

# Maria Strazzullo

PH.D. STUDENT, INTERNATIONAL SCHOOL OF ADVANCED STUDIES

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## Education

### International School for Advanced Studies (SISSA)

PHD STUDENT IN MATHEMATICAL ANALYSIS, MODELLING, AND APPLICATIONS

— *Advisor*: Prof. Gianluigi Rozza, — *Co-Advisor*: Dr. Francesco Ballarin.

*Trieste, Italy*

October 2017 - present

(Ph.D. Degree date: September 2021).

### International School for Advanced Studies (SISSA)

PRE-DOC PROJECT

• **Project Title**: “Numerical methods for parametric optimal flow control with applications in environmental sciences”.

*Trieste, Italy*

Apr 2017 - Jul 2017

### Università degli studi di Trieste

MASTER'S DEGREE IN MATHEMATICS

• **Grade**: 110/110 cum laude.

• **Thesis Title**: “Reduced order methods for parametrized optimal flow control problems” — *Advisor*: Prof. Gianluigi Rozza.

*Trieste, Italy*

Sep 2014 - Mar 2017

### Università degli studi di Camerino

BACHELOR'S DEGREE IN MATHEMATICS

• **Grade**: 110/110 cum laude.

• **Thesis Title**: “La Teoria Dei Codici Autocorrettori” (“The theory of error-correcting codes”) — *Advisor*: Prof. Carlo Toffalori.

*Camerino, Italy*

Sep 2011 - Jul 2014

### Liceo Classico “Giacomo Leopardi”

CLASSICAL CERTIFICATE

• **Grade**: 100/100.

*Macerata, Italy*

Sep 2006 - Jul 2011

## 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

- [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”, <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”, <https://arxiv.org/abs/2103.00632>.
- [6] **Chapter** F. Ballarin, G. Rozza and M. Strazzullo, “Reduced order methods for parametric flow control problems and applications”, submitted, 2020. <https://arxiv.org/abs/2011.12101>.
- [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”, submitted, 2020, <https://arxiv.org/abs/2003.09695>.
- [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://arxiv.org/abs/1912.07886>.

- [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>.

## Talks at Conferences and Seminars

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### SIAM-CSE Congress 2021

INVITED SPEAKER

[Online](#)

March 1-5, 2021

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

### SIAM-CSE Congress 2021

INVITED SPEAKER

[Online](#)

March 1-5, 2021

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

### WCCM-ECCOMAS Congress 2020

INVITED SPEAKER

[Online](#)

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

CONTRIBUTED TALK

[Online](#)

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

POSTER PRESENTATION

[Online](#)

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

LECTURER AND POSTER PRESENTATION

[SISSA, Trieste, Italy](#)

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

INVITED SPEAKER

[El Campello \(Alicante\), Spain](#)

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

INVITED SPEAKER

[Università Federico II, Napoli, Italy](#)

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

POSTER PRESENTATION

[École Centrale, Nantes, France](#)

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

POSTER PRESENTATION

[SISSA, Trieste, Italy](#)

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.

## Skills

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### Computer Skills

- **Advanced:** Python, FEniCS, matlab.
- **Basic:** C++, FreeFEM++, R.

## Language Skills

- **Italian:** Mother tongue.
- **English:** B2 FIRST Certificate in English - University of Cambridge, 2010.
- **German and French:** basic knowledge.

## Awards and Grants

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

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

**Scholarship** ECCOMAS Scholarship for participating 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 Massachusetts Bay Water Acidification.

**Grant** 2018 INDAM GNCS: Model Reduction in Medical Applications.

## Other

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### Teaching

- **Support Lecturer** - Course of "Numerical Analysis", master degree in Data Science and Scientific Computing, 2018.
- **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).
- **Co-advisor** - Master thesis of Eleonora Donadini. Master degree in Data Science and Scientific Computing, University of Trieste, Italy, ongoing.
- **Co-advisor** - Master thesis of Fabio Zoccolan. Master degree in Mathematics, University of Trieste, Italy, ongoing.

### Other tasks

- **Reviewer:** International Journal of Computational Fluid Dynamics (2019), Proceedings in Applied Mathematics and Mechanics (2020).
- **Organizer:** Analysis Junior Seminars, SISSA, 2019 - present.
- **Student Association President:** SISSA SIAM Student Chapter, October 2020 - present.
- **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.