Maria Strazzullo

Postdoc at DISMA, Politecnico di Torino

(+39) 3881088770 | mstrazzu@sissa.it | maria.strazzullo92 | maria.strazzullo

Education

International School for Advanced Studies (SISSA) — *Trieste, Italy*

PhD in Mathematical Analysis, Modelling, and Applications — *September 24, 2021.*

- **Grade**: cum laude.
- **Thesis Title**: "Model Order Reduction for Nonlinear and Time-Dependent Parametric Optimal Flow Control Problems" — ***Advisor***: *Prof. Gianluigi Rozza*, — ***Co-Advisor***: *Dr. Francesco Ballarin*.

International School for Advanced Studies (SISSA) — *Trieste, Italy*

Pre-Doc Project — *Apr 2017 - Jul 2017*

- **Project Title**: "Numerical methods for parametric optimal flow control with applications in environmental sciences".

Università degli studi di Trieste — *Trieste, Italy*

Master's degree in Mathematics — *Sep 2014 - Mar 2017*

- **Grade**: 110/110 cum laude.
- **Thesis Title**: "Reduced order methods for parametrized optimal flow control problems" — ***Advisor***: *Prof. Gianluigi Rozza* — ***Co-Advisors***: *Prof. Renzo Mosetti, Dr. Francesco Ballarin*.

Università degli studi di Camerino — *Camerino, Italy*

Bachelor's degree in Mathematics — *Sep 2011 - Jul 2014*

- **Grade**: 110/110 cum laude.
- **Thesis Title**: "La Teoria Dei Codici Autocorrettori" ("The theory of error-correcting codes") — ***Advisor***: *Prof. Carlo Toffalori*.

Liceo Classico "Giacomo Leopardi" — *Macerata, Italy*

Classical Certificate — *Sep 2006 - Jul 2011*

- **Grade**: 100/100.

Scientific Interests

Reduced order methods, applied mathematics, optimal control theory, inverse methods, uncertainty quantification, environmental and ecological sciences, neural networks for partial differential equations.

Publications

[10] Paper N. Demo, M. Strazzullo and G. Rozza "An Extended Physics Informed Neural Network For Preliminary Analysis of Parametric Optimal Control Problems", submitted, 2021. https://arxiv.org/abs/2110.13530.

[9] Paper M. Strazzullo, M. Girfoglio, F. Ballarin, T. Iliescu and G. Rozza "Consistency of the Full and Reduced Order Models for Evolve-Filter-Relax Regularization of Convection-Dominated, Marginally-Resolved Flows", submitted, 2021. http://arxiv.org/abs/2110.05093.

[8] Paper M. Strazzullo, F. Ballarin, and G. Rozza "A Certified Reduced Basis Method for Linear Parametrized Parabolic Optimal Control Problems in Space-Time Formulation", submitted, 2021. https://arxiv.org/abs/2103.00460.

[7] Paper G. Carere, M. Strazzullo, F. Ballarin, G. Rozza, R. Stevenson. "Weighted POD-reduction for parametrized PDE-constrained Optimal Control Problems with random inputs and its applications to environmental sciences", Computers & Mathematics with Applications, volume 102, pp. 261-276, 2021. https://doi.org/10.1016/j.camwa.2021.10.020.

[6] Chapter F. Ballarin, G. Rozza and M. Strazzullo, "Space-time POD-Galerkin approach for parametric flow control", in press, Handbook of Numerical Analysis, Elsevier,2022.. https://doi.org/10.1016/bs.hna.2021.12.009.

[5] Paper F. Pichi, M. Strazzullo, F. Ballarin, and G. Rozza "Driving bifurcating parametrized nonlinear PDEs by optimal control strategies: application to Navier-Stokes equations and model reduction", submitted, 2020. https://arxiv.org/abs/2010.13506.

