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: 8.48/10
- 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

Research Interests

Gravitational wave astronomy, multimessenger astronomy, fast parameter estimation, machine learning, pipeline development, Bayesian statistics, general relativity

Research Experience

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
- **Compiled thesis titled 'Impact of parameter mismodeling on gravitational-wave searches'**

Graduate School of Science, Kyoto University **May 2023 – Present**
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
- Currently evaluating the computational cost of executing the CNN

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
- **Compiled thesis titled 'Exploring the Scope of Multiband Detection with Next-Generation Gravitational Wave Detectors'**

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

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

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