Grundel, and P. Mlinarić, Stability preserving model reduction for linearly coupled linear time-invariant systems, *Proceedings in Applied Mathematics and Mechanics*, October 2016

P. Mlinarić, S. Grundel, and P. Benner, Clustering-based model order reduction for multi-agent systems with general linear time-invariant Agents, *Proceedings of the 22nd International Symposium on Mathematical Theory of Networks and Systems (MTNS)*, July 2016

P. Mlinarić, S. Grundel, and P. Benner, Efficient model order reduction for multi-agent systems using QR decomposition-based clustering, *Proceedings of the 54th IEEE Conference on Decision and Control*, December 2015

PROFESSIONAL SERVICE

pyMOR School 2024 co-organizer   26–30 Aug 2024
The sixth pyMOR School, taking place at U Münster (`https://2024.school.pymor.org/`).

pyMOR School 2023 co-organizer   18–22 Sep 2023
The fifth pyMOR School, taking place at TU Berlin (`https://2023.school.pymor.org/`).

SIAM CSE23 pyMOR minitutorial co-organizer   1 Mar 2023
A pyMOR minitutorial at the SIAM CSE23 conference in Amsterdam, The Netherlands.

pyMOR School 2022 co-organizer   22–26 Aug 2022
The fourth pyMOR School, taking place at MPI Magdeburg (`https://2022.school.pymor.org/`).

Virginia Tech Department of Mathematics seminar organizer   Aug 2022–Apr 2024
Organized the Applied Numerical Analysis seminar at the Department of Mathematics at Virginia Tech.

Virginia Tech Postdoctoral Association board member   May 2022–July 2024
Held positions as secretary (2022/23) and communications officer (2023/24).

pyMOR School 2021 co-organizer   4–8 Oct 2021
The third pyMOR School, taking place at WWU Münster (`https://2021.school.pymor.org/`).

pyMOR Online Course 2020 co-organizer   28 Sep–2 Oct 2020
The second pyMOR School in an online format (`https://2020.school.pymor.org/`).

SAMM 2020 co-organizer   27–31 Jul 2020
The 7th GAMM Juniors' Summer School on Applied Mathematics and Mechanics (SAMM) with the topic "Learning Models from Data: Model Reduction, System Identification and Machine Learning".

pyMOR School 2019 co-organizer   7–11 Oct 2019
The first pyMOR School, taking place at MPI Magdeburg (`https://2019.school.pymor.org/`).

SIAM Student Chapter of Magdeburg officer   Oct 2015–Sep 2017
Held positions as president (2015/16) and secretary (2016/17).

Reviewer
Applied Mathematics Modeling, Applied Mathematics and Computation, Automatica, Computer Methods in Applied Mechanics and Engineering European Journal of Control, GAMM Archive for Students, IEEE Control Systems Letters, IEEE Transactions on Automatic Control ($\times 4$), Journal of Computational Physics,

MDPI Mathematics (×3), SIAM Journal on Control and Optimization, SIAM Journal on Matrix Analysis and Applications, SIAM Journal on Scientific Computing (×2), SoftwareX, Systems & Control Letters (×4), Transactions on Mathematical Software.

TEACHING EXPERIENCE

Virginia Tech
Math 2114: Introduction to Linear Algebra (Spring 2022, Spring 2023)
Math 4445: Introduction to Numerical Analysis (Spring 2024)

Otto von Guericke University of Magdeburg
Model Order Reduction of Dynamical Systems (Spring 2017, exercises)

ACTIVITIES

Visiting researcher   12–16 Sep 2022
One-week visit at the Josip Juraj Strossmayer University of Osijek.

Visiting researcher   17–23 Dec 2021
One-week visit at the Josip Juraj Strossmayer University of Osijek within an ERASMUS+ project.

ICERM semester program participant   Jan–May 2020
Semester program "Model and dimension reduction in uncertain and dynamic systems".

Visiting researcher   7 Jul–15 Sep 2017
Two-month visit at Prof. Dr. Jun-ichi Imura's research group at Tokyo Institute of Technology. Worked on clustering-based model order reduction for power systems.

GAMM Junior   2017–2020
Three-year position awarded yearly to ten young academics from the field of applied mathematics and mechanics (https://www.gamm-juniors.de/).

CONFERENCE AND WORKSHOP TALKS

Model Reduction and Surrogate Modeling (MORe2024), San Diego, USA   9–13 Sep 2024
Riemannian Optimization over the Manifold of Rational Functions

26th International Symposium on Mathematical Theory of Networks and Systems (MTNS 2024), Cambridge, UK   19–23 Aug 2024
TF-IRKA is also a Riemannian Gradient Descent Method

European Conference on Numerical Mathematics and Advanced Applications (ENUMATH 2023), Lisbon, Portugal   4–8 Sep 2023
Parametric Reduced-order Modeling via Nonlinear Least Squares

25th Conference of the International Linear Algebra Society (ILAS 2023), Madrid, Spain   12–16 Jun 2023
Optimal Reduced-order Modeling for Structured Linear Systems

Nonlinear Model Reduction for Control, Blacksburg, VA, USA   22–26 May 2023
$\mathcal{H}_2 \otimes \mathcal{L}_2$-*optimal Model Order Reduction for Quadratic-bilinear Systems*

SIAM Southeastern Atlantic Section Annual Meeting, Blacksburg, VA, USA   25–26 Mar 2023
$\mathcal{L}_2$-*optimal Reduced-order Modeling of Parametric Stationary Problems*

