

Dr. Vilasini Tinnaneri Sreekanth

Research Engineer · Institut d'Astrophysique Spatiale (IAS), Orsay, France

✉ vilasini.tinnanersreekanth@gmail.com | 🌐 vilasinit.github.io | 📄 github.com/vilasinit | 📞 0009-0008-3885-5131

EDUCATION

Ph.D. in Astronomy and Astrophysics

Oct 2022 – Oct 2025

Université Paris-Saclay & CEA Paris-Saclay

Paris, France

Thesis: *Likelihood-free cosmological parameter inference using theoretical high-order statistics predictions*

M.Sc. in Astrophysics

Sep 2019 – Jul 2021

University of Geneva

Geneva, Switzerland

Thesis: *Simulations of (global) cosmic strings with N-body simulations to investigate their impact on large-scale structure formation*

Integrated M.Sc. in Physics

Jul 2014 – Jul 2019

S V National Institute of Technology

Surat, India

Thesis: *Formation of dark matter halos in quintessence models*

RESEARCH EXPERIENCE

Research Engineer

Feb 2026 – present

Institut d'Astrophysique Spatiale (IAS), Orsay

With: Dr. L. Salvati, Dr. N. Aghanim & Dr. G. Fabbian

CMB × LSS cross-correlations & likelihood pipeline development

- Leading development of a **CCL/Cobaya likelihood pipeline** for joint analyses of galaxy clustering, CMB lensing, weak lensing and their cross-spectra, targeting combined CMB and Stage-IV survey constraints.
- Developing **GODMAX**, a **JAX-based differentiable halo model** for weak-lensing, clustering and tSZ predictions, and integrating it into **CLOE**, the Euclid Consortium likelihood code.
- Applying **Bayesian parameter estimation** (MCMC) to extract cosmological constraints from multi-probe cross-correlation signals.

Ph.D. Researcher

Oct 2022 – Oct 2025

CosmoStat, CEA Paris-Saclay

Advisors: Dr. J.-L. Starck & Dr. S. Codis

Likelihood-free parameter inference using theoretical predictions of higher-order statistics

- Developed a **Large Deviation Theory**-based framework to predict the **wavelet ℓ_1 -norm** of weak-lensing convergence maps, a higher-order statistic that captures non-Gaussian information beyond two-point statistics, as an analytical alternative to costly simulations; released as the open-source package **WALE** [1].
- Applied the prediction within a **generalised forward-backward framework** to generate weak-lensing convergence maps at a fraction of the cost of existing tools; released as **GOLCONDA** [2].
- Designed **Python** modules for **likelihood-free cosmological parameter inference** using higher-order statistical predictions.
- Built **automated data pipelines** with **parallel computing** on HPC and maintained **CI/CD workflows** with GitHub Actions.
- Contributed to the **Euclid** weak-lensing higher-order statistics (HOWLS) effort towards DR1 [3].

M.Sc. Thesis

Sep 2020 – Jul 2021

University of Geneva

Advisor: Dr. M. Kunz

Simulations of (global) cosmic strings & their impact on large-scale structure formation

- Developed simulations of **global topological defects (cosmic strings)** using **LATField2** and **Gevolution** to model global $O(N)$ defect evolution.
- Automated **batch submission** and monitoring of large HPC jobs; performed **parallel post-processing** with pandas and NumPy.

Astrophysics Laboratory II

Feb 2020 – May 2020

University of Geneva

Optimal extraction of spectra obtained with the Hubble Space Telescope

- Implemented the **optimal extraction** algorithm of Horne (1986) in Python for raw **HST/STIS** spectra and quantified the gain in spectral quality over standard box extraction.

Astrophysics Laboratory I

Sep 2019 – Feb 2020

University of Geneva

Supervisors: Prof. C. Ferrigno & Dr. V. Savchenko

Searching gamma-ray detector time series for signatures of energetic stellar explosions

- Developed a statistical method to separate background from transient signals in **INTEGRAL SPI-ACS** light curves, validated on a known gamma-ray burst (GRB).
- Applied it to 10 orbital revolutions: identified **2527 candidates**, of which **7 confirmed GRBs** were cross-matched with the literature; showed the rest to be dominated by cosmic-ray-induced spikes.

