

# Tamara Evstafyeva

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I am interested in studying the phenomenology of binary black hole and boson star mergers through the prism of numerical simulations. My work also extends to certain modified theories of gravity and tests of general relativity using Bayesian inference. I enjoy working in interdisciplinary fields combining mathematics, theoretical physics and data science.

## Professional Positions

### Perimeter Institute for Theoretical Physics

VERA FLORENCE COOPER RUBIN POST DOCTORAL RESEARCH FELLOW

Waterloo, Canada

2024 - present

## Education

### University of Cambridge

PHD IN APPLIED MATHEMATICS AND THEORETICAL PHYSICS

Cambridge

2020 - 2024

- Main Supervisor: Professor Ulrich Sperhake
- Adviser: Dr Michalis Agathos
- Main courses: Scientific Programming in C++, Message Passing Interface, Machine Learning for Fundamental Physics, Astrostatistics, Black Holes, Gravitational Waves and Numerical Relativity

### University College London

MSCI IN MATHEMATICS

London

2016-2020

- Masters thesis supervisor: Professor Christian Boehmer
- Masters thesis title: "Equations of motion for a small charged black hole"
- Main courses: General Relativity, Cosmology, Fluid Dynamics, Numerical Analysis, Differential Geometry, Functional Analysis

## Skills

**Programming:** Python, C, C++, Bash, Mathematica, MATLAB, PyTorch

**Visualisation Software:** VisIt, Paraview

**Languages:** English (fluent), Russian (fluent), French (beginner)

## Publications

### PUBLISHED

- T. Evstafyeva**, U. Sperhake, I. Romero-Shaw, M. Agathos. 2024. Gravitational-Wave Data Analysis with High-Precision Numerical Relativity Simulations of Boson Star Mergers. *Physical Review Letters* 133, 131401
- T. Evstafyeva**, R. Rosca-Mead, U. Sperhake, B. Bruggmann. 2023. Boson stars in massless and massive scalar-tensor gravity. 2023. *Physical Review D* 108, 104064
- T. Evstafyeva**, U. Sperhake, T. Helfer, R. Croft, M. Radia, B. Ge, E. A. Lim. 2023. Unequal-mass boson-star binaries. Initial data and merger dynamics. *Classical and Quantum Gravity* 40, 085009
- T. Evstafyeva**, M. Agathos, J. Ripley. 2023. Measuring the ringdown scalar polarization of gravitational waves in Einstein scalar Gauss-Bonnet gravity. *Physical Review D* 107, 124010
- Llibert Aresté Saló, Sam E. Brady, Katy Clough, Daniela Doneva, **T. Evstafyeva**, P. Figueras, T. França, L. Rossi, S. Yao. 2024. GRFolres: A code for modified gravity simulations in strong gravity. *J. Open Source Softw.* 98, 6369

R.Croft, T.Helfer, B. Ge, M. Radia, **T. Evstafyeva**, E. A. Lim, U. Sperhake. 2023. The gravitational afterglow of boson stars. *Classical and Quantum Gravity* 40, 065001

## IN PREP

T.Helfer, K.W.K. Wong, M. Cheung, J.C. Aurrekoetxea, V. Baibhav, E. Berti, V. Cardoso, **T.Evstafyeva**, P. Figueras, T. França, C. Gu, E. Lim, M. Radia, J. Ripley, U. Sperhake. Ultrarelativistic head-on black hole collisions

## Awards & Grants

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- 2024 **G-Research Monthly Grant**, G-Research
- 2023 **Smith-Knight and Rayleigh-Knight Prize**, University of Cambridge
- 2022-2024 **Sports Grant**, Newnham College
- 2020-2024 **Science and Technology Facilities Council funding grant**, STFC

