FEDERICO PICHI



PERSONAL INFORMATION

Born in Rome, Italy 23 February 1992 Ph.D. in Mathematical Analysis, Modelling and Applications

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POSITION

Current Position

Postdoctoral researcher at EPFL (École Polytechnique Fédérale de Lausanne) in the MCSS group of Prof. Jan S. Hesthaven.

Research Interests

Numerical analysis of bifurcating phenomena held by non-linear equations. Reduced order models in computational Continuum Mechanics, Fluid Dynamics and Quantum Mechanics with applications to Artificial Neural Networks, Optimal Control Problems and Fluid-Structure Interaction.

PUBLICATIONS

2023

[14] F. Pichi, F. Ballarin, G. Rozza, J. S. Hesthaven. "An artificial neural network approach to bifurcating phenomena in computational fluid dynamics". Computers & Fluids, 2023.

2022

- [13] F. Pichi, B. Moya, J. S. Hesthaven. "A convolutional graph neural network approach to model order reduction to non-linear parametrized PDEs". In preparation.
- [12] M. Khamlich, F. Pichi, G. Rozza. "Chapter 15: Reduced Order Models for Bifurcating Phenomena in Fluid-Structure Interaction Problems". Proceedings of Advanced Reduced Order Methods and Applications in Computational Fluid Dynamics.
- [11] F. Pichi, F. Ballarin, G. Rozza. "Chapter 5: Reduced Basis Approaches to Bifurcating Nonlinear Parametrized Partial Differential Equations".

 Proceedings of Advanced Reduced Order Methods and Applications in Computational Fluid Dynamics.
- [10] F. Pichi, M. Strazzullo, F. Ballarin, G. Rozza. "Chapter 2: Finite Element-Based Reduced Basis Method in Computational Fluid Dynamics". Proceedings of Advanced Reduced Order Methods and Applications in Computational Fluid Dynamics.

2021

- [9] F. Pichi, F. Ballarin, G. Rozza, J. S. Hesthaven. "Artificial neural network for bifurcating phenomena modelled by nonlinear parametrized PDEs". PAMM, 20(S1):e202000350, 2021.
- [8] M. KHAMLICH, F. PICHI, G. ROZZA. "Model order reduction for bifurcating phenomena in fluid-structure interaction problems". International Journal for Numerical Methods in Fluids, 2022.

2020

[7] F. Ballarin, F. Pichi, G. Rozza. "A successive partition method for the

efficient evaluation of parametrized stability factors". In preparation.

[6] F. Pichi, M. Strazzullo, F. Ballarin, G. Rozza. "Driving bifurcating parametrized nonlinear PDEs by optimal control strategies: application to Navier-Stokes equations and model reduction". ESAIM: Mathematical Modelling and Numerical Analysis, 2022.

2019

- [5] F. PICHI, J. EFTANG, G. ROZZA, A. T. PATERA. "Reduced order models for the buckling of hyperelastic beams." Report MIT-FVG "ROM2S"
- [4] M. Pintore, F. Pichi, M. Hess, G. Rozza, C. Canuto. "Efficient computation of bifurcation diagrams with a deflated approach to reduced basis spectral element method" Advances in Computational Mathematics, 47:1, 2021.
- [3] F. PICHI, A. QUAINI, G. ROZZA. "A Reduced Order technique to study bifurcating phenomena: application to the Gross-Pitaevskii equation" SIAM Journal on Scientific Computing, 42:5, B1115-B1135, 2020.
- [2] F. Pichi, G. Rozza. "Reduced basis approaches for parametrized bifurcation problems held by non-linear von Kármán equations" Journal of Scientific Computing, 10.1007/s10915-019-01003-3, 2019.

2018

[1] D.B.P. HUYNH, F. PICHI and G. ROZZA. "Reduced Basis Approximation and A Posteriori Error Estimation: Applications to Elasticity Problems in Several Parametric Settings" Numerical Methods for PDEs: State of the Art Techniques, Springer International Publishing, Ch. 8, 203–247, 2018.

