

# Monica Nonino

## Curriculum Vitæ

Faculty of Mathematics  
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### Employment & Education

- 12/2023- **Principal Investigator**, *University of Vienna*, Vienna, FWF ESPRIT project "*Virtual Element based Model Order Reduction*"
- 2020-2023 **Post-Doc**, *University of Vienna*, Vienna
- 2016-2020 **Ph.D in Applied Mathematics**, *International School for Advanced Studies (SISSA)*, Trieste, final grade: cum laude  
Thesis: "On the application of the Reduced Basis Method to Fluid-Structure Interaction Problems".  
Advisors: Prof. Gianluigi Rozza, Dr. Francesco Ballarin
- 2014-2016 **MSc in Mathematics**, *University of Udine*, Udine, final grade: 110/110 cum laude.  
Thesis: "On a special characteristic equation and its application to structured populations". Advisor: Prof. Dimitri Breda.
- 2011-2014 **BSc in Mathematics**, *University of Udine*, Udine, final grade: 110/110 cum laude.  
Thesis: "Modelli matematici sull'evoluzione spaziale e temporale delle epidemie". Advisor: Prof. Paolo Baiti.

### Research activity

#### Preprints

- [4] I. PRUSAK, D. TORLO, M. NONINO, G. ROZZA, *A time-adaptive algorithm for pressure dominated flows: a heuristic estimator*. arXiv:2407.00428, 2024.
- [3] M. NONINO, D. TORLO, *Calibration-Based ALE Model Order Reduction for Hyperbolic Problems with Self-Similar Travelling Discontinuities*. arXiv:2403.11664, 2024.
- [2] I. PRUSAK, D. TORLO, M. NONINO, G. ROZZA, *Optimisation-Based Coupling of Finite Element Model and Reduced Order Model for Computational Fluid Dynamics*. arXiv:2402.10570, 2024.
- [1] D. PRADOVERA, M. NONINO, I. PERUGIA, *Geometry-based approximation of waves in complex domains*, arXiv:2301.13613v3, 2023.

#### Journal articles

- [7] I. PRUSAK, D. TORLO, M. NONINO, G. ROZZA. *An optimisation-based domain-decomposition reduced order model for parameter-dependent non-stationary fluid dynamics problems*. *Computer & Mathematics With Applications* 166:253-268, 2024.
- [6] I. PRUSAK, M. NONINO, D. TORLO, F. BALLARIN, G. ROZZA. *An optimisation-based domain-decomposition reduced order model for the incompressible Navier-Stokes equations*. *Computer & Mathematics With Applications* 151:172-189, 2023.
- [5] M. NONINO, F. BALLARIN, G. ROZZA, Y. MADAY. *A reduced basis method by means of transport maps for a fluid-structure interaction problem with slowly decaying Kolmogorov  $n$ -width*. *Advances in Computational Science and Engineering* 1(1):36-58, 2023.
- [4] M. NONINO, F. BALLARIN, G. ROZZA, Y. MADAY. *Projection Based Semi-Implicit Reduced Basis Method for Fluid-Structure Interaction Problems*. *Journal of Scientific Computing* 94(4), 2023.
- [3] E. KARATZAS, M. NONINO, F. BALLARIN, G. ROZZA. *A reduced order Cut Finite Element Method for geometrically parametrized steady and unsteady Navier-Stokes problems*. *Computer & Mathematics With Applications* 116:140-160, 2022.

- [2] M. NONINO, F. BALLARIN, G. ROZZA. *A monolithic and a partitioned Reduced Basis Method for Fluid-Structure Interaction problems*. Fluids 6(6):229, 2021.
- [1] D. BREDI, G. MENEGON, M. NONINO. *Delay equations and characteristic roots: stability and more from a single curve*. Electronic Journal of Qualitative Theory of Differential Equations 89:1-22, 2018.

### Book chapters

- [1] M. NONINO, F. BALLARIN, G. ROZZA. *Reduced Order Methods for Fluid-Structure Interaction Problems*. In "Advanced Reduced Order Methods and Applications in Computational Fluid Dynamics". SIAM Computational Science & Engineering, pag. 283-310, 2022.

## Teaching

- 2024W **Analysis and Linear Algebra 1**, *Excercise classes*, University of Vienna.
- 2024S **Topics in Finite Element: part II**, *Lecturer*, University of Vienna.
- 2023S **Applied mathematics for secondary school teacher accreditation program**, *Excercise classes*, University of Vienna
- June 2022 **CFD Summer School**. *ROMs for FSI problems and tutorial classes*. SISSA, Trieste(Italy).
- 2022S **Topics in Finite Element: part II**, *Lecturer*, University of Vienna.
- 2015-2016 **Tutor for students of Engineering**, University of Udine.
- 2015-2016 **Tutor for students of Mathematics**, *Mathematical Analysis*, University of Udine.

## Supervision & Mentoring

### PhD

- 2020-2023 **Dr. I. Prusak**. *Application of optimisation-based domain-decomposition reduced order models to parameter-dependent fluid dynamics and multiphysics problems*, SISSA mathLab (with G. Rozza and D.Torlo). Graduation: 13 Dec. 2023.

### Bachelor

- 2024 **A. Fleissner**. *Direkte Lösungsverfahren linearer Gleichungssysteme gestützt durch Programmieren*. University of Vienna.

### Mentor

- 2019 **Laura Huang**, BsC student at Massachusetts Institute of Technology (MIT), visiting student at SISSA (spring semester).

