RIYA RAI

PERSONAL DETAILS:

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Affiliation: McGill University, Canada
Website: https://r-squared0.github.io/PHYS601_Test_website/

EDUCATION:

- McGill University, Canada
  PhD Physics (Aug 2024 onwards)
- Indian Institute of Science Education and Research Bhopal, Department of Physics
  Integrated BS-MS
  August 2019-April 2024

COURSEWORK HIGHLIGHTS:

Numerical Methods and Programming, Data science and Machine Learning, Quantum Field Theory I and II, Nuclear and Particle Physics Laboratory, (Audit) Experimental Techniques
Online Courses: Introduction to Mathematical Thinking- Stanford University, Particle Physics: an Introduction- University of Geneva, Course Certificate ,The Evolving Universe- CalTech, Course Certificate

EXPERIENCE

- **Teaching Assistant-** (Aug '24-Dec '24) Laboratory teaching assistant for PHYS 101 Introductory Physics-Mechanics. Actively involved in experimental discussions, invigilation and lab grading for this course with 500+ students.

- **Masters Thesis Project-** (Aug '23- April '24) Worked on the topic: 'Gravitational waves as a novel probe in search of new physics'. Analyzing different BSM models to theoretically predict potentially observable GWs arising from them using *CosmoTransitions*, a Python package. Guided by Dr. Rahul Srivastava, IISERB. Thesis

- **Experimental Project with the nEXO collaboration-** (May-Aug 2023) Worked on the Ba-ion tagging project as a potential upgrade for the nEXO project. Completed hardware assembly for the quadrupole beam bender. Worked on beam focussing in the beam bender using simulations and real time measurements. Worked on setting up the laser and optics for laser ablation of ion source. Guided by Dr. Thomas Brunner, McGill University, Canada.

- **Reading project on neutrinos-** (May- July2022) Gained theoretical understanding in neutrinos and their mass derivations to develop insights into the phenomenology of Dirac neutrinos. Studied the quantization of Dirac fields and their mathematical structure, symmetry transformations, CPT transformations and electroweak interactions. Guided by Dr. Rahul Srivastava, Dept. of Physics, IISERB.

- **Machine Learning Project**-(Feb '22-July '22) 'Estimation of Semimajor Axis of Exoplanet Orbit using Machine Learning Techniques'. Regression models were tested for this applied data science problem in astronomy. Project motivated towards finding a time effective but highly accurate method to estimate the semimajor axis, which conventionally takes days-years for a specific planet. Awarded best poster and oral presentation for the same. Research paper under peer review. Guided by Dr. Tanmay Basu, Dept of Data Science and Engineering, IISERB.

- **Computational Astronomy project on galaxies**- (May '21-August '22) Analyzing the morphology density relation of galaxies in cluster environments using its spectral data analysis through Python. Studied barred S0 galaxies and their bulges based on the spectra to understand stellar population in them and

their relation with the central bar formation. Guided by Dr. Sudhanshu Baraway, Indian Institute of Astrophysics, Bangalore.

- **Engineering design internship at STAR Lab, Surat (India)**- an aerospace company in India (1st Jan '21- 2nd Feb '21) Worked on the Computer Aided Design and development of Static Test Pad (for model rocket motor thrust tests) and High Powered (non-pyro) Rockets under the Virtual Training and Internship Programme (VTIP).

- **Summer/Winter Schools and Workshops**:
    1. High level simulation language: XMDS2, 1 day course by Dr. Sebastian Wüster, IISER Bhopal. (Aug '23)
    2. Introductory Summer School in Astronomy and Astrophysics by Inter-University Centre for Astronomy and Astrophysics (IUCAA, Pune, India) (May-June 2021)
    3. Workshop on Astrophysics (Techfest '20, IIT Bombay) that involved data analysis of GRBs and Gravitational Waves. Introduced to Image reduction, Aperture and PSF Photometry on Python. Also, completed an online non-certificate workshop on Python for Astronomy.
    4. Winter School on Classical and Quantum Transport Processes: Current state and Future Directions organized by International Centre for Theoretical Sciences (ICTS), Bangalore, India. (Jan-Feb'22)

SKILLS:

- C, Python, Mathematica, Lua, XMDS2
- Softwares used- Fermi-rmfit (GRB analysis), Fusion360 and Solidworks (CAD), Eagle(Electronics-CAD), Proteus, OpenRocket, Arduino IDE, SIMION (Ion simulations)
- Experimental physics labs (college coursework)- Cryogenic systems, SQUID, XRD, Electron Diffraction, Atomic Deposition-Thin Film, Lock-in Amplifiers, Interferometers, Spectroscopy, Vacuum Systems.
- Elementary Proficiency in German (Qualified in Fit in Deutsch 1 at Göthe Institut Indien)

ACHIEVEMENTS:

- Selected for the *Mitacs Globalink Research Internship Programme* '23. (Project- Development of a Ba-ion tagging technique for the future nEXO detector) (May '23) *(6400 USD)*
- Related to the project 'Estimation of Semimajor Axis of Exoplanet Orbit using Machine Learning Techniques':
    1. Awarded the *top presenters' prize at the American Physical Society (APS) March Meeting* for an oral presentation on (March '23)
    2. Awarded the *Future of Physics Days Travel Grant* for oral presentation at the APS March Meeting, 2023 in Las Vegas. (December '22) *(1800 USD)*
    3. *Best poster presentation award* for the poster in Dept. of Data Science and Engineering at IISERB Engineers' Day Meet (Sept '22)
    4. Selected for the APS grant for an oral presentation at the Conference on Computational Physics (CCP) 2024 by IUPAP (International Union of Pure and Applied Physics) in Greece. (May '24) Could not attend due to inadequate funding.
- First prize at the Physics Model Solvay Conference, IISER Bhopal (March '21)
- DST INSPIRE (Innovation in Science Pursuit for Inspired Research) Scholarship ('19-Present): Government of India *(4880 USD)*
- DBT Lokshahir Annabhau Sathe Scholarship for 12th ('19-'20): Pune Municipal Corporation *(300 USD)*
- DBT Bharatratna Maulana Abul Kalam Azad Scholarship for 10th ('17-'18): Pune Municipal Corporation *(180 USD)*

EXTRACURRICULARS:

- **Elected Batch Representative**, Member-Representatives' Council, IISER Bhopal (August '19-July '20)
- **Core Committee Member**- Student Development Council, IISER Bhopal (October '20- April '21)
- **Chief Editor** at CARMA, IISER Bhopal's Career Development Magazine(Oct '2020)
- **Vice-convener** at Enthuzia 2022, IISER Bhopal's Annual Cultural Fest. (April '21- March '22)
- **Volunteer** at Prayaas, IISER Bhopal Social Work Council (Jan 2023).