[4] Paper M. Strazzullo, F. Ballarin, and G. Rozza, "POD-Galerkin Model Order Reduction for Parametrized Nonlinear Time Dependent Optimal Flow Control: an Application to Shallow Water Equations", accepted in Journal of Numerical Mathematics, 2021. https://doi.org/10.1515/jnma-2020-0098.

[3] Paper M. Strazzullo, F. Ballarin, and G. Rozza, "POD–Galerkin Model Order Reduction for Parametrized Time Dependent Linear Quadratic Optimal Control Problems in Saddle Point Formulation", Journal of Scientific Computing, 83(3), pp. 55, 2020, https://doi.org/10.1007/s10915-020-01232-x.

[2] Proceeding M. Strazzullo, Z. Zainib, F. Ballarin, and G. Rozza, "Reduced order methods for parametrized non-linear and time dependent optimal flow control problems, towards applications in biomedical and environmental sciences", in ENUMATH2019 proceedings, 2020, https://doi.org/10.1007/978-3-030-55874-1_83.

[1] Paper M. Strazzullo, F. Ballarin, R. Mosetti and G. Rozza. "Model Reduction for Parametrized Optimal Control Problems in Environmental Marine Sciences and Engineering", SIAM J. Sci. Comput., 40(4), B1055–B1079 (25 pages), 2018, https://doi.org/10.1137/17M1150591.

Awards and Grants

Grant Kovalevskaya grant for the International Congress of Mathematicians 2022 (ICM22).

Award Finalist: BGCE Prize at SIAM-CSE Congress, March 1-5, 2021.

Award Student Travel Award to partecipate to the SIAM Conference on Computational Science and Engineering, March 1-5, 2021.

Scholarship ECCOMAS Scholarship for partecipating at the Virtual Congress WCCM-ECCOMAS January 11 to 15, 2021.

Award Special Mention to PhD4Innovating contest. ESOF 2020, Trieste, Italy.

Grant MIT-Fiuli Venezia Giulia (FVG) Seed Fund 2019-2020: Data Assimilation, Models for Prediction and Control of Massachussets Bay Water Acidification.

Grant 2018 INDAM GNCS: Model Reduction in Medical Applications.

Talks at Conferences and Seminars

Pitt AWM Student Seminar Series *Online*

Invited Speaker *December 3, 2021*

- **Talk title**: "The role of optimal control in bifurcating phenomena: an application to Navier-Stokes equations".

COUPLED 2021 *Online*

Contributed Talk *June 14-16, 2021*

- **Talk title**: "Reduced Order Methods for Uncertainty Quantification Problems applied to Optimal Control in Environmental Sciences".

FEniCS Conference 2021 *Online*

Contributed Talk *March 22-26, 2021*

- **Talk title**: "Reduced order methods for optimal flow control: FEniCS-based applications".

DISMA Seminar Series *Online*

Invited speaker *March 22, 2021*

- **Talk title**: "A Glimpse Of Reduced Order Methods For Parametrized Optimal Control Problems".

SIAM-CSE Congress 2021 *Online*

Invited speaker *March 1-5, 2021*

- **Talk title**: "Reduced Order Methods for Space-Time Parametric Optimal Control Problems in Computational Fluid Dynamics".

SIAM-CSE Congress 2021 *Online*

Invited speaker *March 1-5, 2021*

- **Talk title**: "Reduced Order Methods for Optimal Flow Control Problems: from time-dependency to nonlinearity".

WCCM-ECCOMAS Congress 2020 — *Online*

Invited speaker — *January 11-15, 2021*

- **Talk title**: "Reduced Order Methods for Optimal Flow Control Problems: from time-dependency to nonlinearity".

MORSS 2020 - Model Order Reduction Summer School 2020 — *Online*

Contributed Talk — *September 7-10, 2020*

- **Talk title**: "Advances in Reduced Order Methods for Optimal Flow Control Problems".

