Curriculum Vitae

Michele Buzzicotti
Born July 21, 1987, in Terni (Italy)
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EDUCATION

Jan. 2017 **Ph.D. in Physics**. U. of Rome *Tor Vergata.* Title: Effects of Fourier mode reduction on small-scales turbulent fluctuations; Robustness and modelling.

May 2013 **Master's degree in Physics of the Atmosphere and Meteorology**, *cum laudem*, U. of Rome *Tor Vergata.* Title: Analysis and Diagnostic of the calibration techniques of water vapor measurements from two LIDAR Raman belonging to the international network NDACC.

CURRENT POSITION

Dec. 2018 - present Researcher. Dept. of Physics, **University of Rome** *Tor Vergata* (Italy)

OTHER POSITIONS

Oct. 2021 - Jan. 2022 Visiting Scholar at **University of Rochester** (New York, USA)
Jan. 2020 - Feb. 2020 Visiting Scholar at **University of Rochester** (New York, USA)
Mar. 2017 - Dec. 2018 Post-Doc. Dept. of Physics, **University of Rome** *Tor Vergata* (Italy)

PROJECTS/AWARDS

2021-2023 **Research Project U. Rome Tor Vergata**, Title: "Deep'n'Rec: Adversarial Deep Learning for Network Reconstruction". Duration: 24 months. Funds:10000 Euro.

2019-2021 **Research Project U. Rome Tor Vergata**, Title: "Machine Learning Techniques for Optimal Navigation in Complex flows". Duration: 18 months. Funds:16000 Euro.

2019 **PRACEdays19, Best Scientific Presentation Award.** Title: "*Energy cascade in rotating turbulent flows".*

2012 **Best Poster Presentation:** 12th Specialist Meeting on Microwave Radiometry and Remote Sensing of the Environment.

SUPERVISION

Co-supervision: 2 Ph.D.: G. Goedert & L. Agasthya. **3 Under-graduate Students:** C. Calascibetta, M. Scarpolini & A. De Santis. **Supervision: 2 Master Students:** F. Cianciotta & A. Roscioli.
Main Opponent: 4 Master Students: L. Biello, F. Monnati, D. Taglienti & G. Di Palma.

TEACHING EXPERIENCE

Dept. Physics U. Rome Tor Vergata (Bachelor Course): Statistical Mechanics.
Dept. Physics & Mec. Engineering U. Rome Tor Vergata (Master Course): Turbulence & Complex Fluids.
Dept. Physics U. Rome Tor Vergata (Master Course): Machine Learning Methods for Physics.
Dept. Physics U. Rome Tor Vergata (Ph.D. Course): Hands on Machine Learning.

Short courses: (i) **First Ph.D. School of the Italian Society of Statistical Physics, IMT School for Advanced Studies Lucca in Italy**: Hydrodynamics and Turbulence (Tutoring, 2022). ***(ii)*** **STIMULATE Ph.D. School on Machine and Reinforcement Learning, Rare Events and Tensor Networks (ONLINE)**, Deep Learning and RL applications (Short-course, 2020). ***(iii)*** **Big Data** computer lab for high-schools (PCTO, 2021 & 2023).

Key numbers (scientific impact, Google Scholar)
Number of published papers: 24 (1 NatureComm.; 2 PRL; 6 PRE/PRF; 6 EPJE; 2 JoT; 1 NJP; 1 Chaos; 1 PoP; 1 PoF; 1 AIxIA 2021; 1 ESSOAr; 1 EPL)
Number of papers under revision: 2 (1 JAMES; 1 JFM)
Hirsch-index (H): 12
i10-index (# publications with more than 10 citations): **14**
Citations (total): 440

TEAM MEMBER OF EUROPEAN PROJECTS

ERC AdG Smart-TURB. (PostDoc for 2-years)
ERC AdG NewTURB. (PostDoc for 1.5-years)

