Akshita Mittal

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Indian Institute of Science Education and Research, Thiruvananthapuram
Fifth-Year Integrated MS Student

Education

Integrated MS in Physics with Minor in Data Science | IISER Thiruvananthapuram **Expected: July 2024**

- CGPA: 8.63/10 (3.7/4)
- Relevant coursework: General Theory of Relativity and Cosmology — Mathematical Methods in Physics — Astrophysics — Statistical and Data Analysis Methods in Astronomy — Electromagnetism and Special Theory of Relativity — Computational Techniques and Programming Languages — Machine Learning — Introduction to Probability — Introduction to Data Science — Nuclear and Particle Physics — Optics

Higher Secondary (Grade 12) | West Point School, Kotkapura, Punjab **2018**

- Percentage: 93.2
- Coursework: Physics — Chemistry — Mathematics — Physical Education

Secondary (Grade 10) | Dasmesh Public School, Kotkapura, Punjab **2016**

- GPA: 10
- Coursework: Physics — Chemistry — Biology — Mathematics — Social Science

Research Interests

Compact binary mergers, multimessenger astronomy, fast parameter estimation, machine learning, pipeline development, Bayesian statistics, tests of general relativity

Research Experience

Institute for Gravitation and the Cosmos, Penn State University **Jun 2024 – Present**
Research Project, PI: Prof. Bangalore Sathyaprakash *Pennsylvania, USA*

- To identify matter signatures in quasi-normal modes of remnant black holes in neutron star mergers

School of Physics, IISER Thiruvananthapuram **Aug 2023 – Apr 2024**
Master's Thesis, PI: Dr. Soumen Basak *Trivandrum, India*

- Explored the impact of eccentricity and spin mismodeling on parameter estimation (PE) for binary sources
- Built PyCBC plugin 'teobecc' to accommodate eccentricity and spin
- Conducted PE and comparative analysis to understand parameter mismodeling [Thesis]

Graduate School of Science, Kyoto University **May 2023 – Aug 2023**
Machine Learning Project, PI: Prof. Takahiro Tanaka *Kyoto, Japan*

- Using an excess power method and convolutional neural network (CNN) for an all-sky search of continuous GWs for DECIGO
- Estimated the parameter space and number of grid points to cover the whole sky
- Proposed and compared two methods to minimise the number of grid points

IISER Thiruvananthapuram × IUCAA **Jan 2023 – Apr 2023**
Data Science Minor Thesis, PI: Dr. Apratim Ganguly, Dr. Shabnam Iyyani *Trivandrum, India*

- Conducted predictive GW analysis to explore underlying population distribution of compact binary parameters in the deci-hertz band
- Generated a black hole population, noise and signals using bilby and PyCBC
- Evaluated the signal-to-noise ratio (SNR) for different frequency bands
- Demonstrated enhanced capabilities of proposed deci-hertz observatory [Thesis]

Max Planck Institute for Gravitational Physics **July 2022 – Sept 2022**
Internship, PI: Dr. Frank Ohme *Hannover, Germany*

- Used PyCBC to study effect of mass and distance on SNR of inspiralling binaries and on the mass of the graviton
- Studied modified dispersion relations in context of third-generation gravitational-wave detectors

Inter-University Centre for Astronomy and Astrophysics **Apr 2021 – June 2021**
Internship, PI: Prof. Sanjit Mitra *Pune, India*

- Learnt to conduct injection studies and parameter estimation for binary merger events using the bilby framework
- Attained proficiency in Python programming within the Vim editor
- Conducted literature survey for the use of GW higher-order modes in post-merger data analysis

Thapar Institute of Engineering and Technology **July 2020 – Sept 2020**
Internship, PI: Dr. Mamta Gulati *Patiala, India*

- Studied 'Fundamental Astronomy' by Hannu Karttunen and 'Astrophysics for Physicists' by Arnab Rai Choudhari
- Delivered regular presentations showcasing notes and insights during weekly sessions

Awards, Honors, and Fellowships

Hall of Fame, Science and Technology Council, IISER Thiruvananthapuram **2024**
- Felicitated for contributions to Exhibit A and the quizzing society at IISER Thiruvananthapuram

oSTEM Graduate Application Aid Program **2023**
- Selected for financial aid for graduate school application fees, aimed at gender and sexuality minorities in STEM

Deutscher Akademischer Austauschdienst WISE (DAAD WISE) **2022**
- Selected for the DAAD WISE fellowship to support research with Dr. Frank Ohme, MPI for Gravitational Physics, Hannover

