Eleni Tsaprazi

Postdoctoral Research Associate - Cosmology

CONTACT DETAILS

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RESEARCH INTERESTS

1 - **Cosmology** large-scale structure: clustering, clusters, velocities, supernovae

2 - **Data analysis & Modelling** Bayesian statistics, forward modelling, field-level inference

VISITS / COLLABORATION

2026 - Observatoire de Paris
2025 - University of Bologna

FUNDING & AWARDS

- 2026 **P4F MSCA COFUND fellowship**, Institute of Physics of the Czech Academy of Sciences (offered)
- 2026 **Seal of Excellence**, European Commission, Marie Skłodowska-Curie Actions
- 2025 Faculty of Natural Sciences **Researcher Mobility Grant**, Imperial College London, £1,200
- 2023 **Travel grant**, Balzan Cosmological Studies Program, University of Oxford, £2,000
- 2022 **Project grant**, Royal Swedish Academy of Sciences, SEK 20,000
- 2021 **Research stipend**, Birger och Gurli Grundströms foundation, SEK 5,000
- 2021 **Travel grant**, Fonden för främjande av fysisk forskning, SEK 5,000
- 2018 **Full MSc scholarship**, Institut Lagrange de Paris, 10.000€

PUBLICATIONS

Publication record

10 papers in peer-reviewed journals
0000-0001-5082-4380

- **ADS Public Library** h-index: 6 | Citations: 157 | Average citations : 18.1
- **Google Scholar** h-index: 5 | Citations: 164
- **Submitted:** 3

Other scientific communication

- 1 ESO white paper / 2 productions
- 16 invited talks
- 6 contributed talks and posters

COMMUNITY ROLES

- **2024** Elected member of the Diversity Committee Euclid Consortium
- **2024** Postdoctoral Representative Physics Department, Imperial College London
- **2023** Elected PhD representative of the Incident Contact Unit Aquila Consortium

OPEN SCIENCE

- Field-level inference of intrinsic alignment software (Tsaprazi et al. 2022b) GitHub repository

ACADEMIC AND RESEARCH POSITIONS

Imperial College London - Postdoctoral Research Associate — 10/2023 - now

- Galaxy clusters: clustering, gravitational redshifts (Euclid, WST)
- Peculiar velocities: H_0 inference, supernova synthetic catalogues

EDUCATION

Ph.D. Physics | 7 September 2023 | **Stockholm University**

Supervisors: Dr. Jens Jasche, Prof. Ariel Goobar

- PhD Thesis: "Physics-informed inferences of galaxy clustering with Bayesian forward modelling."

M.Sc. Nuclei, Particles, Astroparticles & Cosmology | July 2019 | **Sorbonne University**

- Dissertation: "The large-scale flow of galaxies: effects on cosmological data"
  Supervisor: Dr. Roya Mohayaee, Paris Institute of Astrophysics (IAP)
- Internship: "Detection of X-rays of astrophysical origin."
  Supervisor: Dr. Jean-Luc Sauvageot, IRFU, CEA Saclay

B.Sc. Physics | July 2018 | **Aristotle University of Thessaloniki**

- Dissertation: "Relativistic approach to the kinematics of large-scale peculiar velocities"
  Supervisor: Prof. Christos Tsagas

RESEARCH RESPONSIBILITIES & PROJECT PARTICIPATION

Euclid Consortium – Project lead — Statistics of Galaxy Clusters WP

- **Scope:** Lead of the Euclid DR1 galaxy cluster two-point correlation function measurement. Lead of the Euclid DR1 galaxy cluster two-point correlation function (multipoles) analysis, from theoretical modelling to pipeline implementation.
- **Delivered:** Implemented and validated an end-to-end redshift-space two-point correlation function (2PCF) pipeline (multipoles, covariance, systematics treatment) on Euclid-like mock catalogues, to be used as the production pipeline for DR1.
- **Coordinated:** Led the analysis team defining and validating robust scale cuts for the cluster 2PCF in DR1; work currently documented in a first-author paper under Euclid internal review.
- **Key outputs:** Cluster 2PCF measurement algorithm and analysis configuration to be used for the Euclid DR1 cosmological analysis with galaxy clusters, and for the subsequent inference of deviations from general relativity.

