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Siddhartha Bandyopadhyay B.S.-M.S.

Education

Department of Physics, Indian Institute of Science Education and Research Kolkata India

Bachelor and Master of Science with Major in Physical Sciences 2019 - 2024

- Advisor: Dr. Golam Mortuza Hossain
- Thesis title: Studies On Neutrino Propagation Inside Compact Stars
- GPA: 9.0/10.0
- *Relevant Coursework*: Quantum Field Theory, High Energy Physics, Astrophysics, General Relativity, Mathematical and Computational Methods.

Julien Day School (ISC) Kolkata, India

Senior Secondary (XII): Science 2017-2019

- Percentage: 91.20%

Julien Day School (ICSE) Kolkata, India

Secondary (X): Science 2012-2017

- Percentage: 92.70%

Publications

1. **Siddhartha Bandyopadhyay, Golam Mortuza Hossain.**"Probing the equation of state of neutron stars using neutrino oscillations",Phys. Rev. D 111, 065009 (2025).

Research and Projects

Junior Research Fellow at the Indian Institute of Science Education and Research Berhampur

Principal Investigator: Dr. Ujjal Kumar Dey Jan 2025 - Current

"News from ν's: Unlocking New Physics from Less-explored Aspects of Neutrinos" Being appointed as a JRF, I'm currently pursuing my interest in theoretical particle physics and how neutrinos and their interactions can serve as clues for physics beyond that of the Standard Model. We use Non-Standard Neutrino Interactions(NSI) as well as Generalised Neutrino Interactions(GNI) to model certain processes involving neutrino interactions and study the phenomenological implications for both particle detectors and cosmology.

Visiting student at the Indian Institute of Science Education and Research Kolkata

Supervised by Dr. Golam Mortuza Hossain July 2024 - Nov 2024

My research focussed on investigating oscillation phases of propagating neutrinos to constrain the Equation of State parameters of neutron stars of varied mass and radius. I had also implemented numerical simulations to put constraints on different EOS - Polytropic, σ-ω flat and σ-ω curved.

Master's Thesis-"Studies on neutrino propagation inside compact stars"

Supervised by Dr. Golam Mortuza Hossain Aug 2023 - Jun 2024

My work involved developing a theoretical description of neutrino propagation and oscillations in a region of spacetime curvature so as to model an astrophysical compact object (such as a neutron star) using the techniques of Quantum Field Theory in Curved Spacetime. I performed a detailed analysis of the transition rates as means of understanding the structure of the compact object.

Supersymmetry Reading Project

Supervised by Prof. Biswarup Mukhopadhyay Aug 2023 - Dec 2023

Understanding the mathematical formalism of supersymmetry algebras, the motivation for them and their effectiveness in answering problems in physics such as the hierarchy problem and the Higgs Mass. Supersymmetry breaking mechanism and the grand unification scheme.

Internships and Workshops

GIAN Workshop

The Standard Model: From Symmetry Principles to Experimental Tests
Instructor: Prof. Yosef (Yossi) Nir, Weizmann Institute of Science, Israel
Host: Dr. Poonam Mehta, Jawaharlal Nehru University, India Feb 2025

I had participated in the workshop organised by the School of Physical Sciences, Jawaharlal Nehru University, India. In the workshop I got to interact with Prof. Yosef Nir from the Weizmann Institute who gave several lectures on the Standard Model and BSM Physics. I had a rich educational experience interacting with him and the participants of the workshop and it was also a great networking opportunity.

COBRA Workshop

Conference on Blazars and Restless AGN July 2024

I had participated in the workshop hosted jointly by Presidency University, Inter University Centre for Astronomy and Astrophysics (IUCAA), Pune and co-hosted by Saha Institute of Nuclear Physics (SINP), Kolkata. In the workshop I got to interact with the leading physicists in the field and also learn about the theoretical and observational aspects of Active Galactic Nuclei. I also did a poster presentation in the conference on the topic of my current research and received positive recognition for my work.

Project 8 PRISMA+ Summer Intern

Supervised by Prof. Dr. Sebastian Böser,
Johannes Gutenberg University Mainz, Germany May 2023 - July 2023

My work was on the Temperature Assessment of Crackers (technical term for the Hydrogen Atomic Beam Source) using Camera Imaging which is an authentic approach for determining the temperature of the capillary where gaseous hydrogen is split into atomic hydrogen. Project 8 aims at measuring the mass of the neutrino with a precision down to 0.04eV @90% C.L. . Current best estimate is from KATRIN (<0.8eV @90% C.L.). The research internship required extensive programming and data-handling skills.

Awards and Honors

- **DFG funded PRISMA+ Scholarship**, for carrying out research in Germany. Mar 2023
- **National Topper Award**, for the National Graduate Physics Examination hosted by Indian Association of Physics Teachers. Jan 2020

Skills

Programming: `Python`, `C++`, `MATLAB`.

Tools: LaTeX, ROOT, Matplotlib.

Teaching Experience

Teaching Assistant for:	Quantum Mechanics I	Jan 2024- May 2024
	Mechanics II	Aug 2023- Dec 2023
	Electronics Laboratory	Jan 2023- Apr 2023

Extra-curriculars

- **Contingent Leader of my Institute's Dance Team**: in the Inter-Iiser-Cultural Meet (IICM 22') held at IISER Pune. Dec 2022
- The **Convener** of Nrutya-The Dance Club of IISER Kolkata. 2020-2022
- **Office bearer** of the Gaming Club of IISER Kolkata. 2021-2022

Volunteer work

- I volunteered for the organization of **Institute Open Day**, organized by Indian Institute of Science Education and Research, Kolkata on the occasion of National Science Day on February 28th, 2024. I had an enriching experience communicating astrophysics topics, especially a demonstration of Sun spots to school and college students.
- Volunteered as an Outreach Representative for my Institute in the **National Space Science Exhibition** (**NSSE**) which occurred under NSSS (National Space Science Symposium) in Kolkata,India in December 2022. The exhibition was visited by people from all walks of life and it was a enriching experience to be involved in scientific communication.

References

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