EDUCATION

2020-2021 SISSA-EPFL, Lausanne (Switzerland)

Postdoc CRUI GO for IT grant · mathLab-MCSS

Project: Reduced order methods for nonlinear PDEs enhanced by machine learning

PIs: Prof. Gianluigi Rozza & Prof. Jan S. HESTHAVEN

2018-2019 MIT, Cambridge (USA)

Visiting Student Massachusetts Institute of Technology · Computational Engineering

Advisors: Prof. Anthony Patera

Project: ROM2S Reduced Order Methods at MIT and SISSA

2016-2020 SISSA, Trieste (Italy)

Ph.D. degree Mathematical Analysis, Modelling and Applications · Mathematics Area

Thesis: Reduced order models for parametric bifurcation problems in nonlinear PDEs

Advisors: Prof. Gianluigi Rozza & Dr. Francesco Ballarin

Final Grading cum laude

2014-2016 'La Sapienza' University, Rome (Italy)

Master degree Applied Mathematics · Department of Mathematics

Thesis: Reduced order methods for parametric Von Kármán equations Advisors: Prof. Maurizio Falcone & Prof. Gianluigi Rozza

Final Grading 110/110 cum laude

2011-2014 'La Sapienza' University, Rome (Italy)

Bachelor degree Mathematics · Department of Mathematics

Thesis: Disconituous differential equations in control theory

Advisor: Prof. Corrado MASCIA Final Grading 110/110 cum laude

OTHER INFORMATION

Teaching and Tasks

Courses

- Analyse III [TA], EPFL, 2022.
- Summer School on Reduced Order Methods in Computational Fluid Dynamics. Invited lecturer, SISSA, 2022.
- Dynamics and bifurcation [TA], EPFL, 2022.
- o Computational Mechanics by Reduced Order Methods [TA], SISSA, 2022.
- o MATLAB, University of Trieste, 2019.
- o ROM in bifurcating parametrised non-linear equations, SISSA, 2019.

Tutoring

- o Master · O. Morrison, Mathematics, EPFL, 2023.
- o Master · I. Gonnella, Data Science and Sci. Comp., University of Trieste, 2023.
- o Internship · M. Hirsch, Math. Sciences, Carnegie Mellon University, 2022.
- o Master · M. Khamlich, Math. Engineering, Politecnico di Milano, 2021.
- o Master · M. Pintore, Math. Engineering, Politecnico di Torino, 2019.

Miscellanea

- o President of SISSA Siam Student Chapter (2019-2020)
- o Organizer of SISSA SIAM Student Chapter Colloquia 2020, Virtual Event
- Reviewer: SIAM Journal on Scientific Computing, Advances in Computational Mathematics, Journal of Scientific Computing, Finite Elements in Analysis and Design, International Journal of Bifurcation and Chaos, AMS Math. Reviews, Advances in Continuous and Discrete Models, Applied Mathematics and Computation, Computers & Mathematics with Applications, Journal of Computational Physics, Communications in Nonlinear Science and Numerical Simulation.

Awards and Funding

2021 Fondazione CIME $\,\cdot\,$ Grant for CIME Summer School: Model Order Reduction and Applications

2021 INDAM GNCS · Grant for Coupled Problems 2021

2021 CRUI project GO for IT · Research grant between EPFL and SISSA: "Reduced order methods for nonlinear PDEs enhanced by machine learning"

2020 ECCOMAS Scholarship · Grant for WCCM-ECCOMAS Virtual Congress

2019 Banco Santander Financial Support Program \cdot Grant for 9th International Congress on Industrial and Applied Mathematics ICIAM2019

2018 MIT-Italy - FVG · ROM2S Reduced Order Methods at MIT and SISSA

SISSA · Master thesis fellowship for pre-graduate students

Sapienza University \cdot Excellence course for Bachelor (2011-2014) and Master degrees in Mathematics (2014-2016)

Conferences and Workshops

NA G-ROM (talk), SIAM CSE 2023 (talk), CODES@Emory 2022 (talk), MORE 2022 (talk), ROM in CFD 2022 (talk), ECCOMAS 2022 (talk), RAMSES 2021 (talk), MMLDT-CSET 2021 (talk), CIME Summer School 2021 (talk), Coupled 2021 (talk), FEniCS 2021 (talk), SIAM CSE 2021 (talk), WCCM-ECCOMAS 2020 (talk), MORSS 2020 (talk), SAMM 2020 (poster), UMI 2019 (talk), ICIAM 2019 (talk), ROM in CFD (poster), CIME-EMS Summer School, ICOSAHOM 2018 (talk), MoRePaS 2018 (poster), QUIET 2017, FEF 2017, EU-MORNET.

April 16, 2023