Monica Nonino

Curriculum Vitæ

Faculty of Mathematics
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Education

2016-2020   **Ph.D**, *International School for Advanced Studies*, 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*, 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*, Italy, Thesis: *"Modelli matematici sull'evoluzione spaziale e temporale delle epidemie"*. Advisor: Prof. Paolo Baiti. Grade: 110/110 cum laude (highest honor).

Employment

2023-   **Principal Investigator**, *University of Vienna*, FWF ESPRIT Grant *"Virtual Element based Model Order Reduction"*, amount: 316,036.52 Euros.

02/2021-current   **Post-Doc**, *University of Vienna*, within the FWF Einzelprojekte *"Problem ortiented Virtual Element Methods"*.

11/2020-02/2021   **Post-Doc**, *University of Vienna*, Research group of Ilaria Perugia.

Mentoring and supervision

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

Publications

Preprints

1. D. Pradovera, M. Nonino, I. Perugia. Geometry-based approximation of waves in complex domains (2023). Submitted to *Journ. of Comp. Phys.* doi.org/10.48550/arXiv.2301.13613.

2. I. Prusak, M. Nonino, D. Torlo, F. Ballarin, G. Rozza. An optimisation-based domain-decomposition reduced order model for the incompressible Navier-Stokes equations (2022). Submitted to *Comput. Math. With Appl.* doi.org/10.48550/arXiv.2211.14528.

Book chapters

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

Refereed articles

1. 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.

2. 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.

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 (2021). In *Comput. Math. With Appl.* **116**. doi.org/10.1016/j.camwa.2021.07.016.

4. 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.

5. M. Nonino. On the application of the Reduced Basis Method to Fluid-Structure Interaction problems. *PhD thesis* (2020). https://hdl.handle.net/20.500.11767/114309.

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.

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).

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.

Professional activity

Referee
1. *Computer & Mathematics With Applications*.

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.

Grants and awards

- PI of the FWF ESPRIT Grant *"Virtual Element based Model Order Reduction"*. Duration: 3 years. Amount: 316,036.52 Euros.
- Award for the best master student in Mathematics. Universitá degli Studi di Udine, 2017.
- Scholarship based on school credit. INPS, 2018–2017–2016–2015.