Harshul Nanda

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M.Sc. Computer Science student with a strong foundation in Python, data processing, and reinforcement learning. I have practical experience building automated data pipelines that clean, harmonize, and validate measurement data, along with writing clear methodology documentation. I am especially interested in the development of end-to-end data-driven projects, and I am currently contributing to an energy market simulation project at KIT.

Education

Karlsruhe Institute of Technology, Germany (10/2025 - Present)
- MSc. in Computer Science

Cluster Innovation Centre, University of Delhi (11/2021 - 06/2025)
- B.Tech. in Information Technology & Mathematical Innovation – Final grade: 9.35 CGPA (1.3-1.5 GPA scale)

Adarsh Public School (04/2020 - 06/2021)
- 12th Standard: High School – Final grade: 91.2%

Work Experience

Student Research Assistantship *(on-site)*, **KIT, Karlsruhe, Germany** (01/2026 - Present)

- Developing and integrating Multi-Agent Proximal Policy Optimization (MAPPO) algorithm within the ASSUME framework repository to simulate complex energy market dynamics using Reinforcement Learning.

Battery Data Engineer *(remote)*, **MEAtec, Turkey** (06/2024 - 07/2025)

- Researched and analyzed battery datasets and literature, generating synthetic data using Equivalent Circuit Model methods, and creating detailed documentation and professional visualizations for stakeholders.
- Built end-to-end ML pipelines for industrial battery analytics including cell-level SOC, SOH, RUL, and anomaly detection, and shipped each as a modular Python package with CI/CD on GitHub Actions, so stakeholders could consume models without touching the training code.
- Generated synthetic battery datasets using Equivalent Circuit Model (ECM) simulations and built data-preprocessing pipelines covering cleaning, feature engineering, and validation against domain rules.
- Designed and built a Streamlit analytics dashboard with asynchronous processing and advanced cache management for real-time visualisation of cell metrics produced UML architectures documenting the end-to-end system for cross-team review.
- Established company-wide standards for documentation, reporting, and GitHub package templates, effectively the lightweight data-governance layer that let a small team scale model delivery without losing traceability.

Machine Learning Intern *(on-site)*, **Havells Pvt. Ltd., Noida, India** (06/2023 - 08/2023)

- Applied time series forecasting using over ten statistical models (AutoRegressive Integrated Moving Average) and neural networks (LSTM) to predict future sales across diverse product lines.
- Contributed to the achievement of over 45% improvement in error rate compared to traditional predictive models.

Software Engineer *(remote)*, **Paras Labs, India** (01/2023 - 05/2023)

- Helped in secured digital banking iOS application development using UIKit and SwiftUI.
- Built user-friendly interfaces with intricate designs and logic.

Machine Learning Intern *(remote)*, **BeyondExams, India** (06/2022 - 11/2022)

- Scraped more than ten thousand videos from YouTube for a channel-specific and video-specific intensive datasets.
- Built an innovative model architecture for categorical classification of YouTube videos (educational vs. non-educational).
- Video Explanation & Project Files

Computer Science Technical Writer *(remote)***, OpenGenus, Tokyo** (04/2022 - 06/2022)

- Published articles explaining algorithms and data structures with practical implementation, showcasing diverse methods, and mathematical skills.

Research & Technical Projects

BLE-Enabled Smart Intrusion Detection System (01/2026 - 02/2026)
(Embedded Systems, Arduino, BLE Communication, Sensor Integration, IoT & Ubiquitous Computing)

- Designed and built a portable, password-protected intrusion detection system using a Seeed XIAO nRF52840 microcontroller, integrating an IR flame sensor for light-change detection and an IMU (LSM6DS3) for tamper/movement detection.
- Implemented a multi-factor owner verification mechanism combining BLE proximity (RSSI thresholding), real-time authentication via custom GATT characteristics, and a dynamic password management system with secure reset flow.
- Developed a firmware architecture with distinct audible feedback patterns for authentication, intrusion, and error states.
- Project Files

