Francesco Romor

Curriculum Vitae

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Current position

November 2023– **Weierstrass Institute, Berlin, Germany**, *Postdoc*, Research group: Numerical Mathematics and Scientific Computing, Head: Prof. Volker John, Coworker: Dr. Alfonso Caiazzo.

Education

October 2019– October 2023 **International School for Advanced Studies (SISSA), Trieste, Italy**, *Ph.D. student*, Mathematical analysis, modelling and applications. Thesis title: Nonlinear Parameter Space and Model Order Reductions enhanced by scientific machine learning, Advisor: Prof. Gianluigi Rozza.
Defence: 29 September 2023

September 2017– October 2019 **University of Trieste, Trieste, Italy**, *Master's degree in mathematics, 110/110 cum laude*, Department of mathematics and geosciences, Thesis title: Reduction in Parameter Space for Problems approximated by the Discontinuous-Galerkin Method in Computational Fluid Dynamics.
Advisor: Prof. Gianluigi Rozza

September 2014– September 2017 **University of Trieste, Trieste, Italy**, *Bachelor degree in mathematics, 110/110 cum laude*, Department of mathematics and geosciences, Thesis title: "**Geodesics on Lie Groups with invariant Metrics**".
Advisor: Prof. Giovanni Landi

Publications

Software Papers

2021 Francesco Romor, Marco Tezzele, and Gianluigi Rozza. ATHENA: Advanced Techniques for High dimensional parameter spaces to Enhance Numerical Analysis. Software Impacts 10 (2021): 100133.

Publications in Journals

2025 Francesco Romor, Davide Torlo, and Gianluigi Rozza. Friedrichs' systems discretized with the DGM: domain decomposable model order reduction and Graph Neural Networks approximating vanishing viscosity solutions. Journal of Computational Physics (2025): 113915.

2025 Francesco Romor, Giovanni Stabile, and Gianluigi Rozza. Explicable hyper-reduced order models on nonlinearly approximated solution manifolds of compressible and incompressible Navier-Stokes equations Journal of Computational Physics 524 (2025): 113729.

2024 Guglielmo Padula, Francesco Romor, Giovanni Stabile, and Gianluigi Rozza. Generative Models for the Deformation of Industrial Shapes with Linear Geometric Constraints: model order and parameter space reductions Computer Methods in Applied Mechanics and Engineering 423 (2024): 116823.

2024 Francesco Romor, Marco Tezzele, Gianluigi Rozza. A local approach to parameter space reduction for regression and classification tasks. Journal of Scientific Computing 99, no. 3 (2024): 83.

2023 Francesco Romor, Giovanni Stabile, and Gianluigi Rozza. Non-linear Manifold Reduced-Order Models with Convolutional Autoencoders and Reduced Over-Collocation Method. Journal of Scientific Computing 94, 74 (2023). https://doi.org/10.1007/s10915-023-02128-2

2023 Francesco Romor, Marco Tezzele, Markus Mrosek, Carsten Othmer, and Gianluigi Rozza. Multi-fidelity data fusion through parameter space reduction with applications to automotive engineering. International Journal for Numerical Methods in Engineering, 124(23), 5293-5311. https://doi.org/10.1002/nme.7349

2022 Francesco Romor, Marco Tezzele, Andrea Lario, Gianluigi Rozza . Kernel-based active subspaces with application to computational fluid dynamics parametric problems using the discontinuous Galerkin method. International Journal for Numerical Methods in Engineering 123.23 (2022): 6000-6027.

Books

2022 Chapters 12 and 16: Gianluigi Rozza, Giovanni Stabile, and Francesco Ballarin, eds. Advanced Reduced Order Methods and Applications in Computational Fluid Dynamics. Society for Industrial and Applied Mathematics, 2022.

Preprints

2025 Francesco Romor, Felipe Galarce, Jan Brüning, Leonid Goubergrits, Alfonso Caiazzo. Data assimilation performed with robust shape registration and graph neural networks: application to aortic coarctation ." (2025).

Conference Proceedings

2021 Romor, Francesco, Marco Tezzele, and Gianluigi Rozza. Multi-fidelity data fusion for the approximation of scalar functions with low intrinsic dimensionality through active subspaces. In PAMM, vol. 20, no. S1, p. e202000349. Berlin: Wiley-VCH GmbH, 2021.

Contribution to national and international events

Visiting periods

2023 Visiting period at the Massachusetts Institute of Technology (MIT) for the MISTI MIT-Italy FVG Project, in collaboration with Prof. Youssef Marzouk, Boston, USA, 3-15 October 2023.

