

# Kaushik Paul

Institute ID: kpaul@nikhef.nl

Webpage Github ORCID INSPIRE-HEP Google Scholar

Email: kpaul.gw@gmail.com

---

## PERSONAL INFORMATION

---

- Date of Birth: 14/10/1996
- Permanent Address: Kolkata, West Bengal, India.
- Current Address: NIKHEF, Amsterdam Science Park, Netherlands.

---

## RESEARCH INTERESTS

---

- Gravitational wave source modeling, post-Newtonian theory, Numerical Relativity, Tests of General Relativity, and Parameter estimation of Gravitational Waves.

---

## EMPLOYMENT

---

- **NIKHEF** Amsterdam, Netherlands  
*Postdoctoral Fellow* *1<sup>st</sup> Dec 2025 - Present*  
*Mentor: Dr. Maria Haney*
- **International Centre for Theoretical Sciences (ICTS)** Bengaluru, India  
*Postdoctoral Fellow* *11<sup>th</sup> Aug 2025 - 30<sup>th</sup> Nov 2025*  
*Mentor: Dr. Prayush Kumar*

---

## EDUCATION

---

- **Indian Institute of Technology Madras (IITM)** Chennai, India  
*Ph.D. Physics* *July 2019 - July 2025*  
*Supervisor: Dr. Chandra Kant Mishra*  
*Thesis title: "Spin effects in eccentric binary black hole mergers"*
- **Visva-Bharati** Santiniketan, India  
*MSc. Physics* *2016 - 2018*  
*M.Sc. project supervisor: Dr. Biswajit Pandey*  
*Thesis title: "The Halo Model Of The Large Scale Structures Of The Universe"*
- **University of Calcutta** Kolkata, India  
*B.Sc.(H) Physics* *2013 - 2016*

---

## PROFESSIONAL MEMBERSHIP

---

### Present

- Virgo
- Einstein Telescope Organisation (ETO).
- Community member of LISA consortium.

### Past

- LIGO Scientific Collaboration (LSC).
- LIGO India Scientific Collaboration (LISC).

---

## TEACHING

---

- Gave a guest lecture on "Gravitational wave source modeling" and acted as a TA in Physics & Astronomy workshop at Nikhef, Amsterdam, Netherlands, 5th - 30th Jan 2026.
- Lecture series on post-Newtonian theory at ICTS, Sept-Oct 2025.  
The recordings of the lectures can be found at this [GitHub repository](#).
- Tutorial on xTensor at Chennai Mathematical Institute (CMI), Chennai, India, Apr 2025.  
The tutorial Mathematica notebook and recordings can be found in this [GitHub repository](#).
- Teaching Assistant at IIT Madras

- **PH5060 M.Sc. Physics lab** July - November, 2023
- **PH1020 Physics II** January - May, 2020, 2021, 2022, 2023
- **PH1010 Physics I** July - November, 2020, 2022
- **PH1050 Foundation of Computational Physics** July - November 2019, 2021

## MENTORSHIP

---

- Students mentored at Nikhef, Amsterdam
  - Ongoing:
    - \* Yara ten Have (B.Sc. in Physics and Astronomy (Natuur- en sterrenkunde)), Roll No. UvA 14537265, VU 2794028, Joint degree from University van Amsterdam and Vrije University.  
Project title: “Measurability of eccentricity for asymmetric binary black hole mergers.”
- Students mentored at IIT Madras
  - Adityan Selvarasu (B.Sc. Physics), Roll No. 23-UPH-211, Loyola College, Chennai, 2025.  
Project title: “Parameter Estimation of Gravitational-Wave Inspirals from Spinning Compact Binaries.”
  - Tanushka Gupta (BS-MS in Physics), Roll No. 23165, Indian Institute of Science Education and Research Berhampur, 2025.  
Project title: “Spin-Induced Quadrupole Moment estimation in compact binaries via Fisher Matrix formalism.”
  - Jyoti Sahu (M.Sc. in Physics), Roll No. 2510190012, Pandit Ravishankar Shukla University, Raipur, Chhattisgarh, 2025.  
Project title: “Forecasting Parameter Estimation Errors in Gravitational Waves with the Fisher Matrix Formalism.”
  - S. Kanishka (M.Sc in Physics), Roll No. 24PPH004, Avinashilingam Institute for Home Science and Higher Education for women, Coimbatore, 2025.  
Project title: “Detection and Analysis of Gravitational Waves observable at deci hertz frequencies: Science case for a space mission.”
  - Vinod Kumar (Integrated MSc in Physics), Roll No. I22PH039, Sardar Vallabhbhai National Institute of Technology (SVNIT), NIT Surat, 2025.  
Project title: “Effect of NS tides in Gravitational Wave Parameter Estimation.”
  - Nidhi Biswas (BS-MS in Physics), Roll No. PH20B009, IIT Madras 2025.  
Project title: “Constraining tidal deformabilities of binary neutron stars with future detectors.”
  - Omkar Sridhar (B.Tech. in Engineering Physics), Roll No. EP20B027, IIT Madras 2024.  
Project title: “Modelling eccentric spinning binary black hole waveforms with PN theory.”  
Published in Phys. Rev. D 112, 024026 (2025). Open access of the manuscript at arXiv:2412.10909.
  - Pratul Manna (M.Sc. in Physics), Roll No. PH21C034, IIT Madras 2023.  
Project title: “PN-NR comparisons and the effect of eccentricity evolution in modelling IMR signals from eccentric mergers.”  
Published in Phys. Rev. D 111, 124026 (2025). Open access of the manuscript at arXiv:2409.10672.

