Lorenzo Maria Perrone

PhD in Astrophysics

Contact

Phone: +39 3483596356

Email: lorenzolmp@protonmail.com

Nationality: Italian

Address: Wiener Str. 14, 10999 Berlin, Germany

Website: lorenzomariaperrone.eu/

LinkedIn: linkedin.com/in/lorenzo-maria-perrone-307505396

Technical Skills

Programming Languages

- Python
- C/C++

Technologies & Frameworks

- Parallel programming (MPI, OpenMP, hybrid programming MPI+X)
- GPU programming (CUDA, Cupy, Numba)
- Version control (Git), containerization (Docker/ Apptainer)

Languages

Italian: Native

English: Bilingual

German: B2 CEFR level

French: basic

Personal interests

Hiking, maps, calendars.

Professional Summary

I completed a PhD in Astrophysics from the University of Cambridge, UK, and I currently work at the Leibniz-Institute for Astrophysics Potsdam, Germany. I use massively-parallelized computer simulations to study how turbulence evolves in our Universe, blending state-of-the-art techniques for data analysis with a strong focus on theoretical modelling. My background is in plasma physics and computational fluid dynamics.

Skills and Experience

Scientific background

- Astrophysics: galaxy clusters, physics of the intracluster-medium (turbulence, transport processes, weakly collisional effects), accretion discs (protoplanetary discs, hot accretion flows).
- Fluid dynamics: stably-stratified turbulence, convection, shearing flows, classical turbulence theory, shocks and compressible flows, Boussinesq approximation. Numerical methods for fluid dynamics.
- Plasma physics: fusion plasmas, kinetic theory (drift kinetics, collision operators), magnetohydrodynamics, Braginskii MHD, plasma instabilities, dynamo theory.
- Machine learning and statistical methods: Gaussian processes, Bayesian inference, stochastic differential equations. Semester project on using Convolutional Deep Neural Networks in the identification of broad-absorption line quasars.

Computational expertise

- Strong experience (8+ years) in Computational Fluid Dynamics (CFD): finite volume/ Lagrangian/spectral methods, LES, multiscale physics. In my PhD and postdoc I used a variety of numerical methods to simulate magnetohydrodynamic turbulence, from simple setups to large-scale multiphysics simulations including magnetic fields, heat transport, gravity, etc.
- Advanced knowledge of parallel computing programming models. I have extensive experience working with MPI/OpenMP-accelerated software and I wrote a GPU-accelerated version of a spectral code in C++ CUDA.
- Coding skills and data analysis of large datasets from simulations (~100GB) with Jupyter Notebooks. I (co-)maintain several Git repos (e.g., turbocluster).

Analytical mindset

- Problem solving and creative thinking: break down complex problems into smaller parts easier to handle, formulate effective models to describe the behaviour of physical systems, apply ideas from other fields.
- Physicists' approach to dealing with new situations: recognize what are the primary drivers, and what is less significant. Understand the validity and recognize the limits of one's assumptions; estimate the scale of relevant quantities and their relative importance.

Collaboration and project leadership

- Formulate new projects and contextualise them in the existing literature. Set own goals and timelines. Combine results-oriented work with creative exploration.
- Work in large, long-running collaborations with international teams spread over different countries (e.g. PICO-Cluster project with ~10 members in Denmark, Berlin, Munich).
- Manage multiple projects at the same time, allocate time and resources effectively. Work in dynamic environments and respect deadlines. Weekly schedule with multiple seminars, journal clubs, collaboration meetings as well as informal exchange.
- Supervise students (2 master students), and teaching assistant for undergraduates.
- Integrate in new teams quickly and successfully lead projects to publication (e.g., published paper in a new topic after 6 months internship at Rutherford Appleton Laboratories / Department of Atomic and Laser Physics at Oxford University).

Effective communication skills

- 8 first-author peer-reviewed publications published in leading scientific journals, co-author in 3+ publications, 50+ total citations.
- Speaker at leading international conferences (10+), where I presented results of my research in front of general as well as specialist audiences. Invited speaker at several international conferences including at the Harvard-Smithsonian Center for Astrophysics (Cambridge MA), Oxford University.
- Communicate and engage through different media (articles, posters, video format, multimedia) with diverse audiences (general and specialist scientists, postgraduates talks at College).
- Co-organize sessions at conferences (Corsica), seminar series (at DAMTP, during PhD) peer-review of scientific articles.
- Involvement in the community: student secretary at College in Cambridge (allocating budget for postgraduate society, attending meetings with management, sending out newsletters), organizer of the sustainability club at AIP, involved in local campaigns.

Education

Year	Description	Institution
10/2022 – ongoing	Postdoc at the Cosmology / High-energy physics group.	Leibniz Institute for Astrophysics Potsdam (AIP), DE
10/2018 – 09/2022	Ph.D. Astrophysics at the department of Applied Mathematics and Theoretical Physics (DAMTP).	University of Cambridge, UK
01/2021 – 07/2021	Internship at the Rutherford Appleton Laboratories / Department of Atomic and Laser Physics.	University of Oxford, UK
09/2016 – 07/2018	M.Sc. Physics, minor in Computational Science and Engineering. Master thesis carried out at the Swiss Plasma Center.	École polytechnique fédérale de Lausanne (EPFL), Switzerland
09/2013 – 07/2016	B.Sc. Physics cum laude (highest mark).	University of Pisa, Italy