

Filippo Santoliquido

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Academic positions

Sep. 2023 - **Postdoctoral researcher**, *Gran Sasso Science Institute (GSSI)*, L'Aquila, Italy.
Jan. 2023 - Sep. 2023 **Postdoctoral researcher**, *University of Padova*.

Education

Oct. 2019 - Apr. 2023 **PhD student in Astrophysics**, *University of Padova*.
Oct. 2017 - Sep. 2019 **Master Student in Astronomy**, *University of Padova*, 110/110.
Sep. 2014 - Sep. 2017 **Bachelor Student in Physics**, *University of Trento*, 104/110.

Scientific visits

Feb. 1 - Jul. 31 2022 **Astroparticule et Cosmologie laboratory**, Paris, France.
May. 30 - Jun. 2 **Observatoire de la Côte d'Azur**, Nice, France.

Awards, Prizes and Grants

May 2023 **Tacchini Prize**, 2k euros, <https://www.sait.it/node/751>.
Oct. 2019 - **Travel grants**, 1.2k euros.
In the next section, I mark with a * conferences and seminars for which I was assigned a travel grant or some sort of financial aid
Feb. 2022 - Jul. 2022 **Erasmus+ Trainee Programme**, *APC laboratory*, Paris, France, 2.1k euros.
Jun. 2019 **Merit award**, *University of Trento*, 4k euros.
Feb. 2017 - Jul. 2017 **Erasmus+ Programme**, *University of Coimbra*, 2k euros.

Invited Colloquia and Seminars

Sep. 22, 2022 * **Invited speaker at University of Milano-Bicocca**.
Jun. 24, 2021 **Invited speaker at the Institut d'Astrophysique de Paris (IAP)**, Paris, France.
Apr. 13, 2021 **Invited speaker at SISSA Astrophysics Colloquium**, Trieste, Italy.

Conferences and Workshops

May 2023 **Contributed Talk at XIII ET symposium**, Cagliari, Italy.
Jun. 27- Jul. 1, 2022 **Contributed Talk at EAS2022**, Valencia, Spain.
Annual meeting of the European Astronomical Society. I held a talk at the symposium: "Gravitational Wave and Multi-messenger Astronomy: current results and future perspectives".
Apr. 6-9, 2022 **Contributed Talk at APS meeting**, New York City, New York, USA.
Jun. 20 - 24, 2022 * **Bayesian Deep Learning in Astrophysics**, Paris, France.
Dec. 2, 2021 **Contributed Talk at GWday**, Padova, Italy.

- Jul. 19-23, 2021 **Contributed Talk at Amaldi14**, Melbourne, Australia.
- Jun. 28 - Jul. 2, 2021 **Poster at EAS2021**, Leiden, Netherlands.
Annual meeting of the European Astronomical Society. I presented a poster at the symposium: "The Birth, Life, and Death of Black Holes".
- May 24-28, 2021 **Contributed Talk at 3rd Workshop on Chemical Abundances in Gaseous Nebulae**, Universidade do Vale do Paraíba, São José dos Campos, Brazil.
- May 10-14, 2021 **#4 Gravitational Wave Open Data Workshop**, Virtual meeting.
- Mar. 30 - Apr. 1, 2021 *** Contributed Talk at The fourth assembly of the Groupement de Recherche Ondes Gravitationnelles**, Paris, France.
- Mar. 9-11, 2021 **Poster at 55th Rencontres de Moriond 2021**, La Thuile, Italy.
- Feb. 18, 2021 **Contributed Talk at annual TEONGRAV meeting**, Virtual meeting.
- Jun. 29 - Jul. 3, 2020 **Poster at EAS2020**, Leiden, Netherlands.
Annual meeting of the European Astronomical Society. I presented a poster at the symposium: "What have we learned from the observed population of gravitational wave sources?".
- Mar. 10-13, 2020 **Invited talk at Mock Innsbruck**, Innsbruck, Austria.

