

PETAR MLINARIĆ

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EXPERIENCE

Virginia Polytechnic Institute and State University

Postdoctoral associate

Sep 2021–present

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

Research assistant, postdoctoral researcher

Sep 2014–Jul 2021

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*

Thesis: Structure-Preserving Model Order Reduction for Network Systems

Supervisor: Prof. Dr. Peter Benner

Oct 2014–Jan 2020

University of Zagreb, *M.Sc. in Applied Mathematics*

Thesis: Approximation of Linear Dynamical Systems in $\mathcal{H}_2^{p \times m}(\mathbb{C}_+)$

Supervisor: Prof. Dr. Zlatko Drmač

Oct 2012–Jul 2014

University of Zagreb, *B.Sc. in Mathematics*

Oct 2009–Jul 2012

PREPRINTS

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

P. Mlinarić, C. Beattie, Z. Drmač, and S. Gugercin, [IRKA is a Riemannian gradient descent method](#), *submitted*, November 2023

P. Mlinarić, P. Benner, and S. Gugercin, [Interpolatory \$\mathcal{H}_2\$ -optimality conditions for structured linear time-invariant systems](#), *submitted*, 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. Chakraborty, 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 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 Postdoctoral Association board member May 2022–present
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 ($\times 3$), SIAM Journal on Control and Optimization, SIAM Journal on Matrix Analysis and Applications, SIAM Journal on Scientific Computing, SoftwareX, Systems & Control Letters ($\times 4$), 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

European Conference on Numerical Mathematics and Advanced Applications 4–8 Sep 2023

(**ENUMATH 2023**), Lisbon, Portugal

Parametric Reduced-order Modeling via Nonlinear Least Squares

25th Conference of the International Linear Algebra Society (ILAS 2023), 12–16 Jun 2023

Madrid, Spain

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), 26 Feb – 3 Mar 2023

Amsterdam, The Netherlands

Least-squares Parametric Reduced-order Modeling

5th Annual Meeting of the SIAM Texas-Louisiana Section (SIAM TXLA22), 4–6 Nov 2022

Houston, TX, USA

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 5–9 Sep 2022

(**ApplMath22**), Brijuni, Croatia

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

3rd Workshop on Optimal Control of Dynamical Systems and Applications, Osijek, Croatia 28 Mar – 1 Apr 2022

Structured \mathcal{L}_2 -Optimal Parametric Model Order Reduction

SIAM Conference on Control and Its Applications (CT21) , virtual <i>Clustering-Based Model Order Reduction for Water Networks</i>	19–21 Jul 2021
Tenth Conference on Applied Mathematics and Scientific Computing (ApplMath20) , Brijuni, Croatia <i>Optimization-Based Parametric Model Order Reduction via Wilson-Type $\mathcal{H}_2 \otimes \mathcal{L}_2$ Conditions</i>	14–18 Sep 2020
EuroSciPy 2019 , Bilbao, Spain <i>pyMOR lightning talk</i>	2–6 Sep 2019
4th Workshop on Model Reduction of Complex Dynamical Systems (MODRED 2019) , Graz, Austria <i>Clustering-Based Model Order Reduction for Nonlinear Network Systems</i>	28–30 Aug 2019
90th GAMM Annual Meeting , Vienna, Austria <i>\mathcal{H}_2-Optimal Model Order Reduction of Interconnected Systems</i>	18–22 Feb 2019
International Workshop on Optimal Control of Dynamical Systems and Applications , Osijek, Croatia <i>\mathcal{H}_2-Optimal Model Order Reduction for Port-Hamiltonian Systems</i>	20–22 Jun 2018
European Control Conference (ECC18) , Limassol, Cyprus <i>Synchronization and Aggregation of Nonlinear Power Systems with Consideration of Bus Network Structures</i>	12–15 Jun 2018
Model Reduction of Parameterized Systems IV (MoRePaS 2018) , Nantes, France <i>\mathcal{H}_2-Optimal Structure-Preserving Model Order Reduction for Second-Order Systems</i>	10–13 Apr 2018
89th GAMM Annual Meeting , Munich, Germany <i>Clustering-Based Model Order Reduction for Nonlinear Multi-Agent Systems</i>	19–23 Mar 2018
Reduced Basis (and Friends) Summer School 2017 , Goslar, Germany <i>\mathcal{H}_2-Optimal Model Order Reduction and Reduced Basis Methods</i>	19–22 Sep 2017
88th GAMM Annual Meeting , Weimar, Germany <i>\mathcal{H}_2-Optimal Model Order Reduction for Second Order Systems</i>	06–10 Mar 2017
3rd Workshop on Model Reduction of Complex Dynamical Systems (MODRED 2017) , Odense, Denmark <i>Model Reduction of Network Systems by Clustering</i>	11–13 Jan 2017
Reduced Basis Summer School 2016 , Hedersleben, Germany <i>Model Order Reduction for Multi-Agent Systems</i>	04–07 Oct 2016
Workshop on Model Reduction Methods and Optimization , Opatija, Croatia <i>Almost Almost-Equitableness and Clustering-Based Error Bounds</i>	20–21 Sep 2016
22nd International Symposium on Mathematical Theory of Networks and Systems (MTNS) , Minneapolis, USA <i>Clustering-Based Model Order Reduction for Multi-Agent Systems with General Linear Time-Invariant Agents</i>	12–15 Jul 2016
6th Croatian Mathematical Congress , Zagreb, Croatia <i>Clustering-Based Model Order Reduction for Multi-Agent Systems</i>	14–17 Jun 2016
Joint Annual Meeting of DMV and GAMM , Braunschweig, Germany <i>Stability Preserving Model Reduction for Linearly Coupled Linear Time-Invariant Systems</i>	07–11 Mar 2016
10th Elgersburg Workshop , Elgersburg, Germany <i>Efficient Model Order Reduction for Multi-Agent Systems Using Graph Partitions</i>	07–11 Feb 2016
54th IEEE Conference on Decision and Control (CDC) , Osaka, Japan <i>Efficient Model Order Reduction for Multi-Agent Systems Using QR Decomposition-Based Clustering</i>	15–18 Dec 2015
Reduced Basis Summer School 2015 , Hegne, Germany <i>Efficient Model Order Reduction for Multi-Agent Systems Using Graph Partitions</i>	14–18 Sep 2015