Joan Alcaide-Núñez

Physics BSc Student @ LMU Munich

joanalnu.github.io | Email

RESEARCH STATEMENT

Physics candidate specializing in Multi-Messenger Cosmology. My work focuses on the integration of Gravitational Wave (GW) and Electromagnetic (EM) data through Bayesian frameworks to constrain cosmological parameters. I prioritize methodological transparency, original code development, and the pursuit of fundamental physical truths over metric-driven research.

RESEARCH EXPERIENCE

OAB-INAF | Brera-Merate Astronomical Observatory *2025*

Independent Research Stay – Multi-Messenger Cosmology

- Developed a self-contained computational framework for GRB/GW parameter estimation from first principles, ensuring 100% code sovereignty.
- Implemented Bayesian inference pipelines to fit Gamma-Ray Burst data, avoiding "black-box" software dependencies to ensure physical accuracy.
- **Advisors:** Dr. G. Ghirlanda, Dr. O. S. Salafia.

ICE-CSIC | Institute of Space Sciences *2024*

Research Fellow – Type Ia Supernovae

- Investigated the limits of SNIa distance moduli fits in the context of the Hubble Tension.
- Documented significant data dispersion in early-stage Hubble diagrams, utilizing the project as a case study in rigorous uncertainty quantification and skepticism toward over-smoothed results.

CAPIBARA Collaboration *2023 – Present*

Lead Coordinator & Founder

- Coordinating a student-led initiative for high-energy instrumentation.
- Facilitating technical collaboration across institutions to develop low-cost X-ray/Gamma-ray satellite components.

TECHNICAL SOVEREIGNTY & CAPABILITIES

Statistical & Mathematical: Bayesian Inference, Nested Sampling, MCMC, Likelihood Analysis, Error Propagation in Cosmological Ladders.
Computational Physics: Python (NumPy, SciPy, Astropy), C++, Git Version Control, Data Visualization for High-Energy Astrophysics.
Instrumentation: Raw data reduction, telescope operations, and instrumentation design for Gamma-ray detection.

EDUCATION

Ludwig-Maximilians-Universität München *Oct 2025 – Present*

Bachelor of Science in Physics
Current Focus: Mastering the mathematical foundations of Theoretical Physics and General Relativity.

Youth and Science Fellowship *2023 – 2025*

Three-year selective research program focused on Astronomy and Cosmology.

METHODOLOGICAL PHILOSOPHY

I maintain a strictly "Open Science" workflow. I believe that the role of a researcher is to be able to draft a theoretical framework or plan an experiment from a "blank page" (the "Desert Principle"). I decline to participate in trend-following or "Publish or Perish" cycles that compromise the depth of understanding for the sake of output volume.

Detailed project archives and source code available at github.com/joanalnu