Christopher Whittall

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Academic positions

Postdoctoral Research Fellow **Sep. 2024 - Present**
University of Birmingham

- Developing methods to accelerate the generation of gravitational waveform templates for next-generation gravitational observatories using reduced order modelling and machine learning.
- Developing analytical and numerical techniques for self-force calculations, particularly as applied to black hole scattering.

Education

PhD in Mathematical Sciences **Sep. 2020 – Sep. 2024**
University of Southampton

- Thesis title: *Frequency-domain approach to self-force in hyperbolic scattering*
- Supervisor: Leor Barack
- Project: developed frequency-domain techniques for calculating the self-force in hyperbolic black hole scatter events.
- Teaching: undergraduate computer labs; face-to-face marking and teaching mathematical methods for undergraduate engineers; marking undergraduate problem sheets.

MMath in Mathematics **Sep. 2019 – Jun. 2020**
University of Cambridge

- 92% in final examination. Pass with Honours. [Conventional classifications not awarded due to onset of the coronavirus pandemic.]
- Courses including: General Relativity, Black Holes, Cosmology and Quantum Field Theory.
- Essay project reviewing the spontaneous scalarisation of neutron stars in scalar-tensor theories of gravity, and the resulting smoking gun gravitational wave signatures.

BA in Mathematics **Oct. 2016 – Jun. 2019**
University of Cambridge

- Class I in 3rd year of the Mathematical Tripos.
- Courses covering a wide range of pure and applied mathematics and theoretical physics.
- President (2018-19) and Treasurer (2017-18) of the Adams Society of St John's College. Responsibilities: organising programme of academic talks, financial management.

Other research experience

Summer research student **Jul. 2019 - Sep. 2019**
DAMTP, University of Cambridge

- Numerically investigated the stability of nonlinear wave equations obeying the classical null condition on compact manifolds. Supervised by Dr Joseph Keir.
- Successful applications for funding from the Faculty of Mathematics and St John's College.

Visiting scientist **Jul. 2018 - Sep. 2018**
UK Meteorological Office

- Developed and implemented a model of atmospheric refraction of ADS-B radio transmissions from aircraft, and applied this to analyse the sensitivity of angle of arrival information to changes in weather profile. Supervised by Malcolm Kitchen.
- Successful application for part-funding from the Faculty of Mathematics.

Publications

[1] O. Long, **C. Whittall** and L. Barack, "Black hole scattering near the transition to plunge: Self-force and resummation of post-Minkowskian theory", Phys. Rev. D **110**, 044039 (2024), arXiv:2406.08363 [gr-qc].

[2] **C. Whittall** and L. Barack, "Frequency-domain approach to self-force in hyperbolic scattering", Phys. Rev. D **108**, 064017 (2023), arXiv:2305.09724 [gr-qc]. **Chosen as an Editors' Suggestion in Physical Review D and awarded a 2023 STAG publication prize.**

Talks and presentations

Invited talks

- "Black hole scattering: the self-force approach", Centre for Theoretical Physics, Queen Mary University of London, 25th March 2024.
- "Self-force in black hole scattering: a scalar-field toy model", Invited talk, Gravitational Self Force and Scattering Amplitudes, University of Edinburgh, 20th March 2024.
- "Black hole scattering: the self-force approach", QCD Meets Gravity IX, CERN, 14th December 2023.
- "Self-force in hyperbolic black hole scattering", Satellite seminar during Asymmetric Binaries meet Fundamental Astro-Physics, Gran Sasso Science Institute, 20th September 2023.

Contributed talks

- "Self-force scattering in the strong and weak field", 27th Capra Meeting on Radiation Reaction in General Relativity, National University of Singapore, 17th June 2024.

- "Self-force in hyperbolic scattering: a frequency-domain approach", 26th Capra Meeting on Radiation Reaction in General Relativity, Niels Bohr Institute, 4th July 2023.
- "Self-force in hyperbolic scattering: a frequency-domain approach", 23rd International Conference on General Relativity and Gravitation (online), Chinese Physical Society, 5th July 2022.
- "Self-force in hyperbolic scattering: a frequency-domain approach", 25th Capra Meeting on Radiation Reaction in General Relativity, University College Dublin, 22nd June 2022.
- "Frequency domain approach to self-force in hyperbolic scattering", 24th Capra Meeting on Radiation Reaction in General Relativity (online), Perimeter Institute, 10th June 2021.

Other events attended

- Gravitational Wave Analysis in the Era of Machine Learning, Royal Astronomical Society, 10th January 2025.
- 3rd Einstein Telescope Annual Meeting, University of Warsaw [attended online], 12th - 15th November 2024.
- Gravitational Memory Effects: From Theory to Observation, Queen Mary University of London [attended online], 5th - 9th June 2023.
- From Scattering Amplitudes to Gravitational-Wave Predictions for Compact Binaries, Universität Zürich & ETH Zürich, 4th - 15th July 2022.
- BritGrav21, University College Dublin [attended online], 12th – 16th April 2021.

Computing experience

Advanced: `C/C++`, `Python`, LaTeX, Linux, Windows

Intermediate: `Mathematica`, `MATLAB`, OpenMP, Bash, Git, SLURM, TensorFlow

Basic: GDB, Markdown, HTML, MacOS

Prizes and awards

2023: STAG prize for best student publication in gravitational physics, *awarded by the STAG Research Centre, University of Southampton.*

2018 – 2020: Wright prize (2019, 2020), Ian Hall Year Prize (2019), College Prize (2018) and Horne Scholarship (2018 – 20), *awarded by St John's College, Cambridge for examination results.*

Service

- Discussion co-chair, "Modelling approaches", 27th Capra Meeting on Radiation Reaction in General Relativity, National University of Singapore, 17th June 2024.

Research collaborations

LISA Consortium: Associate Member **Mar. 2024 – Present**

LIGO Scientific Collaboration: Member **Oct. 2024 – Present**

Einstein Telescope Collaboration: Member **Oct. 2024 – Present**

References

Available on request.

Last compiled: January 11, 2025.