

# FEDERICO PICHI



## PERSONAL INFORMATION

Born in Rome, Italy 23 February 1992

Ph.D. in **Mathematical Analysis, Modelling and Applications**

email [federico.pichi@epfl.ch](mailto:federico.pichi@epfl.ch)

website <https://fpichi.github.io>

## POSITION

*Current Position*  
2021-2023

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, B. MOYA, J. S. HESTHAVEN. “A convolutional graph neural network approach to model order reduction to non-linear parametrized PDEs”. [arXiv preprint arXiv:2305.08573](#).
- [13] 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

- [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

Postdoc	2020-2021	SISSA-EPFL, Lausanne (Switzerland)
	CRUI GO for IT grant · mathLab-MCSS Project: <i>Reduced order methods for nonlinear PDEs enhanced by machine learning</i> PIs: Prof. Gianluigi ROZZA & Prof. Jan S. HESTHAVEN	
Visiting Student	2018-2019	MIT, Cambridge (USA)
	Massachusetts Institute of Technology · Computational Engineering Advisors: Prof. Anthony PATERA Project: ROM2S Reduced Order Methods at MIT and SISSA	
Ph.D. degree	2016-2020	SISSA, Trieste (Italy)
	Mathematical Analysis, Modelling and Applications · Mathematics Area Thesis: <i>Reduced order models for parametric bifurcation problems in nonlinear PDEs</i> Advisors: Prof. Gianluigi ROZZA & Dr. Francesco BALLARIN Final Grading <i>cum laude</i>	
Master degree	2014-2016	'La Sapienza' University, Rome (Italy)
	Applied Mathematics · Department of Mathematics Thesis: <i>Reduced methods for parametric Von Kármán equations</i> Advisors: Prof. Maurizio FALCONE & Prof. Gianluigi ROZZA Final Grading <i>110/110 cum laude</i>	
Bachelor degree	2011-2014	'La Sapienza' University, Rome (Italy)
	Mathematics · Department of Mathematics Thesis: <i>Discontinuous differential equations in control theory</i> Advisor: Prof. Corrado MASCIA Final Grading <i>110/110 cum laude</i>	

## 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.
- *Computational Mechanics by Reduced Order Methods* [TA], SISSA, 2022.
- MATLAB, University of Trieste, 2019.
- *ROM in bifurcating parametrised non-linear equations*, SISSA, 2019.

#### Tutoring

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

#### Miscellanea

- President of **SISSA Siam Student Chapter (2019-2020)**
- 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** · 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** · 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** · Excellence course for Bachelor (2011-2014) and Master degrees in Mathematics (2014-2016)

### Conferences and Workshops

**CFC 2023** (talk), **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**.

May 17, 2023