Referee

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

Teaching and Mentoring

- Mar. 2022 **Co-supervisor of Lorenzo Merli's master thesis.**
- Dec. 2021 **Co-supervisor of Roberta Rufolo's master thesis.**
- Nov. 2021 **Physics Lab assistant**, (20 h/yr).
- Jun. 2021 **Laboratory of Computational Astrophysics**, (12 h/yr).
- Nov. 2020 **Physics Lab assistant**, (20 h/yr).

Affiliations, Memberships and Collaborations

- Jun. 2022 **Einstein Telescope**, *Observation Science Board.*
- Apr. 2022 **AAS**, *American Astronomical Society.*
- Apr. 2021 **EAS**, *European Astronomical Society.*
- Oct. 2019 **INFN**, *Istituto Nazionale di Fisica Nucleare.*
- May 2018 **SIF**, *Società Italiana di Fisica.*

Public Outreach

- Nov. 27, 2020 **Night of Researchers**, Virtual meeting.
- Oct. 2018 - Mar. 2020 **Guide for the Museum of History of Physics**, *University of Padova.*

Technical Skills

Programming and scripting

Advanced Python, Jupyter notebooks
Intermediate MatLab[®], R, C++, SQL, BASH scripting

Other software

Advanced Latex
Intermediate Excel[®] or equivalently Numbers[®],
Basic Parallel computing (CPUs)

Operating Systems

Advanced Linux, iOS, Windows

Versioning and Cloud

Intermediate Git (see ongoing public projects [here](#)), Google Drive

Main developer

COSMORATE ([Santoliquido et al. 2020](#)) written in Python, COSMORATE evaluates the astrophysical rates of compact object mergers and the evolution of their properties across cosmic time. It combines catalogues obtained through any formation channel with an observational-based prescription of the metallicity-dependent star formation rate. It is open source and available on GitLab at https://gitlab.com/Filippo.santoliquido/cosmo_rate_public

GALAXYRATE ([Santoliquido et al. 2022](#)) written in Jupyter Notebooks, GALAXYRATE is a unique tool for studying in an unravelled fast way the properties of host galaxies of compact object mergers with a minimal set of assumptions on observational scaling relations. It is open source and available on GitLab at https://gitlab.com/Filippo.santoliquido/galaxy_rate_open

HPC

Intermediate I usually run on High Performance Computing (HPC) machines using SLURM as a scheduler

Schools and Programs

- Nov. 2022 **ML-INFN Hackathon: Advanced Level**, INFN Bari, Italy.
- Oct. 2022 **Hands-on machine learning course with Python**, OAPd, Padova, Italy.
- Jun. 7 - 9, 2021 **First ML-INFN Hackathon**, INFN Firenze-Pisa-CNAF, Italy.
- Jun. 1 - 5, 2021 **Summer School in Statistics for Astronomers XVI**, Penn State University, USA.
- Mar. 1 - Apr. 1, 2021 * **Gravitational waves: a new messenger to explore the universe**, IHP, Paris, France.
- Feb. 1-5, 2021 **SIGRAV school**, Rome, Italy.
- Jan. 14-23, 2020 **Multi Messenger Astrophysics School**, Asiago, Italy.
- Sep. 17-21, 2018 * **International School of Space Science**, GSSI, L'Aquila, Italy.

Languages

Italian Native speaker
English Excellent

French Basic
Portuguese Basic
Chinese Extremely Basic

List of Publications

ADS [See here for an interactive and most updated list of publications](#)
ORCID <https://orcid.org/0000-0003-3752-1400>
Google Scholar

Summary of Publications

29 Total publications
5 Total publications as first author
22 Refereed publications
3 Refereed publications as first author
907 Total number of citations
169 Total number of citations as first author
15 h-index
3 h-index as first author