## Conference presentations

### Invited conference presentations & seminars

- July 2024 **ECM**. *Towards an ALE MOR framework for advection dominated problems*, Sevilla (Spain).
- June 2024 **ECCOMAS**. *Towards an ALE MOR framework for advection dominated problems*, keynote lecture, Lisbon (Portugal).
- March 2024 **ALGORITMY**. *Towards an ALE MOR framework for advection dominated problems*, High Tatra Mountains (Slovakia).
- Jan. 2024 **Oberseminar Numerik und Optimierung**. *ALE based MOR for transport dominated problems: calibration, optimization and regression*. Leibniz University of Hannover (Germany).
- Sept. 2023 **ENUMATH**. *Geometry based approximation of waves in complex domains*, Lisbon (Portugal).
- June 2023 **COUPLED**. *Model order reduction for FSI problems: POD-based partitioned and monolithic approaches*. Crete (Greece). Talk by G.Rozza due to sudden death of a parent.
- April 2023 **ANADays**. *Slowly decaying Kolmogorov n-width: model order reduction by means of transport maps*. Vienna (Austria).
- March 2023 **CSC Seminars**. *Model Order Reduction for FSI problems: POD-based partitioned and monolithic approaches*. MPI Magdeburg (Germany).
- June 2022 **ECCOMAS**. *A partitioned semi-implicit reduced order model for a FSI problem*. Oslo (Norway).

- May 2022 **SISSA Women in Mathematics**. *The Reduced Basis Method for FSI problems*. Online presentation.
- July 2021 **WCCM-ECCOMAS Young Investigators**. *FSI problems within the Reduced Basis Method: monolithic or partitioned algorithms, and a first CutFEM approach*. Online Virtual Conference.
- Nov. 2019 **CDLAB Seminars**. *Overcoming slowly decaying  $n$ -width by transport maps: application to MOR of CFD and FSI problems*. Udine (Italy).

### Contributed talks

- June 2022 **EFEEF**. *A partitioned semi-implicit reduced order model for a FSI problem*. Aalto (Finland).
- June 2021 **DMV-ÖMG**. *A monolithic and a partitioned Reduced-Basis Method for a FSI problem*. Online virtual conference.
- Jan. 2021 **WCCM-ECCOMAS** *Reduced order models for FSI: monolithic and partitioned approaches*. Online virtual conference.
- June 2019 **COUPLED**. *Reduction of the Kolmogorov  $n$ -width for a transport dominated FSI problem*. Sitges (Spain).

### Internal seminars

- Dec. 2020 **PDE afternoon**. *The Reduced Basis Method for FSI problems*, Vienna (Austria).
- Oct.2020 **Analysis Junior Seminars**. *Segregated Reduced Order Models for FSI problems*, SISSA, Trieste(Italy).
- Oct. 2018 **Analysis Junior Seminars**. *Reduced Order Methods for FSI problems, and reduction of the Kolmogorov  $n$ -width*. SISSA, Trieste(Italy).

### Poster presentations

- April 2023 **2nd SFB International Workshop**. *"Geometry based approximation of waves in complex domains"*.Vienna (Austria).
- July 2019 **Summer School on ROMs in CFD**. *"Reduction of the Kolmogorov  $n$ -width for a transport dominated FSI problem"*. Trieste (Italy).
- April 2018 **MoRePaS**. *POD-Galerkin reduced order methods for inverse and multiphysics problems in fluid dynamics*. Nantes (France).

## Invited research visits

- Jan. 2024 *Leibniz University of Hannover, Hannover (Germany)*. Guest of: T. Wick. (20-26 Jan.)
- Dec. 2023 *mathLab group, SISSA, Trieste (Italy)*. Guest of: G.Rozza, D.Torlo. (11-16 Dec.)
- March 2023 *MPI für dynamik komplexer technischer Systeme, Magdeburg (Germany)*. Guest of: P.Benner, L. Gmkisis. (5-8 March)
- Febr. 2023 *mathLab group, SISSA, Trieste (Italy)*. Guest of: G.Rozza, D.Torlo. (19-24 Febr.)

## Scientific responsibilities & organizing activities

### Minisimposia & seminars organization

- Sept. 2023 **ENUMATH**. Organization of the MS *Reducing the irreducible: model reduction for transport-dominated problems* (with D. Pradovera). Lisbon (Portugal).
- 2019-2020 Organization of the SIAM Chapter Colloquia 2019-2020, serving as vice-president of the SISSA SIAM Student Chapter.

### SISSA SIAM Student Chapter

- 2019-2020 Vice-president.
- 2017-2019 Secretary.

### Representative roles

- 2014-2016 Student Representative in the Department of Mathematics, Informatics and Physics, Udine.
- 2014-2016 Student Representative in the Committee for the evaluation of the didactics, Udine.

### Referee activity

Referee for: Comp. and Math. With Appl., Comp. Meth. in Appl. Math. and Engin., SIAM J. Sci. Comp., J. Comp. Phys., J. Sci. Comp.

### Third party fundings (> 10000 €)

- ESPRIT Career Advancement for Postdocs ESP-519-N "Virtual Element based Model Order Reduction". Awarded by the Austrian Science Fund (FWF). **Total amount:** 316 036 €.

### Research interests

- Parametric Partial Differential Equations
- Coupled problems, Fluid-Structure Interaction problems.
- Model Order Reduction, intrusive and non intrusive approaches.
- Application of reduction techniques to problems with slowly decaying Kolmogorov  $n$ -width.
- Finite Element Method, Cut-Finite Element, Virtual Element Method.