

# NOEMI ANAU MONTEL

Max-Planck-Institut für Astrophysik, Karl-Schwarzschild-Str. 1, 85748 Garching, Germany

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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.

## PROFESSIONAL EXPERIENCE

### Max Planck Institute for Astrophysics

Research Fellowship

Garching, DE

Nov. 2024 – present

## EDUCATION

 [ORCID](#)

### University of Amsterdam, GRAPPA Institute

Ph.D. in Physics

Thesis: *Simulation-based inference for astrophysical data*

Advisor: Christoph Weniger

Amsterdam, NL

Oct. 2020 – Oct. 2024

### 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](#)

1. O. Savchenko, G. Franco Abellan, F. List, N. Anau Montel, C. Weniger, *Fast Sampling of Cosmological Initial Conditions with Gaussian Neural Posterior Estimation*, , [\[arXiv:2502.03139\]](#)
2. N. Anau Montel, J. Alvey, C. Weniger, *Tests for model misspecification in simulation-based inference: from local distortions to global model checks*, [Phys. Rev. D 111, 083013](#), [\[arXiv:2412.15100\]](#)
3. O. Savchenko, F. List, G. Franco Abellan, N. Anau Montel, C. Weniger, *Mean-Field Simulation-Based Inference for Cosmological Initial Conditions*, Machine Learning and the Physical Sciences Workshop at the 38th Conference on Neural Information Processing Systems (NeurIPS 2024) [\[Paper\]](#) [\[Poster\]](#) [\[arXiv:2410.15808\]](#)
4. F. List, N. Anau Montel, C. Weniger, *Bayesian Simulation-based Inference for Cosmological Initial Conditions*, Machine Learning and the Physical Sciences Workshop at the 37th Conference on Neural Information Processing Systems (NeurIPS 2023) [\[Paper\]](#) [\[Poster\]](#) [\[arXiv:2310.19910\]](#)

5. [N. Anau Montel](#), J. Alvey, C. Weniger, *Scalable inference with Autoregressive Neural Ratio Estimation*, [Mon.Not.Roy.Astron.Soc. 530 \(2024\) 4](#), [[arXiv:2308.08597](#)]
6. K. Karchev, [N. Anau Montel](#), A. Coogan, C. Weniger, *Strong-Lensing Source Reconstruction with Denoising Diffusion Restoration Models*, Machine Learning and the Physical Sciences Workshop at the 36th Conference on Neural Information Processing Systems (NeurIPS 2022) [[Paper](#)] [[Poster](#)] [[arXiv:2211.04365](#)]
7. [N. Anau Montel](#), C. Weniger, *Detection is truncation: studying source populations with truncated marginal neural ratio estimation*, Machine Learning and the Physical Sciences Workshop at the 36th Conference on Neural Information Processing Systems (NeurIPS 2022) [[Paper](#)] [[Poster](#)] [[arXiv:2211.04291](#)]
8. A. Coogan, [N. Anau Montel](#), K. Karchev, M. W. Grootes, F. Nattino, C. Weniger, *The effect of the perturber population on subhalo measurements in strong gravitational lenses*, [Mon.Not.Roy.Astron.Soc. 527 \(2024\) 66](#), [[arXiv:2209.09918](#)]
9. [N. Anau Montel](#), A. Coogan, C. Correa, K. Karchev, C. Weniger, *Estimating the warm dark matter mass from strong lensing images with truncated marginal neural ratio estimation*, [Mon.Not.Roy.Astron.Soc. 518 \(2023\) 2746](#), [[arXiv:2205.09126](#)]
10. C. Correa, M. Schaller, S. Ploeckinger, [N. Anau Montel](#), C. Weniger, S. Ando, *TangoSIDM: Tantalizing models of Self-Interacting Dark Matter*, [Mon.Not.Roy.Astron.Soc. 517 \(2022\) 3045](#), [[arXiv:2206.11298](#)]

## SEMINARS AND CONFERENCE TALKS

† = remote

### Seminars:

- Cambridge-LMU seminar †, May. 2025
- 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
- Radboud 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 = ★):

- EuCAIFCon 2025 (European AI for Fundamental Physics conference) [[slides](#)] Cagliari, IT, Jun. 2025
- ORIGINS Lensing Day [[slides](#)] Garching, DE, Nov. 2024
- 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

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**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

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- *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

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 [github.com/NoemiAM](https://github.com/NoemiAM)

**Programming skills:**

- *Expert*: Python (including PyTorch, JAX), bash, vim, slurm, Git,  $\text{\LaTeX}$ .
- *Intermediate*: Mathematica, C++, html.
- *Contributor/maintainer*: [swyft](#), [torchns](#).

**Languages:** fluent English, native Italian, intermediate French.