# MATTEO LULLI

matteo.lulli@gmail.com – lullimat.org, GitHub, LinkedIn, Google Scholar

Theoretical & computational physicist with expertise in statistical field theory, stochastic modeling, and high-performance computing. Developer of Idea.Deploy, a GPU-accelerated framework for reproducible numerical simulations of complex systems and real-world applications.

## ACADEMIC EXPERIENCE

- **The Chinese University of Hong Kong** – *Research Associate* 2023 – Present
  Multivariate probability distributions estimation and stochastic nucleation dynamics (PRE, arXiv, ISU Colloquium)
- **Southern University of Science and Technology** – *Research Associate Professor* 2019 – 2023
  Stochastic fields dynamics and distribution moments optimization with application in multi-phase flows (PRE)
- **The Hong Kong Polytechnic University** – *Postdoc Fellow* 2018 – 2019
  Out-of-equilibrium dynamics of structural glasses (PRL, PRL)
- **U. Twente (PoF), TU/e Eindhoven, U. Rome Tor Vergata** – *Postdoc Fellow* 2015 – 2017
  Graph topological changes dynamics in yield-stress transition: direct comparison with experiments (PRX, SoftMatt)

## EDUCATION

**University of Rome Sapienza** – *Alma mater*

- **Ph.D. in Physics** – Advisor: Giorgio Parisi *(Physics Nobel Prize 2021)* 2011 – 2015
  "Out-of-equilibrium measure of critical parameters for second order phase transitions" (PRE, CompPhysComm)
- **B.A. & M.A. in Physics – 110/110 *cum laude*** 2005 – 2010
  "A study of 2D Ising model phase transition performed with an exact decimation algorithm"
  "Hamiltonian analysis of Dirac's formulation of gravity and ADM formalism" (PLB, Book)

## TECHNICAL SKILLS

- **Programming**: Python, CUDA, OpenCL, C/C++, PyCUDA, PyOpenCL, CTypes, MPI, bitwise optimizations
- **Techniques**: Monte Carlo, stochastic dynamics, SAT, decimation, lattice Boltzmann, differential geometry
- **Applications**: Probability estimation, neural networks (FortPhys, NN), graph orientation, fluid dynamics

## OPEN-SOURCE PROJECTS

*Main developer projects*

- **Idea.Deploy** (2020 – Present) A modular computational framework for the reproducibility of peer-reviewed numerical results. Implements a C-like metalanguage instantiated as CUDA, OpenCL, or C/C++, enabling hardware-agnostic simulations and metaprogramming
- **Ising spin glass** Monte Carlo simulations with bitwise optimizations for branchless 3D multispin updates: Single-GPU, Multi-GPU
- **GPU-based detection of topological changes** library for the identification of changes in Delaunay triangulations: Library code

## PROFESSIONAL ACHIEVEMENTS

- **Award**: *Outstanding Young Scientist* at DSFD 2025 for the paper PRE
- **Director**: Machine Learning Approaches for Complexity – "International School on Complexity" (2024)
- **Funding Grants:** NSFC no.12050410244 International Young Scientists & State Administration (2021 – 2022), total 550K RMB
- **Organizing committee** for the international conference "Perspectives of GPU computing in Science 2016"
- **NVIDIA Awards:** NVIDIA Tesla K40 GPU for excellent talk at DSFD 2016, NVIDIA VIP speaker at GTC 2015, NVIDIA Academic Partnership Program 2013 funding two GTX Titan GPUs
- **Referee for the journals**: Physical Review Research, Physical Review E, Computer Physics Communications, Communications in Computational Physics, Physics of Fluids
- **Advising**: Supervised Master's students G. Hongying (Fudan), F. Pelusi (Rome Tor Vergata) and Bachelor's students Y. Zheng (Ulster), R. Voso (Rome Tor Vergata) for degrees in Physics and in Computing and Engineering