2025 Burgers Fluid Mechanics Tour

27–31 October 2025

Eindhoven University of Technology, University of Twente, Delft University of Technology

Prof. Luca Biferale will visit different groups in the Burgerscentrum at various universities on 27–31 October 2025. During this "Burgers Tour" he will give lectures and have meetings with staff, PhD candidates, and postdocs. Luca Biferale is Full Professor of Theoretical Physics, Mathematical and Numerical Modelling, at the Physics Department of the University of Rome Tor Vergat in Italy. He has a PhD from the Univ. of Rome Sapienza, in which he studied anomalous scaling laws in fully developed turbulence. In 2011 he was a visiting professor in Eindhoven. He is a leading fluid dynamics physicist, particularly in the areas of turbulence, microfluidics, high-performance computing, and lattice Boltzmann methods. His recent work includes using machine learning to model Lagrangian turbulence, which is crucial for understanding dispersion and mixing in various physical contexts. He has also contributed significantly to the study of metastable hydrodynamics in multiphase systems.

University of Twente
29th October, 16:00 – 17:00 hr
Horstring C101

Data driven tools for Multiphase Turbulence

We present a stochastic method for generating and reconstructing complex signals along the trajectories of small objects passively advected by turbulent flows. Our approach makes use of generative Diffusion Models, a recently proposed data-driven machine learning technique. We show applications to data augmentation and data assimilation for 3D tracers in Turbulence, 2D trajectories from NOAA's Global Drifter Program and extensions to the case of Eulerian multiphase flows. Supremacy against linear decomposition and Gaussian Regression Processes is analyzed in terms of statistical and point-wise metrics concerning non-Gaussian components and multi-scale properties. Preliminary results concerning generalizability and model collapse will also be discussed, as well as a personal point of view on long term goals and potentialities of black-box data-driven approaches for turbulence.

Prof. Luca Biferale
University of Rome 'Tor Vergata'

J.M.Burgerscentrum

Research School for Fluid Mechanics

UNIVERSITY OF TWENTE.