Nikolaos Triantafyllou

Physicist, PhD Candidate in Computational Astrophysics and Cosmology

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Research Interests

Large-scale structure, 21cm cosmology, machine learning, bayesian statistics

Education

Scuola Normale Superiore *Pisa, Italy*

PhD in Computational Astrophysics and Cosmology *Nov. 2023 - Present*

- Advisor: Prof. A. Mesinger

University of Crete *Heraklion, Greece*

MSc Graduate Degree in Advanced Physics (specialization: Astrophysics) *Sept. 2022 - June 2023*

- Grade: 8.88/10 (”Excellent”)
- Advisor: Prof. V. Pavlidou

University of Crete *Heraklion, Greece*

BSc Undergraduate Degree in Physics *Sept. 2018 - Sept. 2022*

- Grade: 7.95/10 (”Very Good”)
- Advisor: Prof. V. Pavlidou

Research Experience

Scuola Normale Superiore *Pisa, Italy*

Supervisor: Prof. Andrei Mesinger *2023 - Present*

- Description: Research on Large-scale structure and Cosmology for the EoR. Using **bayesian** techniques (Posterior Density Estimation, Neural Ratio Estimation, Denoising Diffusion Probabilistic Models) to constrain the amplitudes and phases of the **primordial density field** and astrophysical parameters based on **multiple tracers**

University of Crete and IA FORTH *Heraklion, Greece*

Supervisor: Prof. Vasiliki Pavlidou *2021 - 2023*

- Description: Research on Large-scale structure and Cosmology. Used deep (NNs, **CNNs**, GraphNNs) and shallow learning to probe the **turnaround radius** on the plane of the sky based on mass and line-of-sight velocity simulated data in order to constrain cosmological parameters.

Publications

In Preparation

Bayesian Inference for Constraining the Cosmological Initial Density Field with Galaxy Counts and 21-cm Observations from the Epoch of Reionisation
N. Triantafyllou, A. Mesinger

Multi-tracer Inference of Galaxy Properties for the First Billion Years of the Universe
N. Triantafyllou, A. Mesinger

Accepted

Searching for a Signature of Turnaround in Galaxy Clusters with Convolutional Neural Networks
(https://arxiv.org/abs/2412.13304)
N. Triantafyllou, G. Korkidis, V. Pavlidou, P. Bonfini

International Conferences

Presentations can be found here: https://github.com/nikos-triantafyllou/conference_talks/
For more conferences, see: https://nikos-triantafyllou.github.io/conferences.html

A New Era in Astrophysics: preparing for early science with the SKAO — *Görlitz, Germany*
Speaker — *June 2025*

Simulation-Based Inference for Galaxy Evolution — *Bristol, UK*
Speaker — *May 2025*

Teaching Experience

Spring 2025	**Structure Formation in the Early Universe**, Creation of a hands-on tutorial for cosmological initial conditions	*Pisa, Italy*
Fall 2022	**Advanced Physics Lab I**, Teaching Assistant	*Heraklion, Greece*
Spring 2022	**Physics Lab III - Optics**, Teaching Assistant	*Heraklion, Greece*
Spring 2020	**Physics Lab II- Electromagnetism**, Teaching Assistant	*Heraklion, Greece*

Fellowships

2018-2019 **"Chrysanthos and Anastasia Karidis" Bequest Scholarship**,

Skills

Programming & Software
Working with: Python, LaTeX, HPC systems, database creation, parallelization
Familiar with: C, C++, MATLAB, website building

Languages
Greek (native), English (fluent, B2-ECCE, working proficiency), Italian (B1)

Academic
Scientific research, creativity, academic writing, LaTeX typesetting, problem-solving abilities, data analysis, teaching, report writing, proposal writing, presentation & communication skills, collaboration, time management, work ethic

Other Interests

Music (guitar playing, singing, lyric writing), philosophy, art, movies, road trips, swimming, basketball, wine/beer tastings, bars/pubs

Other Projects

AstroVisio (INAF, Design Group Italia)
Project that aims to develop an innovative virtual reality tool to help researchers visualize astrophysical data
Contribution: Explaining the challenges that astrophysicists face in visualizing data, during the very first and intermediate stages of the project.