## Conferences & Talks

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- Autumn 2024. *Boson stars in LIGO data: towards testing the nature of compact objects*. **Invited seminar speaker** (online). Nottingham, UK.
- Autumn 2024. *Boson stars in LIGO data: towards testing the nature of compact objects*. **Invited speaker** of Fundamental physics and gravitational wave detectors workshop. Pollica, Italy.
- Summer 2024. PAX IX workshop. **Invited panelist** for *Tests of general relativity* discussion, King's College, London.
- Winter 2024. *Boson stars through the prism of numerical relativity*. **Invited seminar speaker**, Perimeter Institute, Canada.
- Summer 2023. *Boson stars through the prism of numerical relativity*. **Research Visit and seminar speaker**, Johns Hopkins University, US.
- Spring 2023. *Boson stars through the prism of numerical relativity*. BritGrav conference. University of Southampton, UK.
- Spring 2023. *Boson stars through the prism of numerical relativity*. General Relativity seminar. University of Cambridge, UK.
- Spring 2023. *Measuring the ringdown scalar polarization of gravitational waves in Einstein scalar Gauss-Bonnet gravity*. GR-Chombo meeting. King's College London, UK.
- Autumn 2022. *Unequal-mass boson star binaries: initial data and merger dynamics*. GRChombo meeting. University of Oxford, UK.
- Summer 2022. *Initial data for unequal-mass boson star collisions*. Frontiers in Numerical Relativity conference. Friedrich Schiller University, Germany.
- Spring 2021. *Visualization in ParaView Tutorial*. **Demonstrator** at the GRChombo meeting. University of Cambridge, UK.
- Spring 2021. *Binary black hole ringdown in the Einstein scalar Gauss-Bonnet gravity*. GRChombo meeting, University of Cambridge, UK.

## Teaching & Marking Experience

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| 2024      | <b>Research Computing for Data Intensive Science (MPhil)</b> , Demonstrator | Cambridge |
| 2023      | <b>STEP II Mathematics</b> , Marker   | Cambridge |
| 2021      | <b>Mathematics for Natural Science Tripos</b> , Exam Checker                | Cambridge |
| 2020-2022 | <b>Part II Electrodynamics</b> , Supervisor                                 | Cambridge |
| 2020-2021 | <b>Part II General Relativity</b> , Supervisor                              | Cambridge |
| 2019      | <b>IB Mathematics Higher Level</b> , Tutor at Westminster Academy           | London    |
| 2018      | <b>Teach First Insight Internship</b> , (offered graduate job)              | London    |

## Professional Memberships

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2020-present	<b>GRTL Collaboration (formerly known as GRChombo)</b> , member and contributor
2020-present	<b>LIGO Scientific Collaboration</b> , member, attendance of Testing General Relativity telecons
2023-present	<b>Einstein Telescope</b> , member
2023-present	<b>LISA Consortium</b> , member

## Service & Leadership

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### PEER REVIEW

2023-present	<b>Reviewed multiple articles for Physical Review D, Physical Review Letters and Classical and Quantum Gravity</b> , by invitation
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### GROUPS & CONFERENCES

2021-2024	<b>Numerical Relativity group meetings</b> , organiser: organising bi-weekly meetings, discussing our project work and addressing any questions related to NR	Cambridge
2023-2024	<b>Machine Learning group meetings</b> , organiser: organising reading group sessions, discussing machine learning papers with applications to gravitational wave physics	Cambridge
2023	<b>Kavli-Villum Summer School on Gravitational Waves</b> , local organiser: helping with daily sessions of the school, organising the poster session	Corfu

### OUTREACH

2022	<b>Diversity at DAMTP</b> , speaker: presentation of my research interests and ongoing academic work	Cambridge
2020	<b>HE+ lecture on black holes</b> , lecturer	Cambridge (online)

### MENTORING

2022-2023	<b>Mentor to 1st year women in mathematics</b> , University of Cambridge: organising and running termly meetings, providing students with support and guidance	Cambridge
2022	<b>Russian tutoring for ab initio</b> , Newnham College: providing learning support for first year students in my college learning Russian	Cambridge

### EXTRACURRICULAR

2023	<b>Artificial Intelligence Safety Intro Fellowship</b> , participant	Cambridge AI Safety Hub
2022-2023	<b>Half-blues tennis captain for W2</b> , selected and appointed	Cambridge
2020-2024	<b>Competing for University of Cambridge tennis team</b> , half-blues W2 player	Cambridge