Amit Pal

Curriculum Vitae

School of Physical Sciences,
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Education

2019–Present **Doctor of Philosophy (PhD), Physical Sciences**, *National Institute of Science Education and Research (NISER)*, Bhubaneswar, India (Expected in Dec, 2025).
Experimental High Energy Physics; Under the supervision of Prof. Sanjay Kumar Swain
Thesis title: Seasonal variation of cosmic muon at the NOvA ND and Impact of the HF-CRPA Model on Neutrino Oscillation Parameter Measurements in NOvA

Dec, 2023 – Oct, 2024 **Research Intern**, *Fermi National Accelerator Laboratory (Fermilab)*, IL, U.S.A.
Under the mentorship of Dr. Bryan Ramson

2017 – 2019 **Master of Science, Physics**, *Jadavpur University*, Kolkata, India.

2014 – 2017 **Bachelor of Science, Physics (Hons.)**, *Jadavpur University*, Kolkata, India.

Research

Research Interests

- Neutrino oscillation physics and precision measurements
- Neutrino–nucleus interaction modeling and cross-section uncertainties
- Cosmic ray properties and Astroparticle physics
- Event simulation and reconstruction (GENIE, NuWro, GLoBES, CORSIKA)
- Future neutrino experiments (JUNO, DUNE, T2HK)

Research Experience in the NOvA experiment

- **Cross-section modeling for Neutrino Oscillation parameter measurements:** compared Valencia 1p1h z-expansion and HF-CRPA models for CCQE, developed a framework to calculate weight for cross-section tuning and studied the impact of HF-CRPA model on NOvA oscillation parameter measurements.
- **Seasonal variation of cosmic muon rate using NOvA Near Detector data:** studied multiple muon rate variation and compared it with atmospheric temperature, explained an anomaly observed by MINOS for single and multiple muon events with the help of CORSIKA
- **Cross-section measurement of π^0 production in neutrino interaction:** studied selection strategy of two photon prong for π^0 selection and sideband study to constrain the background.

Other Research Experience

- **ML for event classification:** Used LGBM and DNN to identify prompt and non-prompt J/ψ from the Pythia simulated data.
- **Sensitivity study for future neutrino experiments:** developed infrastructure using GLoBES for various neutrino-nucleus interaction model and studied sensitivity of Δm^2_{32}, $\sin^2\theta_{23}$, δ_{CP} for DUNE experiment.

Research Publications

Journal Articles

2025 - Explanation of the seasonal variation of cosmic multiple muon events observed with the NOvA Near Detector; S. Abubakar et al. **(The NOvA Collaboration)**; arXiv:2508.04434 (Submitted to Phys. Rev. D).

2025 - Precision measurement of neutrino oscillation parameters with 10 years of data from the NOvA experiment; S. Abubakar et al. **(The NOvA Collaboration)**; arXiv:2509.04361 (Submitted to PRL).

Conference Proceedings

2024 ▪ Seasonal Variation of Cosmic Muon at the NOvA Near Detector; **A. Pal**, S. K. Swain; In Proceedings of the XXV DAE-BRNS HEP Symposium 2022, Mohali, India; Springer Proceedings in Physics, vol 304, 2024, pp. 801-803.

Computational Skills

Languages & tools: C, C++, Python, Fortran, UNIX Shell scripting, Machine learning (BDT, DNN)

Software: Root, GENIE, CORSIKA, NuWro, GLoBES, Geant4, Fermilab ART Framework

Others: Git, LaTeX

School and Conferences attended

Oct 8-15, 2025 — Delivered a hands-on tutorial (3 lectures) on **"GENIE: The Neutrino Event Generator"** at the IIFC-vP (Indian-Institutions Fermilab Collaboration in Neutrino Physics) School at NISER, India.

Sep 16-21, 2024 — Presented a talk titled **"Seasonal Variation in Cosmic Muon Rate at the NOvA Experiment"** in NuFact 2024 - The 25th International Workshop on Neutrinos from Accelerators at Argonne National Laboratory, USA.

Sep 16-21, 2024 — Presented a poster titled **"Impact of the HF-CRPA Model on Neutrino Oscillation Parameter Measurements in NOvA"** in NuFact 2024 - The 25th International Workshop on Neutrinos from Accelerators at Argonne National Laboratory, USA.

July 9-12, 2024 — Presented a poster titled **"Impact of HF-CRPA CCQE model on the latest NOvA results"** in 57th Annual Users Meeting at Fermilab, USA.

Aug 28 - Sept 8, 2023 — Presented a talk on **"Prompt and non-prompt J/ψ identification from dimuons using LGBM and DNN"** in School on Statistical Methods and Machine Learning in High Energy Physics at ICTS-TIFR Bengaluru, India.

Feb 16-22, 2023 — Presented a talk titled **"Seasonal variation of cosmic muon at the NOvA near detector"** in International Meeting on High Energy Physics (IMHEP-II) at IOP Bhubaneswar, India.

Dec 12-16, 2022 — Presented a poster titled **"Seasonal variation of cosmic muon at the NOvA near detector"** in XXV DAE-BRNS High Energy Physics Symposium 2022 at IISER Mohali, India.

Dec 16-24, 2019 — Attended Winter school on Cosmic Neutrino Observations at Ultra-High Energy at IIT Kanpur, India.

Achievements

2023–2024 — Receipt of financial assistance from **Fermilab** to participate in the **Fermilab International Student Program** as a Research Intern for the duration of one year.

2019 — Receipt of ***Junior Research Fellowship & Senior Research Fellowship*** of Department of Atomic Energy, Government of India, as a Ph.D. research scholar in the National Institute of Science Education and Research Bhubaneswar.

2018 — Qualified ***National Eligibility Test (NET)*** conducted by Council of Scientific and Industrial Research (CSIR) and University Grants Commission (UGC).

2019 — Qualified ***Graduate Aptitude Test in Engineering (GATE)*** jointly conducted by IITs and IISC.

2019 — Qualified ***Joint Entrance Screening Test (JEST)*** conducted by Indian research institutions.

2017 — Qualified ***Joint Admission Test (JAM)*** conducted by IITs.

2014–2019 — Recipient of ***Inspire Scholarship for Higher Education (SHE)*** from Department of Science and Technology, Government of India.

Teaching and Mentoring

Teaching Assistantship at NISER

- Introductory Physics
- Mathematical Physics
- General Physics Lab I & II

Mentoring

- Mentored Suchismita Sahoo for a Master's project on "Study of cosmic ray properties from simulation".
- Mentored Subrat Bindu Prasad Pradhan for a Master's project on "Studies of Neutrino - Nucleus Interactions from simulation".

Referees

Prof. Sanjay Kumar Swain
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Prof. Maury C. Goodman
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