Widefield Spectroscopic Telescope (WST) – Project lead — Dense Structures WP

- **Scope:** Lead of the science case on testing modified gravity with cluster gravitational redshifts, defining how the WST cosmological survey should be optimised for state-of-the-art constraints.
- **Delivered:** Designed and implemented an initial end-to-end forecasting pipeline for stacked gravitational redshift measurements from WST cluster samples, including survey strategy, target selection and leading systematics.
- **Coordinated:** Led the Dense Structures WP contribution to the ESO WST white paper and interfaced with survey-design and cosmology teams to translate science requirements into survey specifications.
- **Key outputs:** First demonstration of the WST gravitational-redshift forecast pipeline in the ESO WST white paper and forecast paper quantifying WST constraints on modified gravity (arXiv:2512.13221).

LSST Dark Energy Science Collaboration – Lead of the Bayesian Pipelines Topical Team

- **Scope:** Coordination of field-level inference (FLI) projects for weak-lensing and large-scale-structure analyses, with a focus on Bayesian pipeline design and validation.
- **Delivered:** Provided statistical leadership and consultation on FLI methodology, priors and diagnostics for weak-lensing pipelines, helping to shape DESC-wide Bayesian FLI analysis strategies.
- **Coordinated:** Acted as liaison between the Bayesian Pipelines Topical Team and the Weak Lensing / Large-Scale Structure working group; contributed to the Peculiar Velocities Topical Team via DESC PV Project 5 ("Velocity-field inference bias using mocks"), including co-supervision of a BSc student.
- **Key outputs:** Contributions to a methodological paper on Bayesian field-level weak-lensing inference (Mendoza et al., under DESC internal review) and to mock-based validation frameworks for velocity-field inference within DESC.

Aquila Consortium — Field-level inferences of galaxy clustering

- **Scope:** Development and application of novel field-level inference methodologies for galaxy clustering, with a focus on mitigating large-scale-structure systematics.
- **Delivered:** Led the first field-level inference analyses of supernova clustering and galaxy intrinsic alignments on real data, including state-of-the-art treatments of survey and LSS-induced systematics.
- **Key outputs:** Three first-author productions: first FLI of supernova clustering, first FLI of galaxy intrinsic alignment, and the first method to include very low-redshift supernovae in Hubble constant inferences; contributed to the most precise to-date Cepheid-only measurement of the Hubble constant.

- Data Science tutorials (Bayesian regression) GitHub repository
- Machine Learning tutorials (classification & neural networks) GitHub repository
- Public data repository: simulations by Tsaprazi & Heavens 2025 Zenodo link
- GLASS-jax: contributor to field-level inference pipeline for weak lensing GitHub repository
- Bayesian photo-z pipeline: main developer GitHub repository
- Public data repository: data in Tsaprazi et al. 2022a Nextcloud link

INVITED TALKS

- **2025** Field-level inference of H_0 in the low-redshift Universe, Putting the Cosmic LSS on the map, Vienna
- **2025** Bayesian inferences in the cosmic large-scale structure, University of Bologna
- **2025** Bayesian inferences in the cosmic large-scale structure, UC Louvain
- **2025** Field-level inference of H_0 in the low-redshift Universe, University of Barcelona
- **2024** Modern Cosmology: Opportunities & Challenges, PHYSTAT: Statistics meets ML, Imperial College
- **2024** Advancements in large-scale structure reconstructions in light of cosmological tensions, Standard Cosmology at the threshold of change, Aristotle University of Thessaloniki
- **2023** Physics-informed inferences of galaxy clustering, Institut d' Astrophysique de Paris
- **2023** Physics-informed inferences of galaxy clustering, The London Institute of Cosmology
- **2023** Field-level inferences of intrinsic alignment, Hol-IA Workshop, Lorentz Center
- **2023** High-order statistics of photometric galaxy clustering, Oxford University, LSST DESC, Euclid Consortium
- **2022** Field-level analyses of galaxy surveys, Advances in Cosmology through Numerical Simulations, MIAPbP
- **2022** Bayesian inference of intrinsic alignment in the large-scale structure, Euclid Consortium
- **2022** Bayesian inference of intrinsic alignment in the large-scale structure, Max Planck Institute for Astrophysics
- **2021** Tracing the cosmic web with supernovae, University of Cambridge

OUTREACH

- Public experiment with supernovae simulations
- Interview aimed at high-school students
- Women & Girls in Astronomy, IAU
- Scientia Publica podcast & website
- Research vlogs and & summaries
- Content translator (NASA HiRISE)