Data from [ADS](#) taken on April 6, 2023

First-author peer-reviewed publications

- [1] **Santoliquido, Filippo**, Michela Mapelli, Giuliano Iorio, Guglielmo Costa, Simon C. O. Glover, Tilman Hartwig, Ralf S. Klessen, and Lorenzo Merli. Binary black hole mergers from population III stars: Uncertainties from star formation and binary star properties. *MNRAS*, June 2023.
- [2] **Santoliquido, Filippo**, Michela Mapelli, M. Celeste Artale, and Lumen Boco. Modelling the host galaxies of binary compact object mergers with observational scaling relations. *MNRAS*, 516(3):3297–3317, November 2022.
- [3] **Santoliquido, Filippo**, Michela Mapelli, Nicola Giacobbo, Yann Bouffanais, and M. Celeste Artale. The cosmic merger rate density of compact objects: impact of star formation, metallicity, initial mass function, and binary evolution. *MNRAS*, 502(4):4877–4889, April 2021.
- [4] **Santoliquido, Filippo**, Michela Mapelli, Yann Bouffanais, Nicola Giacobbo, Ugo N. Di Carlo, Sara Rastello, M. Celeste Artale, and Alessandro Ballone. The Cosmic Merger Rate Density Evolution of Compact Binaries Formed in Young Star Clusters and in Isolated Binaries. *ApJ*, 898(2):152, August 2020.

Other peer-reviewed publications

- [5] S. Ronchini, M. Branchesi, G. Oganessian, B. Banerjee, U. Dupletsa, G. Ghirlanda, J. Harms, M. Mapelli, and **Santoliquido, F.** Perspectives for multimessenger astronomy with the next generation of gravitational-wave detectors and high-energy satellites. *Astronomy and Astrophysics*, 665:A97, September 2022.
- [6] Barbara Patricelli, Maria Grazia Bernardini, Michela Mapelli, Paolo D'Avanzo, **Santoliquido,**

Filippo, Giancarlo Cella, Massimiliano Razzano, and Elena Cuoco. Erratum: Prospects for multimessenger detection of binary neutron star mergers in the fourth LIGO-Virgo-KAGRA observing run. *MNRAS*, 514(3):3395–3395, August 2022.

- [7] Barbara Patricelli, Maria Grazia Bernardini, Michela Mapelli, Paolo D’Avanzo, **Santoliquido, Filippo**, Giancarlo Cella, Massimiliano Razzano, and Elena Cuoco. Prospects for multimessenger detection of binary neutron star mergers in the fourth LIGO-Virgo-KAGRA observing run. *MNRAS*, 513(3):4159–4168, July 2022.
- [8] Carole P  rigois, **Santoliquido, Filippo**, Yann Bouffanais, Ugo N. Di Carlo, Nicola Giacobbo, Sara Rastello, Michela Mapelli, and Tania Regimbau. Gravitational background from dynamical binaries and detectability with 2G detectors. *Physical Review D*, 105(10):103032, May 2022.
- [9] Rosalba Perna, M. Celeste Artale, Yi-Han Wang, Michela Mapelli, Davide Lazzati, Cecilia Sgalletta, and **Santoliquido, Filippo**. Host galaxies and electromagnetic counterparts to binary neutron star mergers across the cosmic time: detectability of GW170817-like events. *MNRAS*, 512(2):2654–2668, May 2022.
- [10] Michela Mapelli, Yann Bouffanais, **Santoliquido, Filippo**, Manuel Arca Sedda, and M. Celeste Artale. The cosmic evolution of binary black holes in young, globular, and nuclear star clusters: rates, masses, spins, and mixing fractions. *MNRAS*, 511(4):5797–5816, April 2022.
- [11] Alessandro A. Trani, Sara Rastello, Ugo N. Di Carlo, **Santoliquido, Filippo**, Ataru Tanikawa, and Michela Mapelli. Compact object mergers in hierarchical triples from low-mass young star clusters. *MNRAS*, 511(1):1362–1372, February 2022.
- [12] Marco Dall’Amico, Michela Mapelli, Ugo N. Di Carlo, Yann Bouffanais, Sara Rastello, **Santoliquido, Filippo**, Alessandro Ballone, and Manuel Arca Sedda. GW190521 formation via three-body encounters in young massive star clusters. *MNRAS*, 508(2):3045–3054, December 2021.
- [13] Yann Bouffanais, Michela Mapelli, **Santoliquido, Filippo**, Nicola Giacobbo, Ugo N. Di Carlo, Sara Rastello, M. Celeste Artale, and Giuliano Iorio. New insights on binary black hole formation channels after GWTC-2: young star clusters versus isolated binaries. *MNRAS*, 507(4):5224–5235, November 2021.
- [14] Sara Rastello, Michela Mapelli, Ugo N. Di Carlo, Giuliano Iorio, Alessandro Ballone, Nicola Giacobbo, **Santoliquido, Filippo**, and Stefano Torniamenti. Dynamics of binary black holes in low-mass young star clusters. *MNRAS*, 507(3):3612–3625, November 2021.
- [15] Michela Mapelli, **Santoliquido, Filippo**, Yann Bouffanais, Manuel Arca Arca Sedda, Maria Celeste Artale, and Alessandro Ballone. Mass and Rate of Hierarchical Black Hole Mergers in Young, Globular and Nuclear Star Clusters. *Symmetry*, 13(9):1678, September 2021.
- [16] Yann Bouffanais, Michela Mapelli, **Santoliquido, Filippo**, Nicola Giacobbo, Giuliano Iorio, and Guglielmo Costa. Constraining accretion efficiency in massive binary stars with LIGO-Virgo black holes. *MNRAS*, 505(3):3873–3882, August 2021.