TEAM MEMBER OF HIGH-PERFORMANCE COMPUTING PROJECTS

PRACE Allocations: (i) *Turbulence under Rotation* (**55MH**, 2014) **(ii)** *Homogeneous and Anisotropic Turbulence* (**27MH**, 2015). **(iii)** *Instantons and Intermittency in Hydrodynamic Turbulence: A Lattice Monte Carlo Approach* (**18MH**, 2017). **(iv)** Inverse and direct cascades in rotating turbulent flows (**60MH**, 2018).
EuroHPC: 1 Project, EHPC-REG-2021R0049 (**6MH**, 2022).
Italian SuperComputing Resource Allocation – ISCRA: 4 Projects; LagrROT (2016), RotEuler (2016), MultiLES (2017), SupTURB (2018)

OPEN-SOURCE SOFTWARE & DATA INFRASTRUCTURE MANAGEMENT

Smart-Turb, Turbulence Database, Repository: https://smart-turb.roma2.infn.it
Complete, 3D Pseudo-Spectral Code, Repository: https://git-smart-turb.roma2.infn.it
FlowSieve, Code for Coarse-Graining of the Sphere: https://github.com/husseinaluie/FlowSieve

INVITED TALKS

2023 **Flow Seminar @KTH (Sweden)**. Title: "*Physics-Informed Data-Driven Tools: From Ideal models to Geophysical systems".*
2022 **Seminar @ICTP (Italy)**. Title: "*Physics-Informed Data-Driven Tools: From Ideal models to Geophysical systems".*
2021 **Young Seminars, Società Italiana di Fisica Statistica (Italy)**. Title: "*AI Meets Turbulence: Lagrangian and Eulerian data-driven tools for optimal navigation and data-assimilation".*
2020 **Indian Institute of Technology Hyderabad (India)**. Title: "*Artificial Intelligence meets complex flows, from optimal navigation to reconstruction of turbulent data".*
2020 **Laboratoire de Mécanique des Fluides de Lille (France)**. Title: "*Artificial Intelligence meets complex flows, from optimal navigation to reconstruction of turbulent data".*
2019 **Seminar at the CNR-ISAC Rome (Italy)**. Title: "*Optimal navigation in complex flows".*
2016 **COST Lagrangian transport: from complex flows to complex fluids; Lecce (Italy)**. Title: "*Eulerian and Lagrangian turbulence on fractal Fourier set".*

RESEARCH DISSEMINATION

2022 **Presentation during the activities of Moff'Art-Surgente:** Title "*Panta rhei (but how ?)*"
2020 **European Researchers' Night:** Title "*The answer, my friend, is blowin' in the wind...*"

ORGANISING COMMITTEES

2022 **Workshop**: Challenges and Benchmarks for quantitative AI in Complex Fluids and Complex Flows, (Rome)
2020 **PhD Summer School**: School on Machine and Reinforcement Learning, Rare Events and Tensor Networks (Rome)

EDITORIAL AND REVIEWING ACTIVITIES

2022-present **Review Editor**, **Frontiers in Physics** (Interdisciplinary Physics)
2022-2023 **Guest Editor**, European Physical Journal E, **EPJ E Topical Issue: "Quantitative AI in Complex Fluids and Complex Flows: Challenges and Benchmarks"**

Referee for (only major): Physical Review Letters (**PRL**), Philosophical Transactions of the Royal Society A (**PTRS A**), Physics of Fluids (**PoF**), Physical Review Fluids (**PRF**), Journal of Advances in Modeling Earth Systems (**JAMES**), Journal of Turbulence (**JoT**), Journal of Fluid Mechanics (**JFM**), European Journal of Physics E (**EPJ E**), Frontier in Physics (**FronPhys**), Scientific reports (**SciRep**).

Evaluator for NWO: Dutch Science Council, main source of research grants in the Netherlands.

Reviewer for ISCRA and LISA: Call for proposals on the Italian SuperComputing system.

MEMBERSHIPS OF SCIENTIFIC SOCIETIES **(only those still active)**

INFN (Nat. Inst. of Nucl. Phys.); **EUROMECH** (Europ. Mech. Soc.); **APS** (Americ. Phys. Soc.).

