Stefano **Rinaldi**

Ph.D. Candidate · Gravitational Wave Physics

Largo Bruno Pontecorvo 3, I-56127 Pisa, Italy

stefano.rinaldi@phd.unipi.it | sterinaldi.github.io | 0000-0001-5799-4155

Education

University of Pisa

Pisa, Italy

Ph.D. in Physics — *Nov 2020 - PRESENT*

- Thesis: *Bayesian non-parametric methods for gravitational-wave astrophysics*
- Advisor: Prof. Walter Del Pozzo

University of Pisa

Pisa, Italy

M.Sc. in Physics with Honors — *Sep 2018 - Jun 18, 2020*

- Thesis: *Inference of cosmological parameters from gravitational wave observations*
- Advisor: Prof. Walter Del Pozzo

University of Pisa

Pisa, Italy

B.Sc. in Physics — *Sep 2015 - Sep 21, 2018*

- Thesis: *The Spin-Statistics Theorem*
- Advisor: Prof. Paolo Rossi

Research Interests

Gravitational Waves

General Relativity, Astrophysics, Cosmology

- Binary black hole population properties
- Inference of cosmological parameters from gravitational waves
- Lensing of gravitational waves: detection techniques
- Detector sensitivity characterisation

Astrophysics

Statistical and numerical methods

- Star cluster properties
- Gravitational N-body simulation
- Stellar evolution

Statistics

Data analysis, Bayesian statistics

- Dirichlet Process and non-parametric methods
- Model selection via non-parametric methods
- Population studies with censored data

Member of the LIGO-Virgo-KAGRA Collaboration

Virgo Collaboration

Cosmology, Rates & Population technical groups — *Oct 2019 - PRESENT*

Programming

Languages: Python, Cython, C

Other tools: git, LaTeX

GitHub profile: sterinaldi

FIGARO - Fast Inference for GW Astronomy, Research and Observations

PYTHON

Hierarchical multivariate probability density estimator based on (H)DPGMM

SOLARSYSTEM

PYTHON

2PN N-body integrator based on the Crank-Nicolson method

Teaching Experience

Physics II — *University of Pisa*
Physics Department — *Nov 2022 - PRESENT*
- Supplementary teaching with Prof. F. Fidecaro

Mathematics — *University of Pisa*
Biology Department — *Jan 2022 - Jun 2022*
- Teaching support activities with Prof. A. Maffei and Prof. F. Grotto

Linear Algebra — *University of Pisa*
Energy, Systems, Territory and Construction Engineering Department (DESTEC) — *Oct 2019 - Feb 2020*
- Teaching support activities with Prof. F. Acquistapace

Physics Laboratory II — *University of Pisa*
Physics Department — *Mar 2019 - Sep 2019*
- Teaching support activities with Prof. F. Fuso

Student Mentoring

Daniele Sanfratello — *University of Pisa*
Daily supervisor — *May 2022 - PRESENT*
- Master's thesis: *Unsupervised identification of star clusters using the Dirichlet Process Gaussian Mixture Model*

Presentations

Past, present and future of gravitational-wave astronomy — *Volterra, Italy*
Third Gravi-Gamma workshop - Invited talk — *Oct 5, 2022*

Binary black hole mass distribution, the non-parametric way — *New York, USA*
APS April Meeting - Contributed talk — *Apr 9, 2022*

Outreach

Scientific consultant for *Buco Nero* — *Napoli, Italy*
Interactive exhibit in *Spazio (al Futuro)* — *Nov 2022*

Decrittare le onde gravitazionali: l'Universo ascoltando i buchi neri — *Livorno, Italy*
ITIS "G. Galilei" - *Decrypting gravitational waves: the Universe listening to black holes* — *Jun 8, 2022*

Waves: concept and detection — *Cascina, Italy*
REINFORCE: Physics for Senior Citizen Scientists — *Nov 10, 2021*

Selected Publications

[1] Stefano Rinaldi et al. "On the determination of the constant of gravitation". In: *arXiv e-prints*, arXiv:2209.07416 (Sept. 2022), arXiv:2209.07416. arXiv: 2209.07416 [gr-qc].

[2] Stefano Rinaldi and Walter Del Pozzo. "Rapid localization of gravitational wave hosts with FIGARO". In: *MNRAS: Letters* 517.1 (Sept. 2022), pp. L5–L10. ISSN: 1745-3925. DOI: 10.1093/mnrasl/slac101.

[3] Stefano Rinaldi and Walter Del Pozzo. "(H)DPGMM: a hierarchy of Dirichlet process Gaussian mixture models for the inference of the black hole mass function". In: *MNRAS* 509.4 (Nov. 2021), pp. 5454–5466. ISSN: 0035-8711. DOI: 10.1093/mnras/stab3224.

[4] Simone Mastrogiovanni et al. "Cosmology with Gravitational Waves: A Review". In: *Annalen der Physik* (Aug. 2022), p. 2200180. DOI: 10.1002/andp.202200180.

[5] Simone Mastrogiovanni et al. "On the importance of source population models for gravitational-wave cosmology". In: *Phys. Rev. D* 104 (6 Sept. 2021), p. 062009. DOI: 10.1103/PhysRevD.104.062009.