- [17] Michela Mapelli, Marco Dall'Amico, Yann Bouffanais, Nicola Giacobbo, Manuel Arca Sedda, M. Celeste Artale, Alessandro Ballone, Ugo N. Di Carlo, Giuliano Iorio, **Santoliquido, Filippo**, and Stefano Torniamenti. Hierarchical black hole mergers in young, globular and nuclear star clusters: the effect of metallicity, spin and cluster properties. *MNRAS*, 505(1):339–358, July 2021.
- [18] Ugo N. Di Carlo, Michela Mapelli, Nicola Giacobbo, Mario Spera, Yann Bouffanais, Sara Rastello, **Santoliquido, Filippo**, Mario Pasquato, Alessandro Ballone, Alessandro A. Trani, Stefano Torniamenti, and Francesco Haardt. Binary black holes in young star clusters: the impact of metallicity. *MNRAS*, 498(1):495–506, October 2020.
- [19] Sara Rastello, Michela Mapelli, Ugo N. Di Carlo, Nicola Giacobbo, **Santoliquido, Filippo**, Mario Spera, Alessandro Ballone, and Giuliano Iorio. Dynamics of black hole-neutron star binaries in young star clusters. *MNRAS*, 497(2):1563–1570, September 2020.
- [20] Ugo N. Di Carlo, Michela Mapelli, Yann Bouffanais, Nicola Giacobbo, **Santoliquido, Filippo**, Alessandro Bressan, Mario Spera, and Francesco Haardt. Binary black holes in the pair instability mass gap. *MNRAS*, 497(1):1043–1049, September 2020.
- [21] M. Celeste Artale, Yann Bouffanais, Michela Mapelli, Nicola Giacobbo, Nadeen B. Sabha, **Santoliquido, Filippo**, Mario Pasquato, and Mario Spera. An astrophysically motivated ranking criterion for low-latency electromagnetic follow-up of gravitational wave events. *MNRAS*, 495(2):1841–1852, June 2020.
- [22] M. Celeste Artale, Michela Mapelli, Nicola Giacobbo, Nadeen B. Sabha, Mario Spera, **Santoliquido, Filippo**, and Alessandro Bressan. Host galaxies of merging compact objects: mass, star formation rate, metallicity, and colours. *MNRAS*, 487(2):1675–1688, August 2019.
- [23] Michela Mapelli, Nicola Giacobbo, **Santoliquido, Filippo**, and Maria Celeste Artale. The properties of merging black holes and neutron stars across cosmic time. *MNRAS*, 487(1):2–13, July 2019.