SIAM Conference on Computational Science and Engineering (CSE23), Amsterdam, The Netherlands   26 Feb – 3 Mar 2023
Least-squares Parametric Reduced-order Modeling

5th Annual Meeting of the SIAM Texas-Louisiana Section (SIAM TXLA22), Houston, TX, USA   4–6 Nov 2022
Least-squares Parametric Reduced-order Modeling

Model Reduction and Surrogate Modeling (MORE), Berlin, Germany   19–23 Sep 2022
Structured $\mathcal{L}_2$-Optimal Parametric Model Order Reduction

11th Conference on Applied Mathematics and Scientific Computing (ApplMath22), Brijuni, Croatia   5–9 Sep 2022
Iterative Rational Krylov Algorithm and Riemannian Optimization

New Trends in Computational Science in Engineering and Industrial Mathematics, Magdeburg, Germany   1–2 Jul 2022
Is IRKA a Riemannian Optimization Method?

Spring 2020 Reunion Event, Providence, RI, USA 23 May – 10 Jun 2022
$\mathcal{L}_2$-Optimal Reduced-Order Modeling

SIAM Conference on Uncertainty Quantification (UQ22), Atlanta, GA, USA 12–15 Apr 2022
$\mathcal{L}_2$-Optimal Model Order Reduction for Parametric Stationary Problems

3$^{\text{rd}}$ Workshop on Optimal Control of Dynamical Systems and 28 Mar – 1 Apr 2022
Applications, Osijek, Croatia
Structured $\mathcal{L}_2$-Optimal Parametric Model Order Reduction

SIAM Conference on Control and Its Applications (CT21), virtual 19–21 Jul 2021
Clustering-Based Model Order Reduction for Water Networks

Tenth Conference on Applied Mathematics and Scientific Computing 14–18 Sep 2020
(ApplMath20), Brijuni, Croatia
Optimization-Based Parametric Model Order Reduction via Wilson-Type $\mathcal{H}_2 \otimes \mathcal{L}_2$ Conditions

EuroSciPy 2019, Bilbao, Spain 2–6 Sep 2019
pyMOR lightning talk

4$^{\text{th}}$ Workshop on Model Reduction of Complex Dynamical Systems 28–30 Aug 2019
(MODRED 2019), Graz, Austria
Clustering-Based Model Order Reduction for Nonlinear Network Systems

90$^{\text{th}}$ GAMM Annual Meeting, Vienna, Austria 18–22 Feb 2019
$\mathcal{H}_2$-Optimal Model Order Reduction of Interconnected Systems

International Workshop on Optimal Control of Dynamical Systems and Ap- 20–22 Jun 2018
plications, Osijek, Croatia
$\mathcal{H}_2$-Optimal Model Order Reduction for Port-Hamiltonian Systems

European Control Conference (ECC18), Limassol, Cyprus 12–15 Jun 2018
Synchronization and Aggregation of Nonlinear Power Systems with Consideration of Bus Network Structures

Model Reduction of Parameterized Systems IV (MoRePaS 2018), Nantes, 10–13 Apr 2018
France
$\mathcal{H}_2$-Optimal Structure-Preserving Model Order Reduction for Second-Order Systems

89$^{\text{th}}$ GAMM Annual Meeting, Munich, Germany 19–23 Mar 2018
Clustering-Based Model Order Reduction for Nonlinear Multi-Agent Systems

Reduced Basis (and Friends) Summer School 2017, Goslar, Germany 19–22 Sep 2017
$\mathcal{H}_2$-Optimal Model Order Reduction and Reduced Basis Methods

88$^{\text{th}}$ GAMM Annual Meeting, Weimar, Germany 06–10 Mar 2017
$\mathcal{H}_2$-Optimal Model Order Reduction for Second Order Systems

3$^{\text{rd}}$ Workshop on Model Reduction of Complex Dynamical Systems 11–13 Jan 2017
(MODRED 2017), Odense, Denmark
Model Reduction of Network Systems by Clustering

Reduced Basis Summer School 2016, Hedersleben, Germany 04–07 Oct 2016
Model Order Reduction for Multi-Agent Systems

Workshop on Model Reduction Methods and Optimization, Opatija, Croatia 20–21 Sep 2016
Almost Almost-Equitableness and Clustering-Based Error Bounds

22$^{\text{nd}}$ International Symposium on Mathematical Theory of Networks and 12–15 Jul 2016
Systems (MTNS 2016), Minneapolis, USA
Clustering-Based Model Order Reduction for Multi-Agent Systems with General Linear Time-Invariant Agents

6$^{\text{th}}$ Croatian Mathematical Congress, Zagreb, Croatia 14–17 Jun 2016
Clustering-Based Model Order Reduction for Multi-Agent Systems

Joint Annual Meeting of DMV and GAMM, Braunschweig, Germany 07–11 Mar 2016
Stability Preserving Model Reduction for Linearly Coupled Linear Time-Invariant Systems

10$^{\text{th}}$ Elgersburg Workshop, Elgersburg, Germany 07–11 Feb 2016
Efficient Model Order Reduction for Multi-Agent Systems Using Graph Partitions

54$^{\text{th}}$ IEEE Conference on Decision and Control (CDC), Osaka, Japan 15–18 Dec 2015
Efficient Model Order Reduction for Multi-Agent Systems Using QR Decomposition-Based Clustering

Reduced Basis Summer School 2015, Hegne, Germany 14–18 Sep 2015
Efficient Model Order Reduction for Multi-Agent Systems Using Graph Partitions