Maria Strazzullo

POSTDOC AT DISMA, POLITECNICO DI TORINO

Academic Experience _____

Visiting Invited researcher at Virginia Tech, Interdisciplinary Center for Applied Mathematics (ICAM) (Octorber 2023 - November 2023)

Visiting Invited researcher at University of Siviglia (July 2023 - August 2023)

Visiting Invited researcher at Virginia Tech, Interdisciplinary Center for Applied Mathematics (ICAM) (Octorber 2022 - November 2022)

Postdoc Excellence project fellowship at DISMA, Politecnico di Torino, Turin, Italy (January 2022 - ongoing)

Fellowship MathLab group, SISSA, Trieste, Italy (October 2021- December 2021)

Ph.D. Mathematical Analysis, Modelling, and Applications, mathLab group, SISSA, Trieste, Italy (October 2017 - September 2021)

Predoc mathLab group, SISSA, Trieste, Italy (April 2017 - September 2017)

Education

International School for Advanced Studies (SISSA)

PHD IN MATHEMATICAL ANALYSIS, MODELLING, AND APPLICATIONS

Trieste, Italy

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.

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 Sep 2011 - Jul 2014

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.

Liceo Classico "Giacomo Leopardi"

Macerata, Italy

• Grade: 100/100.

Sep 2006 - Jul 2011

Publications

M. Strazzullo, F. Ballarin, T. Iliescu, and C. Canuto, "New Feedback Control and Adaptive Evolve-Filter-Relax Regularization for the Navier-Stokes Equations in the Convection-Dominated Regime", submitted, 2023, https://arxiv.org/abs/2307.00675.

M. Strazzullo and F. Vicini, "POD-based reduced order methods for optimal control problems governed by parametric partial

[17] Paper differential equation with varying boundary control", Applied Mathematics and Computation, 2023,

https://doi.org/10.1016/j.amc.2023.128191.

F. Zoccolan, M. Strazzullo and G. Rozza, "Stabilized Weighted Reduced Order Methods for Parametrized Advection-Dominated

[16] Paper Optimal Control Problems governed by Partial Differential Equations with Random Inputs", submitted, 2022,

https://arxiv.org/abs/2301.01975.

[15] Paper

F. Zoccolan, M. Strazzullo and G. Rozza, "A Streamline upwind Petrov-Galerkin Reduced Order Method for Advection-Dominated Partial Differential Equations under Optimal Control", submitted, 2022, https://arxiv.org/abs/2301.01973.

[14] Chapter

D. Torlo, M.Strazzullo, F. Ballarin and G. Rozza, "Chapter 12: Weighted Reduced Order Methods for Uncertainty Quantification", in Advanced Reduced Order Methods and Applications in Computational Fluid Dynamics,

https://doi.org/10.1137/1.9781611977257.ch12.

[13] Chapter

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

https://doi.org/10.1137/1.9781611977257.ch4.

[12] Chapter

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

https://doi.org/10.1137/1.9781611977257.ch2.

[11] Proceeding

E. Donadini, M. Strazzullo, M. Tezzele and G. Rozza, "A data-driven partitioned approach for the resolution of time-dependent optimal control problems with dynamic mode decomposition", accepted in ICOSAHOM proceedings, 2022,

https://arxiv.org/abs/2111.13906.

[10] Paper

N. Demo, M. Strazzullo and G. Rozza "An Extended Physics Informed Neural Network For Preliminary Analysis of Parametric

Optimal Control Problems", Computers & Mathematics with Applications, 2023,

https://doi.org/10.1016/j.camwa.2023.05.004.

[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", International Journal for Numerical

Methods in Engineering, 2022, https://doi.org/10.1002/nme.6942.

[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.

G. Carere, M. Strazzullo, F. Ballarin, G. Rozza, R. Stevenson. "Weighted POD-reduction for parametrized PDE-constrained Optimal

[7] Paper

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", ESAIM: M2AN, 2022,

https://doi.org/10.1051/m2an/2022044.

[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.

M. Strazzullo, F. Ballarin, and G. Rozza, "POD-Galerkin Model Order Reduction for Parametrized Time Dependent Linear Quadratic

[3] Paper 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.

M. Strazzullo, Z. Zainib, F. Ballarin, and G. Rozza, "Reduced order methods for parametrized non-linear and time dependent [2] Proceeding 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.

