PETAR MLINARIĆ

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EXPERIENCE

University of Zagreb   Mar 2025–present
Assistant professor   *Zagreb, Croatia*

· Assistant professor at the Faculty of Science, Department of Mathematics.

Virginia Polytechnic Institute and State University   Sep 2021–Dec 2024
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

G. Olikier, P. Mlinarić, P.-A. Absil, and A. Uschmajew, The tangent cone to the real determinantal variety: various expressions and four proofs, *submitted*, April 2025

J.M. Maldonado, C. Drischler, R.J. Furnstahl, and P. Mlinarić, Greedy emulators for nuclear two-body scattering, *submitted*, April 2025

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

JOURNAL PUBLICATIONS

P. Mlinarić, P. Benner, and S. Gugercin, Interpolatory $\mathcal{H}_2$-optimality conditions for structured linear time-invariant systems, *SIAM Journal on Numerical Analysis*, April 2025

P. Mlinarić, C. A. Beattie, Z. Drmač, and S. Gugercin, IRKA is a Riemannian gradient descent method, *IEEE Transactions on Automatic Control (Early Access)*, November 2023

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. 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

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

CONFERENCE PROCEEDINGS PUBLICATIONS

P. Mlinarić, Z. Sokolikj, G. Talla, U. Meyer-Baese, A. Stadlbauer, H. Malberg, C.-H. Na, K. Juetten, B. Wiestler, and A. Meyer-Baese, Clustering-based model reduction for glioma graph networks, In: B.S. Gimi, A. Krol (eds), *Medical Imaging 2025: Clinical and Biomedical Imaging*, April 2025

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 and User Meeting 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 Southeastern Atlantic Section minisymposium co-organizer 25–26 Mar 2023
A minisymposium at the SIAM SEAS23 conference in Blacksburg, US.

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

SIAM CSE23 minisymposium co-organizer 26 Feb–3 Mar 2023
A minisymposium 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–Jul 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" (`https://www.mpi-magdeburg.mpg.de/csc/events/samm20`).

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 Control Conference, European Journal of Control, GAMM Archive for Students, IEEE Conference on Decision and Control, IEEE Control Systems Letters, IEEE Transactions on Automatic Control (×5), International Symposium on Mathematical Theory of Networks and Systems, Journal of Applied Mathematics and Mechanics, Journal of Computational Physics, Journal of Computational and Applied Mathematics, MDPI Mathematics (×3), SIAM Journal on Control and Optimization, SIAM Journal on Mathematics of Data Science, SIAM Journal on Matrix Analysis and Applications, SIAM Journal on Numerical Analysis, SIAM Journal on Scientific Computing (×2), SoftwareX, Systems & Control Letters (×4), Transactions on Mathematical Software.

TEACHING EXPERIENCE

Otto von Guericke University of Magdeburg

Model Order Reduction of Dynamical Systems (Summer 2017, exercises)

Virginia Tech

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

RESEARCH VISITS AND TRAININGS

Josip Juraj Strossmayer University of Osijek 12–16 Sep 2022
Visited Prof. Dr. Zoran Tomljanović for one week.

Josip Juraj Strossmayer University of Osijek 17–23 Dec 2021
Visited Prof. Dr. Zoran Tomljanović for one week within an ERASMUS+ project.

ICERM semester program 27 Jan–1 May 2020
Participated in the semester program "Model and dimension reduction in uncertain and dynamic systems" (`https://icerm.brown.edu/programs/sp-s20/`).

Groningen Autumn School on Model Order Reduction 30 Oct–2 Nov 2017
Participated in the fall school in Groningen, The Netherlands.

Tokyo Institute of Technology 7 Jul–15 Sep 2017
Visited Prof. Dr. Jun-ichi Imura's research group for two months.

University of Groningen 20–21 Jan 2016
Visited Prof. Dr. Harry Trentelman for two days.

The Third International School on Model Reduction for Dynamical Control Systems 5–9 Oct 2015
Participated in the summer school in Dubrovnik, Croatia.

7th Elgersburg School 1–7 Mar 2015
Participated in the winter school in Elgersburg, Germany.

DAAD International School on Linear Optimal Control of Dynamic Systems 23–28 Sep 2013
Participated in the summer school in Osijek, Croatia.

AWARDS

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

INVITED MINISYMPOSIUM TALKS

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

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

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

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

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

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

CONFERENCE AND WORKSHOP TALKS

Challenges, Opportunities, and New Horizons in Rational Approximation, Banff, Canada
Riemannian Optimization over Rational Functions
6–11 Apr 2025

4th Workshop on Optimal Control of Dynamical Systems and Applications, Villány, Hungary
Optimal Damping for the Wave Equation
26–28 Feb 2025

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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   6–10 Mar 2017
$\mathcal{H}_2$-Optimal Model Order Reduction for Second Order Systems

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

Reduced Basis Summer School 2016, Hedersleben, Germany   4–7 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

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   7–11 Mar 2016
Stability Preserving Model Reduction for Linearly Coupled Linear Time-Invariant Systems

10$^{\text{th}}$ Elgersburg Workshop, Elgersburg, Germany   7–11 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

TALKS AT INSTITUTIONS

Applied Numerical Analysis Seminar, **Virginia Tech**, Blacksburg, VA, USA   13 Oct 2023
What is the Optimal Damper Position for the Wave Equation?

Applied Numerical Analysis Seminar, **Virginia Tech**, Blacksburg, VA, USA   24 Mar 2023
Optimal Reduced-order Modeling of Structured Linear Systems

Applied Numerical Analysis Seminar, **Virginia Tech**, Blacksburg, VA, USA   14 Oct 2022
Is IRKA a Riemannian Optimization Method?

Optimization and Applications Seminar, **Josip Juraj Strossmayer University of Osijek**, Osijek, Croatia   14 Sep 2022
Interpolatory Conditions for $\mathcal{L}_2$-optimal Reduced-order Modeling

Applied Numerical Analysis Seminar, **Virginia Tech**, Blacksburg, VA, USA   1 Apr 2022
Structured $\mathcal{L}_2$-optimal Parametric Model Order Reduction

Applied Numerical Analysis Seminar, **Virginia Tech**, Blacksburg, VA, USA   24 Sep 2021
$\mathcal{H}_2 \otimes \mathcal{L}_2$-optimal Parametric Model Order Reduction via Wilson-type conditions

Optimization and Applications Seminar, **Josip Juraj Strossmayer University of Osijek**, Osijek, Croatia   22 Dec 2021
Model Order Reduction for Parametric Stationary Problems

Optimization and Applications Seminar, **Josip Juraj Strossmayer University of Osijek**, Osijek, Croatia   2 May 2019
System-theoretic Model Order Reduction in pyMOR

Numerical Mathematics and Scientific Computing Seminar, **Faculty of Science**, **University of Zagreb**, Zagreb, Croatia   24 Apr 2019
Optimalna $\mathcal{H}_2$ redukcija s očuvanjem strukture za linearne sustave

Imura Lab Seminar, **Tokyo Institute of Technology**, Tokyo, Japan   21 Jul 2017
$\mathcal{H}_2$-optimal Model Order Reduction of Network Systems

Computational Methods in Systems and Control Seminar, **Max Planck Institute for Dynamics of Complex Technical Systems**, Magdeburg, Germany   11 Jul 2017
$\mathcal{H}_2$-optimal Model Order Reduction of Structured Linear Systems

Seminar Regelungssysteme, **Technische Universität Berlin**, Berlin, Germany   22 Sep 2015
Efficient Structure-preserving Model Order Reduction for Multi-agent Systems