Speaker

2025 Invited speaker at the conference DTE & AICOMAS 2025 with the talk on "Registration-based data assimilation from medical images", 3-7 June 2024, Lisbon, Portugal.

2024 Invited speaker at the conference ECCOMAS 2024 - "Efficient Numerical Resolution of Parametric Partial Differential Equations on Solution Manifolds Parametrized by Neural Networks", 3-7 June 2024, Lisbon, Portugal.

2023 Invited speaker at the conference ECCOMAS YIC 2023 - MS "Scientific Machine Learning techniques for complex engineering systems", 19-21 June 2023, Porto, Portugal

2023 Contributed talk at the conference SIAM CSE23, 27 February - 3 March 2023, Amsterdam, Netherlands

2022 Invited speaker at the conference GIMC SIMAI YOUNG, 29-30 September 2022, Pavia, Italy

2022 Contributed talk at Model Reduction and Surrogate Modeling (MORE), 19-23 September 2022, Berlin, Germany

2022 Contributed talk at the conference Young Mathematicians in Model Order Reduction - YMMOR, 18-22 July 2022, Munster, Germany

Workshops/Summer schools/Attended conferences

2025 I gave a contributed talk at MESIGA Numerical Methods in Applied Mathematics, 11-13 March, 2025, Potsdam, Germany.

2025 I gave a contributed talk at the COLIBRI focus workshop on Computational Medicine, 30-31 January, 2025, Graz, Austria.

2024 I was poster presenter "Registration-based data assimilation of aortic blood flows" at the Leibniz MMS Days 2024, in Keiserslautern, Germany.

2024 I attended the workshop on Optimal transport in Berlin, Germany, 11-15 March.

2023 I attended the "10th deal.II Users and Developers Workshop" at Leibniz University Hannover, Germany, September 11-15, 2023

2022 I was a monographic co-lecturer at the second edition of the Summer School on Reduced Order Methods in Computational Fluid Dynamics at SISSA

2021 I attended the International Conference in Coupled problems in Science and Engineering, 13-16 March 2021

2021 I attended the SIAM Conference on Computational Science and Engineering, Virtual Conference (originally scheduled in Fort Worth, Texas, U.S.) 1–5 March 2021.

2020 I was a poster presenter at the GAMM Juniors' Summer School on Applied Mathematics and Mechanics, July 2020

2019 I was a poster presenter at the Summer School on Reduced Order Methods in Computational Fluid Dynamics at SISSA.

Organization of minisymposia/seminars

2023 Seminar: "Efficiently solving parametric PDEs on solution manifolds parametrized by neural networks" at MIT, Boston, USA.

2021-2022 I organized with Sara Farinelli the weekly Analysis Junior Seminars at SISSA and the 2022 SISSA Women in mathematics colloquium.

Grants/Scholarships

2014-2017 I was given the scholarship offered by the Istituto Nazionale di Alta Matematica (INDAM) for the Bachelor degree in mathematics

2022 MISTI MIT-Italy FVG Project: multi-fidelity model order reduction for inverse problems at MIT and SISSA

Student supervision/Academic roles

2022-2023 Master's thesis of Guglielmo Padula in "**Generative models for 3D object deformation with constraints applied to reduced order modelling**", Master's degree in Data Science, University of Trieste

2023 Masters's thesis of Giorgio Abelli in "**Comparison of model order reduction methods for inverse problems enhanced by machine learning: FEM basis group equivariant layers on Graph Neural Networks**", Master degree in Data Science, University of Trieste

2021-2022 SISSA SIAM chapter president

Open-source software development

`ATHENA` I am the maintainer and main developer with Dr Marco Tezzele of ATHENA a python library for dimension reduction in parameter space and available on GitHub https://github.com/mathLab/ATHENA

`ITHACA-FV` I contributed to `ITHACA-FV` a C++ library for model reduction based on `OpenFOAM` and available on GitHub https://github.com/mathLab/ITHACA-FV

Computer Skills

Languages **C++, scientific python**

Software **Numerical modelling of PDEs**: `deal.II`, `OpenFOAM`, `FEniCS`

Software **Scientific machine learning**: `PyTorch`, `Pyro`, `scikit-learn`, `Emukit`, `PyTorch Geometric`, `GPyTorch`

Software **Model order reduction**: `ITHACA-FV` (SISSA-mathLab)

Languages

Italian mothertongue

2014 First Certificate in English, Grade A, CEFR level C1

2025 German B1