Other publications

- [24] Marica Branchesi, Michele Maggiore, David Alonso, Charles Badger, Biswajit Banerjee, Freija Beirnaert, Swetha Bhagwat, Guillaume Boileau, Ssohrab Borhanian, Daniel David Brown, Man Leong Chan, Giulia Cusin, Stefan L. Danilishin, Jerome Degallaix, Valerio De Luca, Arnab Dhani, Tim Dietrich, Ulyana Dupletsa, Stefano Foffa, Gabriele Franciolini, Andreas Freise, Gianluca Gemme, Boris Goncharov, Archisman Ghosh, Francesca Gulminelli, Ish Gupta, Pawan Kumar Gupta, Jan Harms, Nandini Hazra, Stefan Hild, Tanja Hinderer, Ik Siong Heng, Francesco Iacovelli, Justin Janquart, Kamiel Janssens, Alexander C. Jenkins, Chinmay Kalaghatgi, Xhesika Korovesi, Tjonnie G. F. Li, Yufeng Li, Eleonora Loffredo, Elisa Maggio, Michele Mancarella, Michela Mapelli, Katarina Martinovic, Andrea Maselli, Patrick Meyers, Andrew L. Miller, Chiranjib Mondal, Niccolò Muttoni, Harsh Narola, Micaela Oertel, Gor Oganessian, Costantino Pacilio, Cristiano Palomba, Paolo Pani, Antonio Pasqualetti, Albino Perego, Carole Pèrigois, Mauro Pieroni, Ornella Juliana Piccinni, Anna Puecher, Paola Puppo, Angelo Ricciardone, Antonio Riotto, Samuele Ronchini, Mairi Sakellariadou, Anuradha Samajdar, **Santoliquido, Filippo**, B. S. Sathyaprakash, Jessica Steinlechner, Sebastian Steinlechner, Andrei Utina, Chris Van Den Broeck, and Teng Zhang.

Science with the Einstein Telescope: a comparison of different designs. *arXiv e-prints*, page arXiv:2303.15923, March 2023.

- [25] **Santoliquido, Filippo**, Michela Mapelli, Giuliano Iorio, Guglielmo Costa, Simon C. O. Glover, Tilman Hartwig, Ralf S. Klessen, and Lorenzo Merli. Binary black hole mergers from Population III stars: uncertainties from star formation and binary star properties. *arXiv e-prints*, page arXiv:2303.15515, March 2023.
- [26] Guglielmo Costa, Michela Mapelli, Giuliano Iorio, **Santoliquido, Filippo**, Gastón J. Escobar, Ralf S. Klessen, and Alessandro Bressan. Massive binary black holes from Population II and III stars. *arXiv e-prints*, page arXiv:2303.15511, March 2023.
- [27] Carole Pérois, Michela Mapelli, **Santoliquido, Filippo**, Yann Bouffanais, and Roberta Rufolo. Binary black hole spins: model selection with GWTC-3. *arXiv e-prints*, page arXiv:2301.01312, January 2023.
- [28] Biswajit Banerjee, Gor Oganessian, Marica Branchesi, Ulyana Dupletsa, Felix Aharonian, Francesco Brighenti, Boris Goncharov, Jan Harms, Michela Mapelli, Samuele Ronchini, and **Santoliquido, Filippo**. Detecting VHE prompt emission from binary neutron-star mergers: ET and CTA synergies. *arXiv e-prints*, page arXiv:2212.14007, December 2022.
- [29] Giuliano Iorio, Guglielmo Costa, Michela Mapelli, Mario Spera, Gastón J. Escobar, Cecilia Sgalletta, Alessandro A. Trani, Erika Korb, **Santoliquido, Filippo**, Marco Dall’Amico, Nicola Gaspari, and Alessandro Bressan. Compact object mergers: exploring uncertainties from stellar and binary evolution with SEVN. *arXiv e-prints*, page arXiv:2211.11774, November 2022.
- [30] **Santoliquido, Filippo**. The evolution of compact object mergers and their host galaxies across cosmic time. In *APS April Meeting Abstracts*, volume 2022 of *APS Meeting Abstracts*, page D15.008, April 2022.