

# Samuel Franklin

Institute of Cosmology and Gravitation – University of Portsmouth

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🌐 [sma-franklin.github.io/Sam-Franklin-Blog](https://sma-franklin.github.io/Sam-Franklin-Blog) • 🌐 Sma-Franklin

## Research Interests

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- General Relativity, Black Hole Perturbation Theory, Gravitational Waves, Quantum Mechanics on Curved Spacetime.

## Education

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### Institute of Cosmology and Gravitation, University of Portsmouth

*PhD in Theoretical Physics*

2024–Present

- Supervised by Prof. Enrique Gaztanaga, Dr. Sravan Kumar, and Prof. Kazuya Koyama.
- Fully funded by a UK STFC PhD Studentship.
- **Courses:** Computational Tensor Algebra, Theoretical Cosmology, Gravitational Waves, Data Languages for Astrophysics, Bayesian Statistics.

### University of Bath

*MPhys Physics & Astrophysics with Placement Year, First Class (80%)*

2019–2024

- Integrated Masters course with a professional placement year.
- **Courses:** MPhys Research Project, Relativistic Cosmology, Advanced Quantum Theory, High Energy Astrophysics, General Relativity, Computational Astrophysics, Data Analysis for Astrophysics, Galaxies and Cosmology, Stars and Stellar Evolution.

## Presentations & Papers

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### Evolution of an FLRW Region in Extended Schwarzschild (Kruskal) Spacetime.

*S. Franklin, E. Gaztanaga, S. Kumar, K. Koyama*

*In Preparation*

### The Black Hole Isospectrality Problem

*S. Franklin*

2025

Oral presentation, SEPnet XV NExT PhD Workshop – **Awarded Best Student Talk**

### Black Hole Isospectrality

*S. Franklin*

2025

Poster presentation, UoP Faculty of Technology R&I Conference – **Awarded Best Student Poster**

### Development of a Digitising Data Acquisition Pipeline for Next Generation Pulsed Muon Spectrometers

*D. E. Pooley et al. J. Phys.: Conf. Ser. 2462 012028*

2023

## Research Experience

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### Institute of Cosmology and Gravitation

*Doctoral Researcher*

2024–Present

- Developed a Mathematica notebook to calculate the Israel junction conditions between FLRW and Kruskal coordinates.
- Derived an analytical equations describing the full evolution of the resulting FLRW-Kruskal composite spacetime.
- Developing a Mathematica notebook to compute the quasi-normal modes of a Schwarzschild black hole. Finding the spectrum for both axial and polar perturbations using non-classical boundary conditions.

### University of Bath

*Masters Research Project*

2023–2024

- Studied the relativistic hydrodynamics of gamma-ray bursts.
- Developed and ran simulations using C++.
- Developed data analysis pipeline to reproduce afterglow light curves from simulation data.

### Rutherford Appleton Laboratory (ISIS Beamline)

*R&D Placement Student*

2022–2023

- R&D for SuperMuSR: The detector upgrade for the muon spin resonance (MuSR) detector.
- Designed and constructed cutting edge detector pixels.
- Conducted experimentation and data analysis to validate pixel performance.

## Teaching Experience

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### University of Portsmouth

*Graduate Demonstrator*

2024–Present

- Demonstrator for undergraduate Python programming laboratories.
- Tutor for the University Maths Cafe, providing support to students across disciplines.
- Marking undergraduate courses: Mathematical Physics 2, Mathematical Methods for Physics, and General Relativity and Cosmology.

### University of Bath

*Lab Demonstrator*

2023–2024

- Demonstrator for undergraduate C programming laboratories during final year of MPhys.

## Skills

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**Languages:** Mathematica (xAct), C++, Python (Numpy, Pandas, Scipy, Matplotlib), LaTeX.

**Technologies:** Git/Github, Linux, Windows, Jupyter Notebooks, VS Code, Overleaf.

## Administration & Service

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### University of Portsmouth

*GRADnet Representative*

2025–Present

Serving as the South East Physics Network (SEPnet) graduate representative for Portsmouth PhD students.

### University of Bath

*Chair of Physics Society*

2022–2023

Led the student society; organized academic and social events for the department.

## Referees

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### Main PhD Supervisor

*Professor Enrique Gaztanaga*

✉ [enrique.gaztanaga@port.ac.uk](mailto:enrique.gaztanaga@port.ac.uk)

**Institute of Cosmology and Gravitation**

### PhD Supervisor

*Professor Kazuya Koyama*

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**Institute of Cosmology and Gravitation**