

Mandeep

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RESEARCH INTERESTS

Experimental high energy particle physics, detector-level data analysis, graph neural networks for event reconstruction and particle identification, deep learning for tracking and calorimetry, machine learning on large-scale collider datasets, physics-informed neural networks.

EDUCATION

Dr. B R Ambedkar National Institute of Technology Jalandhar

Master of Science in Physics

Thesis Title: Medium Modification of Pentaquark Θ^+

Aug 2022 | May 2024

CGPA: 7.08/10

St. Aloysius College, Mangalore, India

Bachelor of Science: Physics, Chemistry, Mathematics

June 2019 | July 2022

CGPA: 7.92/10

PROJECTS

GNN-based Jet Classification Using Public LHC Data (Ongoing)

Research Project

Jalandhar, India

June 2025 | Present

- Implementing Graph Neural Networks to classify top-quark jets vs. QCD background using the Top Tagging Reference Dataset and modeling jets as graphs of particle constituents
- Comparing MPNN and EdgeConv architectures against CNN/BDT baselines using PyTorch Geometric and JetNet
- [View project overview](#) with methodology, tools, and references

Medium Modification of Pentaquark States

Master's Thesis Research

Jalandhar, India

July 2023 | May 2024

- Investigated exotic pentaquark Θ^+ using chiral SU(3) quark mean field model in dense stellar matter environments
- Computed mass modifications in nuclear and strange matter relevant to neutron star cores
- Applied theoretical frameworks incorporating scalar and vector meson fields for dense matter study. [Link to thesis excerpts](#).

Galaxy Classification using Machine Learning

Independent Project

Remote

May 2023 | July 2023

- Built a CNN model to classify galaxy morphologies using SDSS images
- Preprocessed large-scale astronomical data and applied data augmentation
- Automated multi-class galaxy classification pipeline. [Read more](#)

High Fidelity FM Wave Broadcaster

BSc Project

Mangalore, India

May 2022 | July 2022

- Designed and built FM broadcasting system for 88–108 MHz range
- Implemented analog modulation, noise filtering, and RF amplification
- Applied circuit principles relevant to radio astronomy hardware

TRAINING/SUMMER SCHOOLS

Physics Training and Talent Search (PTTS)

IISER TVM | Summer 2021

Advanced undergraduate physics enrichment program

Curves and Surfaces

ICTS, Bengaluru | Summer 2022

Focused training on differential geometry and its applications in theoretical physics

Plasma Physics Workshop

Jalandhar | Autumn 2023

Hands-on training workshop focused on DC sputtering techniques, plasma diagnostics, and thin-film deposition.

SELECTED COURSES

Master's Courses

- Quantum Mechanics
- Relativistic Quantum Mechanics
- Particle Physics
- Nuclear Physics
- Electrodynamics
- Statistical Mechanics
- Solid State Physics
- Mathematical Methods in Physics

BSc Courses (Physics, Chemistry, Mathematics)

- Classical Mechanics, Modern Physics
- Thermodynamics and Electromagnetism
- Organic, Inorganic, and Physical Chemistry
- Calculus, Vector Analysis, Probability & Statistics
- Linear Algebra, Differential Equations
- Complex Analysis, Numerical Methods
- Linear Programming Problems (LPP)
- Chemistry Practicals and Instrumentation

Self-Paced / Additional Courses

- Machine Learning with Python (Coursera)
- Deep Learning Specialization (Coursera)
- Vedic Mathematics

AWARDS/ACHIEVEMENTS

CSIR NET Qualified

India

All India Rank 143 — National eligibility for PhD and research positions

IIT JAM Qualified

India

All India Rank 2283

Qualified Military Exams

India

Qualified exams of National Defence Academy, Combined Defence Services Examination, Airforce Common Admission Test

Bronze Medal – Air Rifle Shooting Championship

District Level

Secured 3rd place in Air Rifle Shooting Championship

2nd Place – National Photography Competition

Utkansh Festival | 2024

Recognized for creative excellence in a national-level cultural event photography contest.

Quiz & Co-Curricular Excellence

India

Multiple awards in quizzes, mime performances, and aircraft investigation competitions

SKILLS

- **Programming & Scripting Languages:** Python, C++, Bash, LaTeX
- **Tools & Libraries:** ROOT, SciPy, NumPy, Pandas, Matplotlib, TensorFlow, Keras, Mathematica
- **Operating Systems & Software:** Linux (Ubuntu & Arch), Windows, Git, Overleaf, Google Colab, Jupyter

LEADERSHIP & EXTRACURRICULAR

DPGC Member – Department of Physics

NIT Jalandhar, India | 2023–2024

Selected by the department to serve as the MSc student representative in the Departmental Postgraduate Committee (DPGC); represented students in the **Institute Senate** through the DPGC on matters of academic policy and curriculum reform.

Placement Representative – Department of Physics

NIT Jalandhar, India | 2023–2024

Facilitated MSc Physics placement activities by coordinating between students and the central placement cell; managed outreach, resume screening, and scheduling.

NCC Air Wing – B and C Certificates

St. Aloysius College, Mangalore | 2019–2022

Completed 3-year NCC training under 6 Kar Air Squadron NCC; trained in aviation basics, parade, leadership, and drill.

NCC Army Wing – A Certificate

Padua High School Mangalore | 2015–2017

Completed foundational military training in weapon handling, disaster response, and field discipline under 18 Kar Battalion NCC.

REFERENCES

Dr. Suneel Dutt

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Scholar Profiles: [NIT Jalandhar](#)  | [Google Scholar](#) 

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