International Astronomy and Astrophysics Competition (IAAC) **2020**
- Awarded the Gold Honor in IAAC 2020 for promotion to the final level

SIMIODE Challenge Using Differential Equations Modeling (SCUDEM) **2020**
- Received the Meritorious Award for solution on 'Problem A: Decay of Oil Agglomerates from the Deepwater Horizon Accident'

Researchathon **2020**
- Received gold medal in national-level physics research competition organized by the National Institute of Technology, Surat, India

Workshops and Conferences

Cosmology from Home **2024**
- Received exposure to the latest research in cosmology

LISC Continuous Gravitational Waves Workshop **2021**
- Acquired a foundational understanding of utilizing PyFstat for the analysis of continuous gravitational-wave (CGW) data
- Developed proficiency of CGW data analysis methods: matched filtering, F-statistic, parameter space metric

LIGO-India Education and Public Outreach (LIEPO) **2021**
- Developed science communication for LIGO research, bridging the gap between academia and the wider public

Outreach

Reading Between the Lines | *Founder* **2023**
- Founded an Ambedkarite reading circle at IISER
- Coordinating weekly book discussions and meetings, organising events to foster awareness

Inventa Magazine | *Managing Editor* **2021-22**
- Led an intercollegiate team from 7 IISERs, NISER, IISc, and CEBS in a year-long project
- Produced an educational podcast episode with Department of Science and Technology, Rajasthan
- Developed and maintained website for the magazine

Ether | *Editor, Designer* **2020-22**
- Wrote articles, reviews, and edited and designed editions

Exhibit A | *Founding member, Editor, Designer* **2019-22**
- Wrote articles, coordinated, edited, and typeset editions
- Moderated interviews with eminent faculty in STEM
- Selected works: Hema Somanathan's Encounters With Bees, Ecology and the People of Science [The Wire Science]

Club of Mathematics, IISER Thiruvananthapuram (CMIT) | *Coordinator* **2019-20**
- Wrote the by-laws and foundational framework for IISER's official mathematics club

Presentations and Posters

"Impact of parameter mismodeling on gravitational-wave searches" **2024**
- Final presentation for master's degree in physics

"Impact of non-eccentric gravitational waveforms on eccentric gravitational-wave searches for LISA" **2023**
- Midterm presentation for master's degree in physics

"Exploring the Scope of Multiband Detection with Next-Generation Gravitational Wave Detectors" **2023**
- Thesis presentation for minor degree in data science

"How to Win an Internship: A Modern Guide to the Art of Applying" **2022**
- Delivered oral presentation to IISER students on advice to secure internships in STEM

"A Star is [Un]Born: Understanding Stellar Collapse" **2022**
- Course project presentation for PHY5128: General Theory of Relativity and Cosmology

"Estimating the Hubble Constant" **2022**
- Course project presentation for PHY5132: Statistical and Data Analysis Methods in Astronomy

"Materials Science Approaches to Increase LIGO Detectors' Sensitivity" **2021**
- Presentation in online seminar organized by Society of Materials and Mechanical Engineers, IIT Ropar

"Decay of Oil Agglomerates from the Deepwater Horizon Accident " **2020**
- Delivered oral presentation on mathematical modelling for SCUDEM V

"P vs. NP: An Overview" **2019**
- Poster presentation of an introduction to the P vs. NP Millennium Prize Problem at the annual science fest *Anvesha*

Teaching Experience

PHY312: Classical Mechanics | *Teaching Assistant* **Aug 2023 – Nov 2023**

- Invigilated examinations and quizzes and maintained attendance records for students

Other Work Experience

Research Matters | *Writer* **2021-Present**

- Conducting comprehensive literature reviews and readings across physics, climate change, and government policy

Dreamscape Media | *Social Media Strategist* **2021-Present**

- Collaborating with a notably experienced team on advertising and social media management
- Managing and organizing calendars, scheduling posts, and maintaining regular client interaction

Skills and Miscellaneous

Programming	Python | R | MATLAB | Wolfram Mathematica
Technical Skills	Bayesian inference | Machine learning | Injection studies | Population studies
Modules	bilby | gwosc | PyCBC | LDC | lisa | lalsuite
Markup	Latex | HTML | CSS
Designing	Adobe InDesign | Adobe Illustrator | Adobe Spark
Other Interests	Activism | Hindustani music | Feminist and anti-caste literature