Integrated M.Sc. Thesis

Jan 2019 – May 2019

University of Trieste

Advisor: Dr. P. Monaco

Formation of dark matter halos in quintessence models

- Modified **PINOCCHIO** for varying equation-of-state parameters w_0 , w_a ; implemented cluster-cosmology validation with statistical analysis libraries.

PUBLICATIONS

[1] Theoretical wavelet ℓ_1 -norm from one-point probability density function prediction

V. T. Sreekanth, A. Barthelemy, S. Codis, J.-L. Starck. *Astronomy & Astrophysics*, 2024.

Code: github.com/vilasinit/WALE

[2] Generative modeling of convergence maps based on predicted one-point statistics

V. T. Sreekanth, J.-L. Starck, S. Codis. *Astronomy & Astrophysics*, accepted.

Code: github.com/vilasinit/GOLCONDA

[3] Euclid preparation: Towards a DR1 application of higher-order weak lensing statistics

Euclid Collaboration: S. Vinciguerra, F. Bouché, N. Martinet, ..., V. T. Sreekanth, ... *arXiv:2510.04953*, 2025.

SOFTWARE

WALE	Lead developer. Theoretical predictions of the wavelet ℓ_1 -norm from Large Deviation Theory [1]; used by the community beyond the original paper.
GOLCONDA	Lead developer. Fast generative modelling of weak-lensing convergence maps from predicted one-point statistics [2].
GODMAX	Developer. JAX-based differentiable halo model for CMB $\times$ LSS predictions; being integrated into the Euclid likelihood code CLOE.

AWARDS

Excellence Master Fellowship

University of Geneva

2019 – 2021

Geneva, Switzerland

Merit fellowship (CHF 30k in total), awarded by the Faculty of Science with external partners.

Summer Research Fellowship

IISER Mohali

2017

Mohali, India

Selected for the Summer Research Internship Programme.

TECHNICAL SKILLS

Languages	Python, JAX, Bash / Unix shell, C++
Tools	CCL, CAMB, CLASS, Cobaya, emcee, GetDist, HEALPix, NaMaster, NumPy/SciPy, pandas, LATField2, Gevolution, Git/GitHub Actions (CI/CD), SLURM/HPC
Methods	Bayesian inference & MCMC, likelihood-free inference, higher-order statistics, power-spectrum & covariance estimation, CMB $\times$ LSS cross-correlations, wavelets, differentiable modelling

SELECTED TALKS, POSTERS & WORKSHOPS

Physics-Informed Machine Learning (PIML) Workshop (participant)	Heraklion, Greece	Sep 2026
Euclid Consortium Meeting (talk, CMBx splinter session)	Barcelona, Spain	May 2026
Joint TITAN-ARGOS-TOSCA Workshop (talk)	Heraklion, Greece	Jul 2025
COLOURS Workshop (talk)	Paris, France	Jun 2025
Euclid-France Meeting (talk)	Paris, France	Jan 2025
COSMO-21 (talk)	Chania, Greece	Dec 2024
Euclid Consortium Meeting (talk & poster)	Rome, Italy	Jun 2024
Euclid SWG-WL Meeting (talk)	Innsbruck, Austria	Feb 2024
Euclid-France Symposium 12 (talk)	Lyon, France	Jan 2024
Colloque national Action Dark Energy (talk)	Annecy, France	Dec 2023
Future Cosmology, École Thématique du CNRS (poster)	Cargèse, France	Apr 2023

LEADERSHIP, OUTREACH & SERVICE

LOC member , COLOURS - 2-week programme on Stage-IV survey readiness	2025
Organiser , z2C Workshop, CEA - 2-day workshop on advanced cosmology for early-career researchers	2024
Organiser , CosmoStat Journal Club - regular discussions of current cosmology research	2023 – 2025
Contributor , Euclid SWG-WL HOWLS - weak-lensing higher-order statistics	2022 – 2025
Tutor , Python & UNIX, University of Geneva - essential tools for astrophysics research	2020 – 2021
Outreach , SVNIT - astronomy talks and stargazing for high-school students	2015 – 2019