M. Strazzullo, F. Ballarin, R. Mosetti and G. Rozza. "Model Reduction for Parametrized Optimal Control Problems in Environmental

[1] Paper 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

EUCCO 2024 Heidelberg, Germany September 25-28, 2023 INVITED SPEAKER

ECCOMAS YIC 2023 Oporto, Portugal

INVITED SPEAKER

June 19-21, 2023

• Talk title: "Model order reduction for varying boundary optimal control problems".

Math 2 Product congress Taormina, Italy

INVITED SPEAKER May 30-June 1, 2023

• Talk title: "POD-Based Strategies For Varying Boundary Optimal Control".

International Workshop on Reduced Order Methods

Singapore

INVITED SPEAKER May 22-26, 2023

• Talk title: "Model order reduction for parametric optimal control problems: overview and applications".

CFC Congress 2023 Cannes, France

INVITED SPEAKER April 25-28, 2023

• Talk title: "Full and Reduced Evolve-Filter-Relax regularization in feedback control for convection-dominated Navier-Stokes equations".

SIAM CSE Congress 2023 Amsterdam, The Netherlands

INVITED SPEAKER February 26-March 3, 2023

• Talk title: "Model Order Reduction for Parametric Optimal Control Problems in Space-Time Formulation".

ARIA-VT Seminar on Regularized ROMS

Blacksburg, USA (hybrid)

INVITED SPEAKER February 2, 2023

• Talk title: "The role of Evolve-Filter-Relax Regularization in Feedback Control for convection-dominated Navier-Stokes Equations: full and reduced order model"

Matematica per l'Intelligenza Artificiale e il Machine Learning

Politecnico di Torino, Italy

November 24, 2022

June 5-9, 2022

April 12-15, 2022

INVITED SPEAKER

INVITED SPEAKER

• Talk title: "Physics-informed Neural Networks for partial differential equations and optimal control in a parametric setting.".

Virginia Tech Math colloquium Blacksburg, USA

November 17, 2022 INVITED SPEAKER

• Talk title: "Model order reduction for nonlinear and time-dependent parametrized optimal control problems.".

Emory mathematics seminars Atlanta, USA October 17, 2022

INVITED SPEAKER • Talk title: "Model order reduction for parametrized optimal control problems: from time-dependency to nonlinearity.".

GIMC SIMAI YOUNG 2022 Pavia, Italy

INVITED SPEAKER September 29-30, 2022

• Talk title: "Physics-informed Neural Networks for parametric partial differential equations and optimal control".

MORE 2022 Berlin, Germany

September 19-23, 2022 CONTRIBUTED TALK

• Talk title: "Full Order Model and Reduced Order Model Consistency for Evolve-Filter-Relax Regularization".

ECCOMAS 2022 Oslo, Norway

• Talk title: "Optimal control and bifurcating systems: an application to Navier-Stokes equations".

Friedrich-Alexander-Universität Mini-Workshop on Model Reduction and Control

INVITED SPEAKER

May 24, 2022

• Talk title: "Model order reduction for time-dependent parametrized optimal control problems".

SIAM Uncertainty Quantification Conference 2022 Online

• Talk title: "Stabilized Reduced Order Methods for Transport Control Problems with Random Inputs".

Analysis Junior Seminar Online

INVITED SPEAKER February 18, 2022

• Talk title: "Full Order Model and Reduced Order Model Consistency for Evolve-Filter-Relax Regularization".

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

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

• 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

January 11-15, 2021

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

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.

Awards and Grants

Grant Travel funds to participate at EUCCO 2023.

Grant INdAM fellowship for a month abroad, 2023 (Virginia Tech).

Grant PI of INdAM - GNCS Project, code CUP_E53C22001930001: "Metodi numerici per lo studio di strutture geometriche parametriche

complesse", 2023.

Grant GNCS grant for partecipating to ECCOMAS 2022.

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.

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

Water Acidification.

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

Teaching and Other Tasks _

Other tasks

- Reviewer: Computers and Mathematics with Applications (2023), Applied Mathematics and Computation (2023), International Journal of Heat and Fluid Flow (2022), Journal of Scientific computing (2022), Advances in Computational Mathematics (2022), Journal of Computational Physics (2022), Frontiers in Applied Mathematics and Statistics (2022), Proceedings in Applied Mathematics and Mechanics (2020), International Journal of Computational Fluid Dynamics (2019).
- Organizer od Mini-symposia: SIAM UQ24, ECCOMAS24, WCCM24.
- Organizer: NA-G-Roms seminars (2023-ongoing).
- 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.