ETH zürich

Institute of Fluid Dynamics
Institute of Energy and Process Engineering

Colloquium Thermo- and Fluid Dynamics

The physics of flowing human crowds

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The dynamics of human crowds is a paramount example of active matter physics with outstanding societal relevance [1]. Understanding and predicting the dynamics of human crowds is key to our daily comfort and safety and efficiency when moving in crowded urban areas. On the basis of a vast collection of experimental recordings, of highly space- and time-accurate trajectories of single individuals in (dense) crowds, we discuss quantitative models capable of explaining and predicting, at a statistical level, the dynamics of human crowds in simple flow configurations [2]. In this talk, we will start by reviewing the basic phenomenology of human crowds, along with a discussion of the simple physics-based models formulated on the basis of Langevin equations and path integrals. Finally, we discuss the most generic phenomenology of human crowd flows and we present a model, based on the coupled dynamics of slow and fast variables, capable of quantitatively describing the behaviour of single individuals in a crowd under very general flow conditions. This model can be used as a framework to infer physics-based models from data.

[1] Corbetta, A. and Toschi, F., 2023. Physics of Human Crowds. Annual Review of Condensed Matter Physics, 14.
[2] https://crowdflow.phys.tue.nl/

Federico Toschi was appointed Full Professor of Computational Physics of Multi-scale Transport Phenomena at the Departments of Applied Physics and Science Education of Eindhoven University of Technology (TU/e) in 2008. His research focuses on the emerging complexity in challenging multi-scale problems at the crossroad between statistical physics, fluid mechanics, soft condensed matter and bio-physics. Federico is a fellow of the American Physical Society (APS, 2015), has been a visiting scientist at University of Chicago and Stanford. He has published more than 200 peer-reviewed papers and provided more than 100 invited talks and seminars.

Date: Tuesday 7 May 2024
Time: 16:15 - 17:15h
Place: ETH Zurich, HG E 3
Host: Prof. Filippo Coletti

Further information: https://ifd.ethz.ch/events/ktf.html

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