

# ULYANA DUPLETSA

PhD Candidate in Astroparticle Physics

## CONTACT INFO

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## ABOUT ME

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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

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**PhD in Astroparticle Physics** **2020-current**  
*Gran Sasso Science Institute | L'Aquila, Italy*

- Research topic: "Gravitational-wave Cosmology with Compact Binaries"
- Advisor: Jan Harms
- Co-advisors: some projects are co-supervised by Marica Branchesi and Riccardo Murgia

## EDUCATION

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**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

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**Private Tutoring** **2012-2020**

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

## VISITINGS

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**University of Cagliari**  
*Cagliari, Italy*

**22-26 Apr, 2024**

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

**Johns Hopkins University**  
*Baltimore, United States*

**Oct-Nov, 2023**

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

## PHD SCHOOLS

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**Scientific Communication in Astronomy School**  
*Bertinoro, Italy*

**2-6 Oct, 2023**

**First EuCapt School in Cosmology**  
*Valencia, Spain*

**18-22 Sept, 2023**

**Amaldi Research Center Summer School**  
*Paestum, Italy*

**5-9 Sept, 2022**

**The Onassis Foundation Science Lectures in Physics:  
Gravitational Waves**  
*Heraklion, Crete*

**25-29 Jul, 2022**

## PUBLICATIONS

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### 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](https://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

**ModIC 2024 - Model-Independent Cosmology with gravitational waves, large-scale structure, and high-energy surveys** 13-17 May, 2024

IFPU Trieste, Italy

- **Contributed talk** on 'Dark Sirens Cosmology with neutral hydrogen intensity mapping' and hands-on session on GWFish with and without priors

**XIV ET Symposium**

6-10 May, 2024

Maastricht, Netherlands

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

**Linking Advances in our Understanding of Theoretical Astrophysics and Relativity to Observations (LAU-TARO)**

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**

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**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

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### Programming languages

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

### Software and Tools

- $\text{\LaTeX}$
- git

### Languages

- Italian (native)
- Ukrainian (native)
- English (advanced)

## OUTREACH ACTIVITIES

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### ***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

### ***Scienza 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