Filippo Santoliquido

email: filippo.santoliquido@gssi.it, **website**: https://filippo-santoliquido.github.io/

Academic positions

- **Postdoctoral researcher**, *Gran Sasso Science Institute (GSSI)*, L'Aquila, Italy. Sep. 2023 - now
    - I am a postdoctoral researcher at GSSI, working within the group led by Prof. Marica Branchesi. My work focuses on developing advanced tools for population inference using data from gravitational-wave interferometers, with a special focus on applications for the Einstein Telescope
- **Postdoctoral researcher**, *University of Padova*, Padova, Italy. Jan. 2023 - Sep. 2023
    - I conducted postdoctoral research at the University of Padova as part of Prof. Michela Mapelli's group. My work involved developing simulation codes to model the merger rates of compact objects—an essential analysis for interpreting observed rates from the LIGO-Virgo interferometers and shaping the scientific case for the Einstein Telescope

Education

- **PhD student in Astrophysics**, *University of Padova*, Oct. 2019 - 3 Apr. 2023 (defence date). Including the following scientific visit:
    - *Astroparticule et Cosmologie (APC) laboratory*, Paris, France. Feb. - Jul. 2022
- **Master Student in Astronomy**, *University of Padova*, 110/110, Oct. 2017 - 26 Sep. 2019 (defence date)
- **Bachelor Student in Physics**, *University of Trento*, 104/110, Sep. 2014 - 25 Sep. 2017 (defence date)

Awards, Prizes and Grants

- **Tacchini Prize**, 2k euros, Vincitori dei premi SAIt 2023 | Società Astronomica Italiana. 25 May 2023

- **Erasmus+ Trainee Program**, *APC laboratory*, Paris, France, 2.1k euros. Feb. 2022 - Jul. 2022
- **2018 Merit award**, *University of Trento*, 4k euros. 10 Jun. 2019
- **Erasmus+ Program***, *University of Coimbra*, 2k euros. Feb. 2017 - Jul. 2017

Invited Colloquia and Seminars

- Invited speaker, Johns Hopkins *University, Baltimore*, USA. 10 Jun. 2025
- Invited speaker, GW-BO meeting, *University of Bologna*, Bologna, Italy. 11 Feb. 2025
- Invited speaker, *INFN-Cagliari*, Cagliari, Italy. 29 Nov. 2024
- Invited speaker, Department of Astronomy, *University Andrés Bello*, Santiago, Chile. 6 Aug. 2024
- Invited speaker, *INFN-Laboratori Nazionali del Gran Sasso*, L'Aquila, Italy. 22 Mar. 2024
- Invited speaker, Department of Physics, *University of Milano-Bicocca*, Milan, Italy. 22 Sep. 2022
- Invited speaker, High Energy Group Meeting, *Institut d'Astrophysique de Paris (IAP)*, Paris, France. 24 Jun. 2021
- Invited speaker, GW group meeting, *Observatoire de la Côte d'Azur*, Nice, France. 29 May - 2 Jun. 2022
- Invited speaker, *SISSA Astrophysics Colloquium*, Trieste, Italy. 13 Apr. 2021

Conferences and Workshops

1. Contributed talk at "EuCAIFCon 2025", Cagliari, Italia. 16-20 Jun. 2025
2. Poster at the workshop "Scientific Machine Learning for Gravitational Wave Astronomy", The Institute for Computational and Experimental Research in Mathematics (ICERM), Providence, USA. 2-6 Jun. 2025
3. Contributed talk at the "XV Einstein Telescope Symposium", Bologna, Italia. 26-30 May 2025
4. Contributed talk and panelist at the workshop "Challenges and future perspectives in gravitational-wave astronomy: O4 and beyond", Lorentz Center, Leiden, Netherlands. 14-18

