Noemi Anau Montel

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Research Interests

My research interests lie towards analyzing complex astrophysical and cosmological datasets at various observable scales for new physics searches. In particular, my work uses novel scientific machine learning techniques to develop innovative data analysis pipelines and statistical algorithms. The aim is to alleviate the statistics challenges facing the fields of astrophysics and cosmology in light of high-quality data from current and future observatories. On the application side, I am currently working on gravitational lensing, cosmological simulations of large scale structures, and point sources in sky maps.

Professional Experience

Max Planck Institute for Astrophysics **Garching, DE**
Research Fellowship Nov. 2024 – present

Education

ORCiD

University of Amsterdam, GRAPPA Institute **Amsterdam, NL**
Ph.D. in Physics Oct. 2020 – Oct. 2024
Thesis: *Simulation-based inference for astrophysical data*
Advisor: Christoph Weniger

Università di Torino **Torino, IT**
Laurea magistrale in Fisica Teorica (equivalent to *M.Sc.* in Theoretical Physics) Oct. 2018 – Jul. 2020
Grade: 110/110 magna cum laude with honors
Advisor: Nicolao Fornengo

Laurea triennale in Fisica (equivalent to *B.Sc.* in Physics) Oct. 2015 – Jul. 2018
Grade: 110/110 magna cum laude
Advisor: Paolo Gambino

Publications

arXiv Inspire HEP

Author of 4 publications and 3 contributions to the Machine Learning and the Physical Sciences Workshop at the Conference on Neural Information Processing Systems (NeurIPS). A full publication record can be found in the publication list.

Seminars and Conference Talks

† = remote

Seminars:

- Max Planck Institute for Astrophysics Garching, DE, Dec. 2024
- Donostia International Physics Center (Cosmology & Astrophysics group) †, Apr. 2024
- Utrecht University (Institute for Theoretical Physics) Utrecht, NL, Apr. 2024

- Harvard University (Department of Physics) — Cambridge (MA), US, May. 2023
- Radbound University (Donders Institute) — †, Jan. 2022

Invited talks:

- BASP Frontiers 2025 — Villars-sur-Ollon, FR, Jan. 2025
- EAS 2024 – AI in astronomy session — Padova, IT, Jul. 2024
- PHYSTAT-SBI 2024 — Garching, DE, May. 2024

Contributed talks (and posters = ⋆):

- GRAPPA 10 year anniversary conference [slides] — Amsterdam, NL, Jul. 2023
- The Road to Differentiable and Probabilistic Programming in Physics [slides] — Munich, DE, Jun. 2023
- Third EuCAPT annual symposium at CERN [slides] — Geneva, CH, May. 2023
- Cosmic Connections (Symposium at Flatiron Institute) ⋆ — New York (NY), US, May. 2023
- Novel approaches to characterise the Galactic Centre Excess [slides] — Annecy, FR, Mar. 2023
- Simulation-based inference with Swyft Workshop [slides] — Amsterdam, NL, Jan. 2023
- NeurIPS 2022, ML and the Physical Sciences Workshop ⋆ [poster] — New Orleans (LA), US, Dec. 2022
- Identification of Dark Matter (IDM) 2022 [slides] — Vienna, AU, Jul. 2022
- Likelihood-free in Paris [slides] — Paris, FR, Mar. 2022
- UK National Astronomy Meeting (NAM) 2021 [slides] — †, Jul. 2021

Teaching and Supervision Experience

Teaching assistant (preparing and leading tutorials, designing and marking exams) for master courses:

- Advanced Cosmology (16 hours); Lecturer: C. Weniger — Winter 2024
- Machine Learning for Physics and Astronomy (64 hours); Lecturer: C. Weniger — Spring 2022, 2023
- Quantum Field Theory 3 (16 hours); Lecturer: M. Isachenkov — Winter 2023
- Quantum Field Theory (32 hours); Lecturer: E. Verlinde — Fall 2020

Guest lecturer for the Professional Skills and Career Development Physics and Astronomy course (2023).

Research supervisor for 3 master students and 1 bachelor student, devising their projects and providing weekly supervisor support on their theses.

Professional Activities and Community

- *Reviewer*, NeurIPS Machine Learning and the Physical Sciences Workshop — 2023, 2024
- *Co-Organizer*, Dutch Machine Learning for Gravitational Waves Meeting — Dec. 2023
- *Co-Organizer*, Simulation-based inference with Swyft Workshop — Jan. 2023
- *Member*, GRAPPA Colloquium Committee — 2022 – 2024

Professional Skills

github.com/NoemiAM

Programming skills:

- *Expert*: Python (including `PyTorch`, `Pyro`), bash, vim, slurm, Git, LaTeX.

- *Intermediate*: Mathematica, C++, html.
- *Contributor/maintainer*: `swyft`, `torchns`.

Languages: fluent English, native Italian, intermediate French.

Research Training

- ISAPP School on Exploring the Dark Universe — Texel, NL, Nov. 2023
- MIAPbP Workshop on Differentiable and Probabilistic Programming — Munich, DE, May. 2023
- Lorentz Center School on Fundamentals of the Universe — Leiden, NL, Apr. 2023
- GGI School on Astroparticle Physics, Cosmology and Gravitation — Firenze, IT, Mar. 2021 and 2022

References

- Christoph Weniger (University of Amsterdam) — c.weniger@uva.nl
- Camila Correa (Université Paris-Saclay) — camila.correa@cea.fr
- Douglas Finkbeiner (Harvard University) — dfinkbeiner@cfa.harvard.edu
- Gianfranco Bertone (University of Amsterdam) — g.bertone@uva.nl