SAMM 2020 - Learning Models from Data: Model Reduction, System Identification and Machine Learning — *Online*

Poster presentation — *July 19-24, 2020*

- **Poster title**: "POD-Galerkin reduction for nonlinear time dependent optimal flow control problems with applications in environmental sciences" — ***co-authors***: *F. Ballarin and G. Rozza*.

Summer School on Reduced Order Methods in Computational Fluid Dynamics — *SISSA, Trieste, Italy*

Lecturer and poster presentation — *July 8-12, 2019*

- **Lecture title**: "Reduced order methods for parametrized optimal flow control problems: applications in biomedical and environmental sciences" — ***co-lecturer***: *Z. Zainib*.
- **Poster title**: "Reduced Order Methods Applied to Nonlinear Time Dependent Optimal Flow Control Problems in Environmental Marine Sciences and Engineering" — ***co-authors***: *F. Ballarin, R. Mosetti and G. Rozza*.

ADMOS 2019 - International Conference on Adaptive Modeling and Simulation — *El Campello (Alicante),Spain*

Invited speaker — *May 27-29, 2019*

- **Talk title**: "Reduced Order Methods for Nonlinear Time Dependent Optimal Flow Control Problems Applied to Environmental Marine Sciences and Engineering".

Analysis, Control and Inverse Problems for PDEs — *Università Federico II, Napoli, Italy*

Invited speaker — *November 26-3, 2018*

- **Talk title**: "Reduced Order Methods for Optimal Flow Control Problem with Application in Environmental Marine Sciences and Engineering".

MoRePas 2018 - Model Reduction for Parametrized System IV — *École Centrale, Nantes, France*

Poster presentation — *April 10-13, 2018*

- **Poster title**: "POD–Galerkin reduced order methods for inverse problems and multi-physics problems in fluid dynamics" — ***co-authors***: *M. Nonino, Z. Zainib, F. Ballarin and G. Rozza*.

QUIET 2017 - Quantification of Uncertainty: Improving Efficiency and Technology — *SISSA, Trieste, Italy*

Poster presentation — *July 18-21, 2017*

- **Poster title**: "Reduced Order Methods for Environmental Marine Problems by Optimal Flow Control" — ***co-authors***: *F. Ballarin, R. Mosetti and G. Rozza*.

Other

Teaching and co-advisoring

- **Co-advisor** - Master thesis of Fabio Zoccolan. Master degree in Mathmatics, University of Trieste, Italy, ongoing.
- **Co-advisor** - Master thesis of Eleonora Donadini: "A Data-Driven Approach for Time-Dependent Optimal Control Problems by Dynamic Mode Decomposition". Master degree in Data Science and Scientific Computing, University of Trieste, Italy, (May 2021).
- **Co-advisor** - Master thesis of Giuseppe Carere: "Reduced Order Methods for Optimal Control Problems constrained by PDEs with random inputs and applications". Master degree in mathematics, Korteweg-de Vries Institute for Mathematics , the Netherlands, (January 2019).
- **Support Lecturer** - Course of "Numerical Analysis", master degree in Data Science and Scientific Computing, 2018.

Other tasks

- **Reviewer**: International Journal of Computational Fluid Dynamics (2019), Proceedings in Applied Mathematics and Mechanics (2020).
- **Organizer**: Analysis Junior Seminars, SISSA, 2019 - 2021. SISSA Women in Mathematics 2021.
- **Student Association President**: SISSA SIAM Student Chapter, October 2020 - October 2021.
- **Student Association Vicepresident**: SISSA SIAM Student Chapter, October 2019 - September 2020.
- **Educational volunteer**: SISSA 4 SCHOOLS program, 2019 - present.
- **Educational Seminar**: "Pint of Science Festival".
- **Internship**: formulation of a Finite Element simulation of Quasi-Geostrophic equation in the North-Atlantic Ocean at OGS (National Institute of Oceanography and Applied Geophysics), 2016.