Oct. 2024

5. Contributed talk at the annual TEONGRAV meeting, Sapienza Università di Roma, Rome, Italy. 16-20 Sep. 2024
6. Contributed talk at the 41ST LIAC, Université de Liège, Liège, Belgium. 15-19 Jul. 2024
7. Participation at the workshop "Fundamental Physics in the Era of Big Data and Machine Learning", Aspen Center for Physics, Aspen, USA. 27 May - 9 Jul. 2024
8. Contributed talk at the XIV ET Symposium, Maastricht, Netherlands. 6-10 May 2024
9. Contributed talk at the "Fourth EPS Conference on Gravitation: Black Holes", Valencia, Spain. 13-15 Nov. 2023
10. Poster at GraSP23, University of Pisa, Pisa, Italy. 24-27 Oct. 2023
11. Contributed talk at IV Gravi-Gamma-Nu workshop, Gran Sasso Science Institute, L'Aquila, Italy. 4-6 Oct. 2023
12. Panelist at GWPOPNEXT, University of Milano-Bicocca, Milan, Italy. 10-14 Jul. 2023
13. Contributed talk at XIII ET symposium, Cagliari, Italy. 8-12 May 2023
14. Contributed talk at EAS2022, annual meeting of the European Astronomical Society during the symposium: "Gravitational Wave and Multi-messenger Astronomy: current results and future perspectives", Valencia, Spain. 27 Jun. - Jul. 1 2022
15. Participation at the workshop "Bayesian Deep Learning in Astrophysics", Paris, France. 20-24 Jun. 2022
16. Contributed talk at the American Physical Society April Meeting 2022, New York City, New York, USA. 9-12 Apr. 2022
17. Contributed talk at GWday, Padova, Italy. 2 Dec. 2021
18. Contributed talk at Amaldi14, Melbourne, Australia. 19-23 Jul. 2021
19. Jun. 2021 Poster at EAS2021, annual meeting of the European Astronomical Society during the symposium: "The Birth, Life, and Death of Black Holes". Leiden, Netherlands. Jun. 28-Jul. 2 2021
20. Contributed talk at "3rd Workshop on Chemical Abundances in Gaseous Nebulae", Universidade do Vale do Paraíba, São José dos Campos, Brazil. 24-28 May 2021

21. Participation at the workshop "#4 Gravitational Wave Open Data Workshop", Virtual meeting. 10-14 May 2021
22. Contributed talk at "The fourth assembly of the Groupement de Recherche Ondes Gravitationnelles", Paris, France. 30 Mar. -1 Apr. 2021
23. Poster at 55th Rencontres de Moriond 2021, La Thuile, Italy. 9-11 Mar. 2021
24. Contributed talk at annual TEONGRAV meeting, Virtual meeting. 18 Feb. 2021
25. Poster at EAS2020, annual meeting of the European Astronomical Society during the symposium: "What have we learned from the observed population of gravitational wave sources?", Leiden, Netherlands. 29 Jun.-3 Jul. 2020
26. Invited talk at Mock Innsbruck, Innsbruck, Austria. 10-13 Mar. 2020

Referee

- Monthly Notices of the Royal Astronomical Society (MNRAS).
- The Astrophysical Journal (ApJ).

Teaching and Mentoring

- Lecturer of the course “Gravitational Wave Astrophysics” at the school “Cosmological History: from Gravitational Waves to Exoplanets”, *ICTP-SAIFR/IFT-UNESP*, São Paulo, Brazil, 4 h.
- Co-supervisor of **master thesis**:
    - Lorenzo Merli, Mar. 2022
    - Roberta Rufolo, Dec. 2021
- Co-supervisor of **PhD thesis**:
    - Ludovico Alessio De Santis, expected Dec. 2026
    - Mirko Pitzalis, expected Dec. 2026
- Physics Lab assistant, *University of Padova*, Padova, Italy, 20 h. Nov. 2021
- Laboratory of Computational Astrophysics, *University of Padova*, Padova, Italy, 12 h. Jun. 2021

- Physics Lab assistant, *University of Padova*, Padova, Italy, 20 h. Nov. 2020

Affiliations, Memberships and Collaborations

- Member of the LIGO-Virgo-KAGRA collaboration. Sep. 2023 - now
- Member of the Einstein Telescope collaboration in the Observation Science Board. Jun. 2022 - now
- Affiliated with *INFN (Istituto Nazionale di Fisica Nucleare)*:
  - *Laboratori Nazionali del Gran Sasso*. Sep. 2023 - now
  - *Padova*. Oct. 2019 - Aug. 2023

Public Outreach

- Night of Researchers, volunteer at SHARPER, *GSSI*, L'Aquila, Italy. 27 Sep. 2024
- Night of Researchers, volunteer at SHARPER, *GSSI*, L'Aquila, Italy. 29 Sep. 2023
- Night of Researchers, *University of Padova*, Virtual meeting. 27 Nov. 2020
- Guide for the Museum of History of Physics, *University of Padova*. Oct. 2018 - Mar. 2020

Technical Skills

	Programming and scripting
Advanced	Python, Jupyter notebooks, Latex
Intermediate	BASH scripting, Parallel computing (CPUs and GPUs)
Basic	PyTorch, Keras, MatLab, R, C++, SQL
	Operating Systems
Advanced	Linux, iOS, Windows
	Versioning and Cloud
Advanced	Git - see public repositories
	Main developer
	cosmo$\mathcal{R}$ate
	galaxy$\mathcal{R}$ate
	ET_classifier

I also usually run on High Performance Computing (HPC) machines, such as the servers of the LIGO data grid

