Mauro Bernardini

Curriculum Vitae

Institute of Computational Sciences
University of Zurich
✉ *mauro.bernardini@uzh.ch*
Github

Education

2023–present **Postdoc, Data Science**, *University of Zurich*.
Cosmology, Large-scale structure, Galaxy Formation, Machine and Deep Learning

2019–2023 **PhD, Data Science**, *University of Zurich*.
Cosmology, Large-scale structure, Galaxy Formation, Machine and Deep Learning

2017–2019 **Master of Natural Sciences, Astrophysics and Cosmology**, *University of Zurich*.
Focus on theoretical physics, astrophysical processes, large-scale structure formation and Cosmology

2013–2017 **Bachelor of Natural Sciences, Physics**, *University of Zurich*.
Focus on theoretical and particle physics

Research

Journal Articles (accepted)

2022 **Robert Feldmann, others, Mauro Bernardini**, FIREbox: simulating galaxies at high dynamic range in a cosmological volume, ***MNRAS*** *Article publication*.
The official FIREbox simulation paper.

2020 **Mauro Bernardini, Robert Feldmann, et al.**, From EMBER to FIRE: predicting high resolution baryon fields from dark matter simulations with deep learning, ***MNRAS*** *Article publication*.
A study about a neural network based methodology to enrich dark matter simulations with baryon fields.

2019 **Mauro Bernardini, Lucio Mayer Darren Reed and Robert Feldmann**, Predicting dark matter halo formation in N-body simulations with deep regression networks, ***MNRAS*** *Article publication*.
A study investigating the mapping from initial conditions in cosmological simulations to final halo populations using a deep regression network based on the U-net architecture.

2019 **Sandra Baumgartner, Mauro Bernardini, et al.**, Towards a polarization prediction for LISA via intensity interferometry, ***MNRAS*** *Article publication*.
A study about a novel approach for testing General Relativity via LISA verification binaries by measuring polarization amplitudes of gravitational waves. This approach proposes to include ground based telescopes (in particular the Cherenkov Telescope Array) for resolving the binary orientation on the sky.

Miscellaneous

2016 **Mauro Bernardini, Prasenjit Saha**, Characterization of the local velocity field with TGAS-RAVE, Bachelor Thesis.
A data science approach for characterizing the local velocity field of the Milky Way galaxy including shear motions and a phase space based finder for stellar streams.

Talks

2022 **Swiss SKA-days**, *Lugano*, EMBER: emulating gas fields from dark matter simulations, *keynote slides*.
Main conference topics: Science with the Square Kilometer Array (SKA) and Switzerlands role in it

2022 **The Wheel of Star Formation**, *Prag*, EMBER: emulating gas fields from dark matter simulations, *keynote slides*.
Main conference topics: Star Formation, Stellar Feedback, Galaxy Clusters

2021 **Swiss SKA-days**, *Lausanne*, EMBER: emulating gas fields from dark matter simulations.
Main conference topics: Science with the Square Kilometer Array (SKA) and Switzerlands role in it

2021 **Debating the potential of Machine Learning in Astronomical Surveys**, *Paris*, Accelerating the modeling of HI on cosmological scales via Deep Learning, *https://ml-iap2021.sciencesconf.org/browse/session?sessionid=66736*.
Main conference topics: Star Formation, Stellar Feedback, Galaxy Clusters

Computer skills

Languages	Python, Cython, C++, LaTeX
API's	scikit-learn, PyTorch, Keras, Tensorflow, Sonnet
Misc	SQL, Linux and Unix Command Line

Teaching Assistance

2023, FS **ESC 403: Introduction to Data Science**, University of Zurich.
2022, HS **AST 241: Introduction to Astrophysics**, University of Zurich.
2022, FS **AST 210: Astronomy Field Trips**, University of Zurich.
2021, HS **AST 246: Computational Astrophysics**, University of Zurich.
2021, FS **AST 210: Astronomy Field Trips**, University of Zurich.
2020, HS **AST 210: Astronomy Field Trips**, University of Zurich.
2020, FS **ESC 403: Introduction to Data Science**, University of Zurich.
2019, HS **AST 210: Astronomy Field Trips**, University of Zurich.

References

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Prof. Dr. Jan Dirk Wegner
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