## SKILLS SUMMARY

---

- **Languages:** Python, Mathematica, C, C++, HTML, CSS
- **Scripting:** Bash, Zsh
- **Packages:** LALSuite, PyCBC, xAct, Math Tensor, Bilby
- **Tools:** Git, L<sup>A</sup>T<sub>E</sub>X, HTCondor, Slurm
- **Platforms:** Linux, macOS

## SEMINARS/WORKSHOPS/CONFERENCES/EXCHANGE PROGRAMS ATTENDED

---

- Physics & Astronomy workshop, 5th - 30th January 2026 at Nikhef, Amsterdam, Netherlands.
- The Future of Gravitational-Wave Astronomy, 27th - 31st October, 2025, ICTS-TIFR, Bangalore, India.
- Scientific machine learning for the gravitational waves astronomy, 2nd – 6th June, 2025, ICERM, Brown University, USA.
- Eccentricity Workshop, 1st - 4th March, 2025, Indian Institute of Technology Madras, India.
- Second school on Black Holes and Gravitational Waves, 10th - 14th February, 2025, Indian Institute of Technology Madras, India.

- 33rd meeting of Indian Association for General Relativity and Gravitation (IAGRG33), 2nd - 4th January, 2025, Birla Institute of Technology And Science, Pilani (BITS Pilani), India.
- Workshop on Technical and Scientific Writing, 23rd - 27th November, 2024, Indian Institute of Technology Madras, Chennai, India.
- LVK meeting September, 23rd – 26th September, 2024, Barcelona, Spain (attended online).
- LVK meeting March, 11th - 14th March, 2024, Louisiana State University, Baton Rouge, Louisiana, USA.
- International Conference of Gravitation & Cosmology, 6th - 9th December, 2023, Indian Institute of Technology (IIT) Guwahati, Guwahati, India.
- LVK meeting March, 13th - 16th March, 2023, Northwestern University, USA (attended online).
- ICTS Summer School on Gravitational-Wave Astronomy, 24th July - 4th August, 2023, Bangalore, India.
- 26th Capra meeting on Radiation Reaction in General Relativity, 3rd - 7th July, 2023, Copenhagen, Denmark (attended online).
- International Workshop on Gravitational Memory Effects: From Theory to Observation: 5th - 9th June, 2023, Queen Mary University of London, United Kingdom (attended online).
- 15th Edoardo Amaldi Conference on Gravitational Waves, 7th - 21st July, 2023 (attended online).
- Advanced General Relativity: A Centennial Tribute to Amal Kumar Raychaudhuri by Sunil Mukhi, 20th March - 28th April, 2023, ICTS-TIFR, Bangalore, India (attended online).
- 41st Meeting of the Astronomical Society of India, 1st - 5th March, 2023, Indian Institute of Technology (IIT) Indore, India.
- Lunar gravitational wave detection meeting, 17th - 20th April, 2023, ICTS-TIFR, Bangalore, India.
- 32nd meeting of Indian Association for General Relativity and Gravitation (IAGRG32), 19th - 21st December, 2022, Indian Institute of Science Education and Research (IISER), Kolkata, India.
- Young Astronomers' Meet, 9th - 13th November, 2022, Aryabhata Research Institute of Observational Sciences (ARIES), Nainital, India.
- LVK meeting September, 12th - 15th September, 2022, Cardiff University, United Kingdom (attended online).
- ICTS Summer School on Gravitational-Wave Astronomy, 30th May - 10th June, 2022, ICTS-TIFR, Bangalore, India (attended online).
- 40th meeting of the Astronomical Society of India, 25th - 29th March, 2022, Indian Institute of Technology (IIT) Roorkee (attended online).
- LVK meeting March, 17th - 21st March, 2022 (attended online).
- Chennai Symposium on Gravitation and Cosmology, 2nd - 5th February, 2022, Indian Institute of Technology (IIT) Madras, Chennai, India.
- School on Black Holes & Gravitational Waves, 17th - 22nd January 2022, Indian Institute of Technology (IIT) Madras, Chennai, India.
- LISC Continuous Gravitational Waves Workshop, 25th - 27th October, 2021 (attended online).
- Rates and population lectures for gravitational waves, August, 2021, ICTS-TIFR, Bangalore, India (attended online).
- LVK meeting September, 6th - 10th September, 2021 (attended online).
- ICTS Summer School on Gravitational-Wave Astronomy, 5th - 16th July, 2021, ICTS-TIFR, Bangalore, India (attended online).
- 14th Edoardo Amaldi Conference on Gravitational Waves, 19th - 23rd July, 2021 (attended online).
- Gravitational-Wave Parameter Estimation using Bilby, August, 2020, ICTS-TIFR, Bangalore, India (attended online).
- Chennai Symposium on Gravitation and Cosmology, 22nd - 24th January, 2020, Indian Institute of Technology (IIT) Madras, Chennai, India.