Schools and Programs

- Introduction to Deep Learning, CINECA, Rome, Italy. 10-12 Apr. 2024
- ML-INFN Hackathon: Advanced Level, *INFN-Bari*, Italy. 21-24 Nov. 2022
- Hands-on machine learning course with Python, *OAPd*, Padova, Italy. Oct. 2022
- First ML-INFN Hackathon, *INFN-Firenze-Pisa-CNAF*, Italy. 7-9 Jun. 2021
- Summer School in Statistics for Astronomers XVI, *Penn State University*, USA. 1-5 Jun. 2021
- Gravitational waves: a new messenger to explore the universe, *IHP*, Paris, France. 1 Mar.-9 Apr. 2021
- SIGRAV school, Rome, Italy. 1-5 Feb. 2021

- Multi Messenger Astrophysics School, Asiago, Italy. 14-23 Jan. 2020

Languages

Italian Native speaker, **English** Excellent

List of Publications

ADS, ORCID, Google Scholar

Summary of Publications

Total publications	43
Total publications as first author	8
Refereed publications	38
Refereed publications as first author	6
Total number of citations	2199
Total number of citations as first author	346
h-index	25
h-index as first author	5

Data taken from ADS on 7 June 2025

First-author peer-reviewed publications

1. *Classifying binary black holes from Population III stars with the Einstein Telescope: A machine-learning approach*, Santoliquido et al., A&A 690 10/2024, 10.1051/0004-6361/202450381
2. *Correction to: Binary black hole mergers from population III stars: uncertainties from star formation and binary star properties*, Santoliquido et al., MNRAS 528(1), 02/2024, 10.1093/mnras/stad3969
3. *Binary black hole mergers from population III stars: uncertainties from star formation and binary star properties*, Santoliquido et al., MNRAS 524(1), 09/2023, 10.1093/mnras/stad1860

4. *Modelling the host galaxies of binary compact object mergers with observational scaling relations*, Santoliquido et al., MNRAS 516(3), 11/2022, 10.1093/mnras/stac2384
5. *The cosmic merger rate density of compact objects: impact of star formation, metallicity, initial mass function, and binary evolution*, Santoliquido et al., MNRAS 502(4), 04/2021, 10.1093/mnras/stab280
6. *The Cosmic Merger Rate Density Evolution of Compact Binaries Formed in Young Star Clusters and in Isolated Binaries*, Santoliquido et al., ApJ 898(2), 08/2020, 10.3847/1538-4357/ab9b78

Other peer-reviewed publications

7. *Search for Gravitational Waves Emitted from SN 2023ixf*, Abac et al., ApJ 985(2), 06/2025, 2025ApJ...985..183A.
8. *Prospects for optical detections from binary neutron star mergers with the next-generation multi-messenger observatories*, Loffredo et al., A&A 697 05/2025, 2025A&A...697A..36L.
9. *Search for Continuous Gravitational Waves from Known Pulsars in the First Part of the Fourth LIGO-Virgo-KAGRA Observing Run*, Abac et al., ApJ 983(2), 04/2025, 2025ApJ...983...99A.
10. *A new prescription for the spectral properties of population III stellar populations*, Lecroq et al., A&A 695 03/2025, 2025A&A...695A..17L.
11. *Validating prior-informed Fisher-matrix analyses against GWTC data*, Dupletsa et al., PhRvD 111(2), 01/2025, 2025PhRvD.111b4036D.
12. *A Search Using GEO600 for Gravitational Waves Coincident with Fast Radio Bursts from SGR 1935+2154*, Abac et al., ApJ 977(2), 12/2024, 10.3847/1538-4357/ad8de0
13. *Gravitational waves from mergers of Population III binary black holes: roles played by two evolution channels*, Liu et al., MNRAS 534(3), 11/2024, 10.1093/mnras/stae2120
14. *Binary black hole mergers from Population III star clusters*, Mestichelli et al., A&A 690 10/2024, 10.1051/0004-6361/202450667
15. *Observation of Gravitational Waves from the Coalescence of a 2.5–4.5 M ⊙ Compact Object and a Neutron Star*, Abac et al., ApJL 970(2), 08/2024, 10.3847/2041-8213/ad5beb
16. *Binary Black Hole Spins: Model Selection with GWTC-3*, Périgois et al., Univ 9(12), 12/2023, 10.3390/universe9120507

17. *Massive binary black holes from Population II and III stars*, Costa et al., MNRAS 525(2), 10/2023, 10.1093/mnras/stad2443

