

Challenges and Benchmarks for quantitative AI in Complex Fluids and Complex Flows

| 6 July      |   | 7 July      |   | 8 July      |  |
|-------------|---|-------------|---|-------------|--|
| time        |   | time        |   | time        |  |
| 10.30-11.45 | Registration + Welcome Coffee   | 09.30-10.00 | "Data-driven manifold dynamics" <b>Michael Graham</b>   | 09.30-10.00 | "FourCastNet: A Data-driven Model for High-resolution Weather Forecasts using Adaptive Fourier Neural Operators" <b>Peter Harrington</b> |
| 11.45-11.55 | Welcome - Luciano Pietronero President of Centro Enrico Fermi   | 10.00-10.30 | "Optimal policies for olfactory search in turbulent flows" <b>Robin Heinonen</b>                                | 10.00-10.30 | "Symbolic regression as example for explainability " <b>Markus Abel</b>  |
| 11.55-12.00 | Welcome - Luca Biferale, Michele Buzzicotti & Massimo Cencini   | 10.30-11.15 | <b>BREAK</b>  | 10.30-11.15 | <b>BREAK</b>   |
| 12.00-12.30 | "There is plenty of room in the middle: Alloys of Scientific Computing and Machine learning" <b>Petros Koumoutsakos</b>                               | 11.15-11.45 | "Searching for a source in turbulence: from heuristics to deep reinforcement learning" <b>Aurore Loisy</b>      | 11.15-11.45 | "Steering undulatory microswimmers in a moving fluid through reinforcement learning" <b>J r mie Bec</b>                                  |
| 12.30-13.00 | "Optimizing Airborne Wind Energy with Reinforcement Learning" <b>Antonio Celani</b>   | 11.45-12.15 | Bethany Lusch <b>TBA</b>  | 11.45-12.15 | "Lagrangian Large Eddy Simulations via Physics Informed Machine Learning" <b>Michael Chertkov</b>  |
| 13.00-14.30 | <b>LUNCH</b>  | 12.15-12.45 | "Vector-cloud neural network for nonlocal constitutive modeling" <b>Heng Xiao</b>                               | 12.15-12.45 | "Towards a Numerical Proof of Turbulence Closure" <b>Federico Toschi</b>   |
| 14.30-15.00 | "Learned navigation of smart active particles" <b>Holger Stark</b>  | 12.45-14.15 | <b>LUNCH</b>  | 12.45-14.15 | <b>LUNCH</b>   |
| 15.00-15.30 | "Physical and data-driven modelling for Earth observation" <b>Bertrand Le Saux</b>  | 14.15-14.45 | "Neural Corrections for Fast Fluid Flow Solvers" <b>Gianluca Iaccarino</b>                                      | 14.15-14.45 | "Learning to navigate complex environments" <b>Massimo Vergassola</b>  |
| 15.30-16.00 | "Modeling and controlling turbulent flows through deep learning" <b>Ricardo Vinuesa</b>   | 14.45-15.15 | "Learning from Interactions between Models and Differentiable Physics" <b>Kiwon Um</b>                          | 14.45-15.15 | "Reconstruction and preparation of turbulent states" <b>Patricio Clark di Leoni</b>  |
| 16.00-16.30 | <b>BREAK</b>  | 15.15-15.45 | "Choosing parameters for successful reservoir computing" <b>Kristian Gustafsson</b>                             | 15.15-15.25 | "DA for a new generation of sea-ice model" <b>Yumeng Chen</b>  |
| 16.30-16.40 | "Reinforcement learning of optimal active particle navigation" <b>Mahdi Nasiri</b>  | 15.45-16.30 | <b>BREAK</b>  | 15.25-15.35 | "Machine learning for optimal control in an axial compressor" <b>Mohamed Elhawary</b>  |
| 16.40-16.50 | "Optimal navigation strategies in complex and noisy environments" <b>Lorenzo Piro</b>   | 16.30-16.40 | "Optimal Control tools to minimize dispersion in chaotic flows" <b>Chiara Calascibetta</b>                      | 15.35-15.45 | "Machine learning for optimal control in an axial compressor" <b>Mohamed Elhawary</b>  |
| 16.50-17.00 | "Data reconstruction of turbulent flows with Gappy POD and Generative Adversarial Networks" <b>Tianyi Li</b>  | 16.40-16.50 | "Active gyrotactic stability of microswimmers using hydromechanical signals" <b>Navid Mousavi</b>               | 15.45-16.20 | <b>BREAK</b>   |
| 17.00-17.30 | "Generalizable Data-augmented Turbulence Modeling using Learning and Inference assisted by Feature-space Engineering (LIFE)" <b>Karthik Duraisamy</b> | 16.50-17.00 | "A data-driven approach for second-order thermal turbulence modelling" <b>Matilde Fiore</b>                     | 16.20-16.50 | "Comparative analysis of machine learning methods for active flow control" <b>Miguel Alfonso Mendez</b>                                  |
| 17.30-18.00 | "Using machine learning in geophysical data assimilation (some of the issues and some ideas)" <b>Alberto Carrassi</b>                                 | 17.00-17.10 | "Reinforcement learning for pursuit and evasion of microswimmers at low Reynolds number" <b>Francesco Borra</b> | 16.50-17.20 | "Interpreted machine learning in fluid dynamics: explaining relaminarisation events in wall-bounded shear flows" <b>Moritz Linkmann</b>  |
| 18.00-18.30 | "Optimal Microswimmer Navigation" <b>Benno Liebchen</b>   | 17.10-17.40 | "Reliability and generalization of machine-learning predictions: two examples" <b>Onofrio Semeraro</b>          | 17.20-17.50 | "Machine Learning for Climate and Weather Prediction" <b>Edward Ott</b>  |
|             |   | 17.40-18.10 | "Machine Learning and Feedback Microscopy" <b>Frank Cichos</b>  | 17.50-18.00 | <b>CLOSING</b>   |