## ORAL PRESENTATIONS IN CONFERENCES

---

- **Oral presentation at Eccentricity Workshop, 1st - 4th March, 2025, IIT Madras, India:** Unveiling eccentric behaviors in black hole pairs using ESIGMAHM. [link to the slides]
- **Oral presentation at 33rd meeting of Indian Association for General Relativity and Gravitation (IAGRG33), 2nd - 4th January, 2025, BITS Pilani, India:** Unravelling the dance of black holes in a binary on eccentric orbits. [link to the slides]
- **Oral presentation at International Conference on Gravitation and Cosmology (ICGC), 6th - 9th December, 2023, IIT Guwahati, India:** “ENIGMA”- An aligned-spin eccentric IMR waveform model for compact binary mergers.[link to the slides]
- **Oral presentation at 7th Physics in-house symposium, 27th - 28th October, 2023, IIT Madras, Chennai, India:** Modeling aligned-spin eccentric compact binaries with ENIGMA [link to the slides]
- **Oral presentation at 32nd meeting of Indian Association for General Relativity and Gravitation (IAGRG32), 19th - 21st December, 2022, IISER Kolkata, India:** Spin effects in spherical harmonic modes of the gravitational waveform for eccentric compact binary mergers. [link to the slides]
- **Oral presentation at Young Astronomers’ Meet, 9th - 13th November, 2022, ARIES, Nainital:** Spin effects in eccentric higher modes from inspiralling compact binaries up to 2PN order. [link to the slides]

## POSTERS PRESENTED IN CONFERENCES

---

- **The Future of Gravitational-Wave Astronomy:** ESIGMAHMv2: Improving the model accuracy using higher order PN and SF corrections, 27th - 31st October, 2025, ICTS-TIFR, Bangalore, India.
- **Scientific machine learning for the gravitational waves astronomy, 2nd – 6th June, 2025, ICERM, Brown University:** Unraveling the eccentric binary black hole mergers with ESIGMAHM
- **In-house symposium, Department of Physics, 18th – 19th October, 2024, IIT Madras:** Peering into the “eccentric” side of black hole binaries using ESIGMAHM
- **LVK September meeting, 23rd – 26th September, 2024, Barcelona, Spain (attended online):** ESIGMAHM: An Eccentric, Spinning inspiral-merger-ringdown waveform model with Higher Modes for the detection and characterization of binary black holes
- **LVK March meeting, 11th - 14th March, 2024, Louisiana State University, Baton Rouge, Louisiana, USA:** ESIGMAHM: An eccentric spinning IMR waveform model for the detection and characterization of eccentric BBH mergers
- **15th Edoardo Amaldi Conference on Gravitational Waves, 17th - 21st July, 2023 (attended online):** “ENIGMA” - A waveform model for spinning eccentric compact binaries. [link to the poster]
- **41st Meeting of the Astronomical Society of India, 1st - 5th March, 2023, IIT Indore, India :** 2PN spin effects in spherical harmonic modes of the gravitational waveform from eccentric compact binary mergers. [link to the poster]
- **In-house symposium, Department of physics, 22nd - 23rd April, 2022, IIT Madras, :** 2PN spin effects in the gravitational waveform from eccentric inspirals. [link to the poster]
- **40th meeting of the Astronomical Society of India, 25th - 29th March, 2022, Indian Institute of Technology (IIT) Roorkee (attended online):** Spin effects in the gravitational waveform from eccentric compact binary mergers. [link to the poster]