18. *Pre-merger alert to detect prompt emission in very-high-energy gamma-rays from binary neutron star mergers: Einstein Telescope and Cherenkov Telescope Array synergy*, Banerjee et al., A&A 678 10/2023, 10.1051/0004-6361/202345850

19. *Compact object mergers: exploring uncertainties from stellar and binary evolution with SEVN*, Iorio et al., MNRAS 524(1), 09/2023, 10.1093/mnras/stad1630

20. *Science with the Einstein Telescope: a comparison of different designs*, Branchesi et al., JCAP 2023(7), 07/2023, 10.1088/1475-7516/2023/07/068

21. *Perspectives for multimessenger astronomy with the next generation of gravitational-wave detectors and high-energy satellites*, Ronchini et al., A&A 665 09/2022, 10.1051/0004-6361/202243705

22. *Prospects for multimessenger detection of binary neutron star mergers in the fourth LIGO-Virgo-KAGRA observing run*, Patricelli et al., MNRAS 513(3), 07/2022, 10.1093/mnras/stac1167

23. *Gravitational background from dynamical binaries and detectability with 2G detectors*, Périgois et al., PhRvD 105(10), 05/2022, 10.1103/PhysRevD.105.103032

24. *Host galaxies and electromagnetic counterparts to binary neutron star mergers across the cosmic time: detectability of GW170817-like events*, Perna et al., MNRAS 512(2), 05/2022, 10.1093/mnras/stac685

25. *The cosmic evolution of binary black holes in young, globular, and nuclear star clusters: rates, masses, spins, and mixing fractions*, Mapelli et al., MNRAS 511(4), 04/2022, 10.1093/mnras/stac422

26. *Compact object mergers in hierarchical triples from low-mass young star clusters*, Trani et al., MNRAS 511(1), 02/2022, 10.1093/mnras/stac122

27. *GW190521 formation via three-body encounters in young massive star clusters*, Dall'Amico et al., MNRAS 508(2), 12/2021, 10.1093/mnras/stab2783

28. *New insights on binary black hole formation channels after GWTC-2: young star clusters versus isolated binaries*, Bouffanais et al., MNRAS 507(4), 11/2021, 10.1093/mnras/stab2438

29. *Dynamics of binary black holes in low-mass young star clusters*, Rastello et al., MNRAS 507(3), 11/2021, 10.1093/mnras/stab2355

30. *Mass and Rate of Hierarchical Black Hole Mergers in Young, Globular and Nuclear Star Clusters*, Mapelli et al., Symm 13(9), 09/2021, 10.3390/sym13091678

31. *Constraining accretion efficiency in massive binary stars with LIGO -Virgo black holes*, Bouffanais et al., MNRAS 505(3), 08/2021, 10.1093/mnras/stab1589

32. *Hierarchical black hole mergers in young, globular and nuclear star clusters: the effect of metallicity, spin and cluster properties*, Mapelli et al., MNRAS 505(1), 07/2021, 10.1093/mnras/stab1334

33. *Binary black holes in young star clusters: the impact of metallicity*, Di Carlo et al., MNRAS 498(1), 10/2020, 10.1093/mnras/staa2286

34. *Dynamics of black hole-neutron star binaries in young star clusters*, Rastello et al., MNRAS 497(2), 09/2020, 10.1093/mnras/staa2018

35. *Binary black holes in the pair instability mass gap*, Di Carlo et al., MNRAS 497(1), 09/2020, 10.1093/mnras/staa1997

36. *An astrophysically motivated ranking criterion for low-latency electromagnetic follow-up of gravitational wave events*, Artale et al., MNRAS 495(2), 06/2020, 10.1093/mnras/staa1252

37. *Host galaxies of merging compact objects: mass, star formation rate, metallicity, and colours*, Artale et al., MNRAS 487(2), 08/2019, 10.1093/mnras/stz1382

38. *The properties of merging black holes and neutron stars across cosmic time*, Mapelli et al., MNRAS 487(1), 07/2019, 10.1093/mnras/stz1150

Other publications

39. *The Science of the Einstein Telescope*, Abac et al., arXiv 03/2025, 2025arXiv250312263A.

40. *The more accurately we model the metal-dependent star formation rate, the larger the predicted excess of binary black hole mergers*, Sgalletta et al., arXiv 10/2024, 10.48550/arXiv.2410.21401

41. *Erratum: Prospects for multimessenger detection of binary neutron star mergers in the fourth LIGO-Virgo-KAGRA observing run*, Patricelli et al., MNRAS 514(3), 08/2022, 10.1093/mnras/stac1668

42. *The evolution of compact object mergers and their host galaxies across cosmic time*, Santoliquido et al., APS..APRD 2022 04/2022, (https://ui.adsabs.harvard.edu/abs/2022APS..APRD15008S)