

Monica Nonino

Curriculum Vitæ

Faculty of Mathematics
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Education

- 2016-2020 **Ph.D**, *International School for Advanced Studies (SISSA)*, Trieste, Italy, Thesis: "*On the application of the Reduced Basis Method to Fluid-Structure Interaction Problems*". Advisors: Prof. Gianluigi Rozza, Dr. Francesco Ballarin. Grade: summa cum laude (highest honor).
- 2014-2016 **M.Sc. in Mathematics**, *University of Udine*, Udine, Italy, Thesis: "*On a special characteristic equation and its application to structured populations*". Advisor: Prof. Dimitri Breda. Grade: 110/110 cum laude (highest honor).
- 2011-2014 **B.Sc. in Mathematics**, *University of Udine*, Udine, Italy, Thesis: "*Modelli matematici sull'evoluzione spaziale e temporale delle epidemie*". Advisor: Prof. Paolo Baiti. Grade: 110/110 cum laude (highest honor).

Employment

- 12/2023- **Principal Investigator**, *University of Vienna*, FWF ESPRIT project "*Virtual Element based Model Order Reduction*".
- 11/2021- **Post-Doc**, *University of Vienna*, Research group of Ilaria Perugia.
11/2023
- 02/2021- **Post-Doc**, *University of Vienna*, within the FWF Einzelprojekte "*Problem oriented Virtual Element Methods*".
10/2021
- 11/2020- **Post-Doc**, *University of Vienna*, Research group of Ilaria Perugia.
02/2021

Mentoring and supervision

- Co-advisor of Ivan Prusak, PhD Student at SISSA, mathLab. Topic: *optimization-based Domain Decomposition for Fluid-Structure Interaction problems*. Graduation: 13 December 2023.
- Mentor of Laura Huang, BsC student at Massachusetts Institute of Technology (MIT), visiting student at SISSA (spring semester 2019).
- Mathematical Analysis tutor, Università degli Studi di Udine, Italy, 2015.
- Mathematical Analysis tutor for Engineering, Università degli Studi di Udine, Italy, 2015-2016.

Research interests

- Parametric Partial Differential Equations, coupled multiphysics problems, Fluid-Structure Interaction problems.
- Model Order Reduction techniques, intrusive approaches, application of the Reduced Basis Method to Fluid-Structure Interaction problems.
- Advection dominated problems, application of reduction techniques to problems with slowly decaying Kolmogorov n -width.
- Standard Finite Element Method and alternatives/extensions for problems with moving interfaces: Cut-Finite Element, Virtual Element Method.

Teaching

SS 23 Applied mathematics for secondary school teacher accreditation programm, Bc.S class (in German).

SS 22 Topics in Finite Element: part II, Ms.C class (in English).

Publications

Preprints

1. D. Pradovera, M. Nonino, I. Perugia. Geometry-based approximation of waves in complex domains (2023). Submitted to *SIAM Journ. on Appl. Math.* doi.org/10.48550/arXiv.2301.13613.
2. I. Prusak, D. Torlo, M. Nonino, G. Rozza. An optimisation-based domain-decomposition reduced order model for parameter-dependent non-stationary fluid dynamics problems (2023). Submitted to *Comput. & Math. With Appl.* doi.org/10.48550/arXiv.2308.01733.

Book chapters

1. M. Nonino, F. Ballarin, G. Rozza. Reduced Order Methods for Fluid-Structure Interaction Problems (2022). In "Advanced Reduced Order Methods and Applications in Computational Fluid Dynamics", G. Rozza, G. Stabile, F. Ballarin (Eds). *Siam Series on Computational Science and Engineering*.

Journals

1. I. Prusak, M. Nonino, D. Torlo, F. Ballarin, G. Rozza. An optimisation-based domain-decomposition reduced order model for the incompressible Navier-Stokes equations (2023). In *Comput. & Math. With Appl.* doi.org/10.1016/j.camwa.2023.09.039.
2. 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 (2023). In *Adv. Comp. Sci. and Eng.*. doi:10.3934/acse.2023002.
3. M. Nonino, F. Ballarin, G. Rozza, Y. Maday. Projection Based Semi-Implicit Reduced Basis Method for Fluid-Structure Interaction Problems (2022). In *J. Sci. Comp.* **94** (4). doi.org/10.1007/s10915-022-02049-6.
4. E. Karatzas, M. Nonino, F. Ballarin, G. Rozza. A reduced order Cut Finite Element Method for geometrically parametrized steady and unsteady Navier-Stokes problems (2021). In *Comput. & Math. With Appl.* **116**. doi.org/10.1016/j.camwa.2021.07.016.

5. M. Nonino, F. Ballarin, G. Rozza. A monolithic and a partitioned Reduced Basis Method for Fluid-Structure Interaction problems (2021). In *Fluids* **6**(6). doi.org/10.3390/fluids6060229.
6. D. Breda, G. Menegon, M. Nonino. Delay equations and characteristic roots: stability and more from a single curve (2018). In *El. J. of Qual. T. of Diff. Eq.* **89**. doi.org/10.14232/ejqtde.2018.1.89 .

