Riya Singh

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Research Interests

Astroparticle Physics: Detector Development, Dark Matter, Cosmic Neutrinos

Education

2021-2023 Purdue University
Master of Science, Department of Physics and Astronomy

2016-2020 Indian Institute of Technology Bombay
Bachelor of Technology, **GPA: 9.36/10**
Major: Mechanical, Minor: Physics

Publications

1. **Riya** et al., Closed-Loop Simulation for Attitude Control of Nano-satellite, *Advances in Small Satellite Technologies*, pp 87-97, **Springer**, Singapore (2020).
2. **Riya** and V. Rentala, Neutrinos from the cosmic noon: a probe of the cosmic star formation history (2020), **arxiv**:2007.02951.
3. A. Kopec et al., Correlated Single- and Few-Electron Backgrounds Milliseconds after Interactions in Dual-Phase Liquid Xenon Time Projection Chambers (2021), **arXiv**:2103.05077
4. Y. Gupta, Aakash V, **R. Singh** et al., Lunar Exploration through ChipSats, International Astronautical Congresses (2020), **IAC**-20,A3,2C,30,x59667.

Conference Presentations

1. Resolution of discrepancy in SFR at Cosmic Noon using Diffuse Supernova Neutrino Background
   Advances in Astroparticle Physics and Cosmology 2020, Kolkata, India
2. Closed Loop Simulation for Attitude Control of Nano-Satellite
   International Conference on Small Satellites and Systems 2019, Hyderabad, India
3. Star Formation Rate using Diffused Supernova Neutrino Background
   National Space Science Symposium 2019, Pune, India

Honors and Awards

Undergraduate Research Award (URA 01), IIT Bombay, 2019
Future Research Talent Award, Australian National University, 2019
Kishore Vaigyanik Protsahan Yojna (KVPY), IISc, 2016

Research Experience

Summer 2020 **Electron Background Characterisation of ASTERiX and XENON dark matter detectors**
Supervisor *Prof. Rafael Lang, Department of Physics and Astronomy, Purdue University*
- Obtained rate of eâĹŠs and detected dependence of decay of rates with time on extraction voltage
- Analyzed detected signals and deduced the absence of observable amount of electron burst

2018-2020 **Neutrinos from the Cosmic Noon: a probe of the Cosmic Star Formation History**
Supervisor *Prof. Vikram Rentala, Department of Physics, Indian Institute of Technology (IIT), Bombay*
- Concluded that values of maximum Star Formation Rate (SFR) inferred from two different sets of methods disagree after reviewing the existing methods
- Simulated the detection signal at HyperK due to Diffuse Supernova Neutrino Background (DSNB)

- Based on χ^2 test-results **claimed potential of DSNB to resolve the discrepancy** in 1.6-20 years

Summer 2019 **Scintillator Material Characterisation for SABRE dark matter detector**

Supervisor *Dr Lindsey Bignell, Department of Nuclear Physics, Australian National University (ANU)*

- Measured relative light yields of scintillator samples to **verify absence of degradation** in scintillator properties after exposure to detector materials, implying no need for modification to detector design
- Measured charge distribution in BaF2 and LAB due to 22Na decay and fitted an exponential to time-delay to obtain the scintillation decay time (a parameter needed for simulation of detectors)
- Assisted in purification and storage of scintillator and detector-materials for setting-up the experiments

IIT Bombay Student Satellite Project

2019-2020 **System Leader, Great Lunar Expedition for Everyone (GLEE)**

GLEE is a collaboration of different institutions around the globe with a mission to conduct scientific experiments and test technology by deploying a network of 5-gram chipsatellites on the lunar surface.

- Supervised a team of **9 members** to select payloads, ideate the setup for their on-ground testing and develop electrical and communication design of the chipsats
- Evaluated the use of chipsats to **space-qualify technologies developed at IIT Bombay** such as AJIT Microprocessor and Nanosniff gas detector; chose AJIT microprocessor for the purpose

2017-2018 **Payload Engineer, Advitiy: Second Generation Student Satellite of IIT Bombay**

- Spearheaded a team to develop **quality assured** "satellite **simulation-framework**" for the ground-verification of control-algorithms; my leadership led to publication of a book-chapter in **Springer**
- Proposed different payloads and analyzed their system requirements as per the guidelines of **ISRO**
- Executed three-step recruitment process to ensure **team-continuity**, selecting **10** students out of **50+** applicants by evaluating them on their technical ability, practical approach, and teamwork

Social Goal | *A pro bono outreach effort to facilitate knowledge sharing*

- Contributed to Satellite 101 wiki which now has **1Lakh+** views and **38.5k** users around the globe
- Conducted **Ground Station Workshop** attended by **50+** students and faculties from **15+** colleges

Positions of Responsibility

Summer 2020 **Summer of Science Mentor** | Maths and Physics Club, IIT Bombay

Guided **4 students** in learning various topics and tools of astrophysics and cosmology

Summer 2018 **Teaching Assistant** | Prof. D M Dwaikar, Department of Civil Engineering, IIT Bombay

Tutored **35** undergraduate students to help them get better insight of Engineering Mechanics

2017-2018 **Associate Secretary** | Department of Mechanical Engineering, IIT Bombay

Organized events like orientation, convocation, lab-visits, department trip etc. to facilitate the interaction among **1100+** students and with 62 department faculties

Technical Skills

Machine Learning, Python, R, C++, MATLAB. Simulink, LaTeX, HTML

Miscellaneous

- Taught basic mathematics to **underprivileged students** for **a year** at Abhyasika, IIT Bombay
- Assisted in execution of '**SHE**', an initiative by Techfest to promote Sanitary and Health Education
- Represented IIT Bombay as a contingent member in 6^{th} and 8^{th} **Inter-IIT Technical Meet**
- Attended Football Girls Camp for two years and **won** institute girls' first **football** tournament
- Delivered a talk on **Dark Matter** to provide IIT Bombay students an essence about the topic
- Created a wikipedia page on Supernova neutrinos