SCIENTIFIC COMMUNITY LEADERSHIP & COORDINATION

- **2025** Co-organiser of the Astrophysics Group Postgraduate Courses, Imperial College London
- **2024** Invited discussion leader: COSMO CLASSIC, Future prospects for Cosmology, "If you're tired of w_0, w_α, what are the interesting problems?" , University of Padova, Asiago
- **2024** Co-organiser of the Soft-skills Roundtable, Imperial College London
- **2024** Co-organiser of the Astrophysics seminars, Imperial College London
- **2023** Chair of plenary session, February Collaboration Meeting, LSST DESC
- **2022** Co-author of the Aquila Consortium Code of Conduct, Aquila Consortium
- **2022** Co-organiser of the Aquila Consortium fall meeting, Aquila Consortium
- **2021** Co-organiser of the Cosmology & Gravitation meetings, Stockholm University
- **2020** Co-organiser of the Supernova & Cosmology meetings, Stockholm University

COLLECTIVE RESPONSIBILITIES & GOVERNANCE

- **Reviewer** for ApJ, Euclid Consortium
- **2024** Lead of the Bayesian Pipelines Topical Team, Dark Energy Science Collaboration Coordinating field-level inference projects and Bayesian analysis pipelines across the weak-lensing and large-scale-structure teams, providing statistical consultation to active projects and being responsible for managing computational resources.
- **2024** Elected Member, Astronomy Large Awards Sift Panel, UK Research and Innovation Tasked to assess applications and make recommendations to the Science and Technology Facilities Council (STFC), taking account of strategic advice provided by the STFC and the UK Space Agency, alongside senior experts in the field.

TEACHING AND MENTORING

Teaching experience

- **2026** Lecturer, BSc/MSc courses (Research Computing Skills for Physicists), Imperial College 4 hours in person, 12 hours preparation
- **2026** Lecturer, BSc course (Fourier analysis), Imperial College 1 hour in person, 3 hours preparation
- **2025** Lecturer & course creator, PhD courses (Supervised ML), Imperial College 6 hours in person, 12 hours preparation
- **2025** Marking, MSc course Statistical Methods for Experimental Physics, Imperial College 2 hours
- **2024** Lecturer & course creator, PhD courses (Machine Learning classification, Bayesian regression), Imperial College 4 hours in person, 8 hours preparation
- **2024** Lecturer & course creator, Bayesian inference in practice, ICIC Data Analysis Workshop, Imperial College 1 hour in person, 3 hours preparation
- **2024** Demonstrator on Bayesian inference methods, ICIC Data Analysis Workshop, Imperial College 12 hours in person, 24 hours preparation
- **2023** Open questions in Cosmology, textbook author, Stockholm University 202.5 hours of textbook writing **PDF**
- **2015** Electricity – Magnetism, Teaching assistant, Aristotle University of Thessaloniki 10 hours in person
- **2014** Informatics laboratory, Teaching assistant, Aristotle University of Thessaloniki 10 hours in person

Supervision and Mentoring

- **2026** Co-supervisor of MSc student Matteo Macchione, Cluster gravitational redshifts: probing gravity with Stage-IV data, University of Bologna
- **2026** Supervisor of BSc student Arvind Chandrasekar (UROP programme, 4 weeks), The impact of gravity on internal halo structure, Imperial College London
- **2026** Supervisor of BSc student Camille de Saintignon (5 weeks), Probing the impact of modified gravity on gravitational wave lensing observables, Université Paris Cité
- **2026** Co-supervisor of MSc student Ettore Delpogetto, Probing deviations from General Relativity with gravitational wave strong lensing in third-generation detectors, University of Bologna
- **2025** Supervisor of BSc student Francesco Calice (UROP programme, 4 weeks), Simulating type Ia supernovae in the cosmic large-scale structure, Imperial College London
- **2022** Co-supervisor of MSc student Somaya Bakhsh, Searching for the ISW effect in large-scale structure surveys, Stockholm University

TECHNICAL SKILLS

- **Programming** Python (scientific stack, JAX/BlackJAX), C, C++, Fortran, MATLAB, SQL, shell
- **Scientific computing & HPC** Linux/Unix, HPC clusters, job schedulers (SLURM/PBS), OpenMP, MPI, cosmological simulations, large-scale data processing
- **Bayesian inference & statistics** Bayesian hierarchical modelling, MCMC and nested sampling (PyMC, Dynesty, UltraNest), Gibbs and slice sampling, Hamiltonian Monte Carlo, Stan, field-level inference, CosmoBolognaLib
- **Collaboration & infrastructure** Git (GitHub, GitLab, Bitbucket), continuous integration and testing (GitHub Actions), reproducible workflows, documentation and collaboration platforms (WordPress, MediaWiki, Indico)
- **Languages** 🇬🇷 Greek native, 🇬🇧 English fluent, 🇫🇷 French advanced, 🇮🇹 Italian basic

TRAINING

Challenging poor behaviours (Imperial College) | Project management (Stockholm University) | Philosophy of Science and Research ethics (Stockholm University)