Organizing activities

1. Organization of the MS "*Reducing the irreducible: model reduction for transport-dominated problems*" with D. Pradovera, at **ENUMATH2023**, Lisbon, 4-8 Sept. 2023.
2. Organization of the SIAM Chapter Colloquia 2019-2020, serving as vice-president of the SISSA SIAM Student Chapter.

Conference talks

1. "*Geometry based approximation of waves in complex domains*". ENUMATH 2023, Lisbon, Portugal, 4-8 September 2023.
2. "*Model order reduction for FSI problems: POD-based partitioned and monolithic approaches*". COUPLED 2023, Chania, Crete, Greece, 5-7 June 2023.
3. "*Slowly decaying Kolmogorov n -width: model order reduction by means of transport maps*". Austrian Numerical Analysis days, Vienna, Austria, 27-28 April 2023.
4. "*A partitioned semi-implicit reduced order model for a Fluid-Structure Interaction problem*". ECCOMAS, Oslo, Norway, 5-9 June 2022.
5. "*A partitioned semi-implicit reduced order model for a Fluid-Structure Interaction problem*". European Finite Element Fair, Aalto, Finland, 3-4 June 2022.
6. "*A monolithic and a partitioned Reduced-Basis Method for a Fluid-Structure Interaction problem*". DMV-ÖMG, online virtual conference, 27 September-1 October 2021.
7. "*Reduced order models for Fluid-Structure Interaction: monolithic and partitioned approaches*". WCCM-ECCOMAS, online virtual conference, 11-15 January 2021.
8. "*The Reduced Basis Method for Fluid-Structure Interaction problems*", PDE afternoon, Vienna, Austria, 9 December 2020.
9. "*Reduction of the Kolmogorov n -width for a transport dominated fluid-structure interaction problem*". COUPLED 2019, Sitges, Spain, 3-5 June 2019.
10. "*Reduced Order Methods for FSI problems, and reduction of the Kolmogorov n -width*". Analysis Junior Seminars, Trieste, Italy, 19 October 2018.

Lectures within international schools

1. *Summer School on Reduced Order Methods in Computational Fluid Dynamics*, SISSA, Trieste, 11-15 July 2022. Lectures: Reduced Order Models for Fluid-Structure Interaction.
2. *Summer School on Reduced Order Methods in Computational Fluid Dynamics*, SISSA, Trieste, 11-15 July 2022. Lectures: Practical Sessions with RBniCS.

Invited seminar talks

1. "*Model Order Reduction for FSI problems: POD-based partitioned and monolithic approaches*" at the **CSC seminar**, Max Plank Institut, Madgeburg, Germany, 7 March 2023.
2. "*The reduced basis method for fluid-structure interaction problems*" at the **SISSA Women in Mathematics 2022**, SISSA, Trieste, Italy, 12 May 2022.
3. "*Segregated reduced order models for fluid-structure interaction problems*" at the **Analysis Junior Seminars**, SISSA, Trieste, Italy, 23 October 2020.
4. "*FSI problems within the Reduced Basis Method: monolithic and partitioned algorithms, and a first cutFEM approach*" at the **WCCM-ECCOMAS Young Investigators**, online, 7-9 July 2019.
5. "*Overcoming slowly decaying n -width by transport maps: application to model order reduction of fluid dynamics and fluid-structure interaction problems*". CD Lab seminars, Udine, Italy, 8 November 2019.

Posters

1. "*Geometry based approximation of waves in complex domains*". 2nd SFB International Workshop, Vienna, Austria, 19-21 April 2023.
2. "*Reduction of the Kolmogorov n -width for a transport dominated fluid-structure interaction problem*". Summer School on Reduced Order Methods in Computational Fluid Dynamics, Trieste, Italy, 8-12 July 2019.
3. "*POD-Galerkin reduced order methods for inverse and multiphysics problems in fluid dynamics*". MoRePa, Nantes, France, 10-13 April 2018.

Invited visits

1. Max Plack Institut für dynamik komplexer technischer Systeme, Magdeburg, Germany, 5-8 March 2023.
2. mathLab group, SISSA, Trieste, Italy, 19-24 February 2023.

Coding contributions

1. Contributed to the development of Python based Model Order Reduction codes for the RBniCS library <https://github.com/RBniCS/RBniCS/blob/master/AUTHORS>, 2016-2020.

Other activities

Referee

1. *Computer & Mathematics With Applications*.
2. *SIAM Journal on Scientific Computing*.
3. *Computer Methods in Applied Mechanics and Engineering*.

SISSA SIAM Student Chapter

1. Chapter Vice-president, 2019-2020.
2. Chapter Secretary, 2017-2019.

Representative roles

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

■ Awards and scholarships

- Award for the best master student in Mathematics. Università degli Studi di Udine, 2017.
- Scholarship based on school credit. INPS, 2018–2017–2016–2015.

■ Grants from third party funding (> 2000 €)

- ESPRIT Career Advancement for Postdocs ESP-519-N "*Virtual Element based Model Order Reduction*". Awarded by the Austrian Science Fund (FWF) on the 5.07.2023. Total amount: 316 036 €.