## ACADEMIC VISITS

---

- **Academic Visitor, Institute of Theoretical Physics, Utrecht University:** Host: Prof. Tanja Hinderar, 22nd April, 2026.
- **Academic Visitor, International Centre for Theoretical Sciences - Tata Institute of Fundamental Research (ICTS-TIFR):** Host: Prof. Prayush Kumar, 4th May - 30th June, 2024.
- **Academic Visitor, International Centre for Theoretical Sciences - Tata Institute of Fundamental Research (ICTS-TIFR):** Host: Prof. Prayush Kumar, 19th June - 24th July, 2023.

## PUBLICATIONS

---

### As primary author

- Eccentric, spinning, inspiral-merger-ringdown waveform model with higher modes for the detection and characterization of binary black holes: *Phys.Rev.D 111, 084074*, **Kaushik Paul**, Akash Maurya, Quentin Henry, Kartikey Sharma, Pranav Satheesh, Divyajyoti, Prayush Kumar, Chandra Kant Mishra, 2025, Open-Access (at arXiv: [2409.13866]).
- Spin effects in spherical harmonic modes of gravitational waves from eccentric compact binary inspirals: *Phys.Rev.D 108, 024023*, **Kaushik Paul**, Chandra Kant Mishra, 2023, Open-Access (at arXiv: [2211.04155]).

### As corresponding author

- Spin effects in the phasing formula of eccentric compact binary inspirals up to the third post-Newtonian order: *Phys.Rev.D 112, 024026*, Omkar Sridhar, Soham Bhattacharyya, **Kaushik Paul**, Chandra Kant Mishra, 2025, Open-Access (at arXiv: [2412.10909]).

## As contributing author

- Biased parameter inference of eccentric, spin-precessing binary black holes: *Phys.Rev.D* 113, 103022, Divyajyoti, Isobel M. Romero-Shaw, Vaishak Prasad, **Kaushik Paul**, Chandra Kant Mishra, Prayush Kumar, Akash Maurya, Michael Boyle, Lawrence E. Kidder, Harald P. Pfeiffer, Mark A. Scheel, 2026, Open-Access (at arXiv: [2510.04332]).
- Chase Orbits, not Time: A Scalable Paradigm for Long-Duration Eccentric Gravitational-Wave Surrogates: Akash Maurya, Prayush Kumar, Scott E. Field, Chandra Kant Mishra, Peter James Nee, **Kaushik Paul**, Harald P. Pfeiffer, Adhrit Ravichandran, Vijay Varma, 2025, Open-Access (at arXiv: [2510.00116]).
- Early Warning From Eccentric Compact Binaries: Template Initialization And Sub-dominant Mode Effects: Priyanka Sinha, R. Prasad, Mukesh Kumar Singh, Prayush Kumar, Akash Maurya, **Kaushik Paul**, 2025, Open-Access (at arXiv: [2507.07021]).
- An Accurate Modeling of Nano-hertz Gravitational Wave Signal from Eccentric Supermassive Binary Black Holes: An Essential Step Toward a Robust Discovery: *Astrophys.J.* 993, 118, Mohit Raj Sah, Akash Maurya, Suvodip Mukherjee, Prayush Kumar, Vida Saeedzadeh, Arif Babul, Chandra Kant Mishra, **Kaushik Paul**, Thomas R. Quinn, Michael Tremmel, 2025, Open-Access (at arXiv: [2505.22745]).

## HONORS AND AWARDS

---

- International Travel Support (ITS) Grant — 2025  
Anusandhan National Research Foundation (ANRF), Government of India  
Awarded to present research on Unraveling the eccentric binary black hole mergers with **ESIGMAHM** at Scientific Machine Learning for Gravitational Wave Astronomy, 2025, ICERM, Brown University, Providence, USA.