ULYANA DUPLETSA

PhD Candidate in Astroparticle Physics

CONTACT INFO

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ABOUT ME

Theoretical astrophysicist, studying gravitational waves from compact binary systems to probe the universe's expansion history, both with future, such as the Einstein Telescope, and current, the LIGO-Virgo-KAGRA Collaboration gravitational-wave detectors. Research interests include gravitational-wave astronomy, data analysis, and Bayesian statistics.

CURRENT POSITION

PhD in Astroparticle Physics **2020-*current***

Gran Sasso Science Institute | *L'Aquila, Italy*

- Research topic: "Gravitational-wave Cosmology with Compact Binaries"
- Advisor: Jan Harms

EDUCATION

Master's degree in Theoretical Physics **2017-2019**

University of Milano Bicocca | *Milan, Italy*

- Thesis title: "Thermodynamic Aspects of AdS_4 Black Holes in $N = 2$ Gauged Supergravity"
- Advisor: Alberto Zaffaroni
- Final degree grade: 110/110 cum Laude

Bachelor's Degree in Physics **2013-2017**

The University of Milano Bicocca | *Milan, Italy*

- Thesis title: "Supermassive Binary Black Holes and their Dynamics in Galactic Nuclei"
- Advisor: Monica Colpi
- Final degree grade: 110/110 cum Laude

TEACHING EXPERIENCE

Private Tutoring **2012-2020**

- Mentoring of high-school and university students on various subjects mainly in maths and physics

VISITINGS

University of Cagliari **22-26 Apr, 2024**
Cagliari, Italy

- Invited seminar on 'ET forecasts on cosmological growth of BH masses'

Johns Hopkins University **Oct-Nov, 2023**
Baltimore, United States

- Collaboration with Emanuele Berti's group as part of the exchange program MAECI MUR organized by professor Andrea Maselli

PHD SCHOOLS

Scientific Communication in Astronomy School **2-6 Oct, 2023**
Bertinoro, Italy

First EuCapt School in Cosmology **18-22 Sept, 2023**
Valencia, Spain

Amaldi Research Center Summer School **5-9 Sept, 2022**
Paestum, Italy

The Onassis Foundation Science Lectures in Physics: Gravitational Waves **25-29 Jul, 2022**
Heraklion, Crete

PUBLICATIONS

Short Author-List Papers

10. *"Validating Prior-informed Fisher-matrix Analyses against GWTC Data"* **U. Dupletsa**, J. Harms, J. Tissino, F. Santoliquido, A. Cozzumbo; 2024, arXiv:2404.16103 [gr-qc]

9. *"Classifying binary black holes from Population III stars with the Einstein Telescope: a machine-learning approach"* F. Santoliquido, **U. Dupletsa**, J. Tissino, M. Branchesi, F. Iacovelli, G. Iorio, M. Mapelli, D. Gerosa, J. Harms and M. Pasquato ; 2024, arXiv:2404.10048 [astro-ph.HE]

8. *"The Wide-field Spectroscopic Telescope (WST) Science White Paper"* V. Mainieri et al. incl. **U. Dupletsa**; 2024, arXiv:2403:05398 [astro-ph.IM]

7. *"Phenomenological models of Cosmic Ray transport in Galaxies"* C. Evoli and **U. Dupletsa**; 2023, in *Proceedings of the International School of Physics "Enrico Fermi"*, Volume 208: Foundations of Cosmic Ray Astrophysics, arXiv:2309.00298 [astro-ph.HE]

6. *"Science with the Einstein Telescope: a comparison of different designs"* M. Branchesi, M. Maggiore et al. incl. **U. Dupletsa**; *JCAP* 07 (2023) 068, DOI:10.1088/1475-7516/2023/07/068, arXiv:2303.15923 [gr-qc] [astro-ph.CO] [astro-ph.HE]

5. *"Pre-merger alert to detect the very-high-energy prompt emission from binary neutron-star mergers: Einstein Telescope and Cherenkov Telescope Array synergy"*,
B. Banerjee, G. Oganesyan, M. Branchesi, **U. Dupletsa**, F. Aharonian, F. Brighenti, B. Goncharov, J. Harms, M. Mapelli, S. Ronchini, F. Santoliquido
Astronomy and Astrophysics, Vol. 678, DOI:10.1051/0004-6361/202345850 arXiv:2212.14007 [astro-ph.HE]

4. *"Measuring properties of primordial black hole mergers at cosmological distances: effect of higher order modes in gravitational waves"*,
K. K. Y. Ng, B. Goncharov, S. Chen, S. Borhanian, **U. Dupletsa**, G. Franciolini, M. Branchesi, J. Harms, M. Maggiore, A. Riotto, B. S. Sathyaprakash, S. Vitale, Phys. Rev. D 107, 024041,
DOI:10.1103/PhysRevD.107.024041, arXiv:2210.03132 [astro-ph.HE] [gr-qc]