MAIN COLLABORATIONS & TEAM MEMBERS: I am proud and honoured that I had the opportunity to learn from world class scientists such as R. Benzi, U. Frisch, L. Biferale, C. Meneveau. With some of them I still collaborate. More recently, my main collaborators have been A. Alexakis (ENS, Paris), A. Celani (ICTP, Trieste), and F. Toschi (TUE, Eindhoven). I have an open collaboration with Prof. Hussein Aluie (University of Rochester, NY) on geophysical observation and numerical models' data analysis. More recently I have started another collaboration with Prof. Ricardo Vinuesa (KTH, Stochkolm) on Machine Learning subjects.

The 12 papers more relevant for the application (not the most cited). TC: time cited (Google Scholar)**.**

[1] M. Buzzicotti. *Data reconstruction for complex flows using AI: recent progress, obstacles, and perspectives. Europhysics Letters,* (2023). **TC 0.**
[2] M. Buzzicotti, and F. Bonaccorso. *Inferring turbulent environments via machine learning.* The European Physical Journal E 45.12*:102,* (2022). **TC 1.**
[3] B.A. Storer, **M. Buzzicotti**, H. Khatri, S.M. Griffies, H. Aluie. *Global energy spectrum of the general oceanic circulation*. Nature communications 13 (1), 1-9, (2022). **TC 5.**
[4] M. Buzzicotti, B.A. Storer, S.M. Griffies, H. Aluie. *A coarse-grained decomposition of surface geostrophic kinetic energy in the global ocean*. Earth and Space Science Open Archive: ESSOAr & arXiv preprint arXiv:2106.04157, (2021). **TC 7.**
[5] M. Buzzicotti, F. Bonaccorso, P. Clark Di Leoni, L. Biferale. *Reconstruction of turbulent data with deep generative models for semantic inpainting from TURB-Rot database*. Physical Review Fluids 6 (5), 050503, (2021). **TC 24.**
[6] M. Buzzicotti, P. Clark Di Leoni. *Synchronizing subgrid scale models of turbulence to data.* Physics of Fluids 32 (12), 125116, (2021). **TC 17.**
[7] M. Buzzicotti, L. Biferale, F. Toschi. *Statistical properties of turbulence in the presence of a smart small-scale control*. Physical Review Letters 124 (8), 084504, (2020). **TC 4.**
[8] L. Biferale, F. Bonaccorso, **M. Buzzicotti**, P. Clark Di Leoni and K. Gustavsson. *Zermelo's problem: Optimal point-to-point navigation in 2D turbulent flows using Reinforcement Learning*. Chaos: An Interdisciplinary Journal of Nonlinear Science 29 (10), 103138, (2019). **TC 66.**
[9] L. Biferale, F. Bonaccorso, **M. Buzzicotti**, K. P. Iyer. *Self-similar subgrid-scale models for inertial range turbulence and accurate measurements of intermittency*. Physical Review Letters 123 (1), 014503, (2019). **TC 14.**
[10] M. Buzzicotti, M. Linkmann, H. Aluie, L. Biferale, J. Brasseur, C. Meneveau. *Effect of filter type on the statistics of energy transfer between resolved and subfilter scales from a-priori analysis of direct numerical simulations of isotropic turbulence.* Journal of Turbulence 19 (2), 167-197, (2018). **TC 50.**
[11] M. Buzzicotti, H. Aluie, L. Biferale, M. Linkmann. *Energy transfer in turbulence under rotation.* Physical Review Fluids 3 (3), 034802, (2018). **TC 49.**
[12] M. Buzzicotti, A. Bhatnagar, L. Biferale, A.S. Lanotte, S.S. Ray. *Lagrangian statistics for Navier–Stokes turbulence under Fourier-mode reduction: fractal and homogeneous decimations*. New Journal of Physics 18 (11), 113047, (2016). **TC 26.**

Rome, 23/05/2023