3. *"GWFish: A simulation software to evaluate parameter-estimation capabilities of gravitational-wave detector networks"*
U. Dupletsa, J. Harms, B. Banerjee, M. Branchesi, B. Goncharov, A. Maselli, A. C. S. Oliveira, S. Ronchini, J. Tissino; *Astronomy and Computing* (2023), DOI:10.1016/j.ascom.2022.100671, arXiv:2205.02499 [gr-qc]
[github link: github.com/janosch314/GWFish]

2. *"Perspectives for multi-messenger astronomy with the next generation of gravitational-wave detectors and high-energy satellites"*,
S. Ronchini, M. Branchesi, G. Oganesyan, B. Banerjee, **U. Dupletsa**, G. Ghirlanda, J. Harms, M. Mapelli, F. Santoliquido;*Astronomy & Astrophysics* (2022), Volume 665, A97, DOI:10.1051/0004-6361 /202243705, arXiv:2108.07276 [astro-ph.HE]

1. *"On the single-event-based identification of primordial black hole mergers at cosmological distances"*,
K. K. Y. Ng, S. Chen, B. Goncharov, **U. Dupletsa**, S. Borhanian, M. Branchesi, J. Harms, M. Maggiore, B. S. Sathyaprakash, S. Vitale; ApJL 931 L12 (2022), DOI 10.3847/2041-8213/ac6bea, arXiv:2108.07276 [gr-qc], [hep-ph]

20+ Collaboration Papers inside the LVK Collaboration [see complete list here]

SELECTED CONFERENCES & SEMINARS

Linking Advances in our Understanding of Theoretical Astrophysics and Relativity to Observations (LAUTARO) **17-19 Apr, 2024**
Milano-Bicocca, Italy

- Contributed talk on *'Enhancing Fisher Matrix Results with Physically Motivated Priors'*

ET: Scienza e Tecnologia in Italia **20-23 Feb, 2024**
Assisi, Italy

- School lecture on *'GWFish: Simulation of gravitational-wave detector networks with Fisher-matrix PE'*

LIGO-Virgo-KAGRA Collaboration Meeting **11-14 Sept, 2023**
Toyama, Japan

- **contributed talk**: *"Mock Data Challenge - Analysis with icarogw"*

Amaldi 15 **17-21 Jul, 2023**
[online]

- **contributed talk**: *"Forecasting detection and parameter estimation capabilities for different ET designs in a multi-messenger context"*

Gravitational-wave populations: what's next? Workshop **10-14 Jul, 2023**
Milan, Italy

- **contributed short talk**: *"GWFish - a Fisher Matrix Software"*

Gravitational Wave Advanced Detector Workshop **22-26 May, 2023**
Isola d'Elba, Italy

- **invited talk**: *"Forecasting the Detection and Parameter Estimation Capabilities for different ET Designs"*

XIII ET Symposium **8-12 May, 2023**
Cagliari, Italy

- **invited talk**: *"Fisher Information Matrix for ET Forecasts: How Informative is it?"*
- organization of tutorial session on *"GWFish - a Fisher Matrix Analysis Software"*

OSB3 Monthly meeting **14 Mar, 2023**
[online]

- **presentation** on *"GWFish - a Fisher Matrix Analysis Software"*

OSB9 Monthly meeting **10 Mar, 2023**
[online]

- **presentation** on *"Fisher Matrix Analysis - adding Priors"*

LIGO-Virgo-KAGRA Collaboration Meeting **12-16 Sep, 2022**
Cardiff

- **poster**: *"GWFish - A simulation software to evaluate parameter-estimation capabilities of gravitational-wave detector networks"*

MEMBERSHIPS

LIGO-Virgo-KAGRA Collaboration

- **CBC Cosmology Group**

Einstein Telescope Collaboration

- Observational Science Board: **Cosmology**
- Observational Science Board: **Multi-Messenger Astrophysics**
- Observational Science Board: **Common Tools**

SKILLS

Programming languages

- Python (advanced)
- C/C++, Mathematica (intermediate)
- Bash, SQL (basic)

Sowtfare and Tools	• LaTeX • `git`
Languages	• Italian (native) • Ukrainian (native) • English (advanced)

OUTREACH ACTIVITIES

SHARPER | *L'Aquila, Italy*

- Yearly participation to the outreach activities of the European Researchers' Night (24 September 2021, 30 September 2022 and 29 September 2023)

PhTea Talks | *L'Aquila, Italy*

- Co-organizer of informal talks for PhD students
- talk *"A Hitchhiker's Guide to hush annoying Flat Earthers"* in March 2023
- talk *"Sip back and relax: it's tea time!"* in April 2024

Premio Asimov | *L'Aquila, Italy*

- Project organized by prof. Francesco Vissani
- Part of reviewing committee for the years 2021, 2022, 2023, 2024

Scientzia in Bidda | *Sardinia*

- Organized by Riccardo Murgia since 2023
- Part of the outreach project to talk about the relevance of the Einstein Telescope in Sardinia