Autonomous Trajectory Tracking in Mobile Robotics: Evaluation of Fractional PID Control and Obstacle Avoidance Strategies (12/2024 - 06/2025)
(ROS, TurtleBot-3 Hardware Assembly, Arduino, Raspberry Pi)

- Compared four Proportional-Integral-Derivative (PID) control models: standard, fractional, adaptive fractional, and non-linear fractional, to regulate robot's movement along a predefined trajectory.
- Proposed a general PID control mechanism with experiments both virtually and on a physical TurtleBot-3 robot.
- Implemented and improved four pathfinding algorithms (Particle Swarm Optimised Heuristics A-star, Dijkstra, Breadth-First Search, Greedy Best First), integrating them with PID for static obstacle avoidance.
- Test Cases Videos and Project Files

A Predictive Health Management System for Patient Readmission Risk (11/2024 - 12/2024)
(Web Development, Dynamic Dashboard Designing)

- Developed integrated patient and admin dashboards for real-time readmission risk tracking.
- Implemented predictive models (Random Forests, Gaussian Process Classification) with an easy re-training platform for adaptive risk estimation.
- Project Files

A Comprehensive Study to Predicting Unethical: Activity in Videos Through Deep Learning Techniques (11/2023 - 12/2023)
(Video Classification, Machine Learning)

- Curated a dataset of CCTV footage and videos containing unethical activity and analysed four video classification model architectures.
- Achieved over 94% accuracy in classifying criminal vs. safe content.
- Project Files

[Article published in Proceedings of International Conference on Generative AI, Cryptography and Predictive Analytics Springer publication]

Crime Prediction in Conversations (02/2023 - 04/2023)
(Natural Language Processing, Data Science)

- Developed a dataset comprising over one thousand daily life conversations, each consisting of 7 to 10 dialogues and annotated with six categories ranging from unethical to neutral.
- Studied and compared over fifty crime-predicting text classification model architectures.
- Proposed a state-of-the-art architecture using a fine-tuned BERT model in public safety and NLP research, achieving 98% accuracy on the created dataset.
- Video Explanation & Project Files

Technical Skills

Languages: Python, C/C++, JavaScript, MATLAB, HTML, CSS, MySQL
CS Foundations: Data Structures & Algorithms, Numerical Methods, Linear Algebra, Object-Oriented Programming
ML & Data: Machine Learning, Reinforcement Learning, Predictive Modelling (e.g., ARIMA, LSTM), Natural Language Processing, TensorFlow, Keras, Scikit-learn, PyTorch, Numpy, Pandas, Advanced Excel, OpenCV, Matplotlib, Seaborn, LangChain
Web & UI: Streamlit, Flask, ReactJS, Figma for UI/UX design, SwiftUI, UIKit
Tools: Git, CI/CD (GitHub Actions), Docker, ROS (Robot Operating System), Blender

Soft Skills

Effective Communication, Critical Thinking, Problem-Solving, Attention to Detail, Adaptability, Collaboration, Time Management, Leadership, Public Speaking, Creativity

Languages

Mother tongue(s): HINDI
Other language(s): ENGLISH C2, GERMAN B1

Certifications

17/11/2022 - **Algoexpert**, 100 Data Structures and Algorithms problems completion certificate.
05/12/2025 - **Coursera**, Reinforcement Learning Specialization, University of Alberta & Alberta Machine Intelligence Institute
26/06/2023 - **Coursera**, Analyse Data (CertNexus), Bill Rosenthal, CEO at CertNexus
11/06/2023 - **Coursera**, Getting started with TensorFlow 2, Kevin Webster, Senior Teaching Fellow in Statistics, Imperial College of London
07/06/2023 - **Coursera**, Machine Learning Algorithms Supervised Learning Tip to Tail by Anna Koop, Senior Scientific Advisor, Alberta
06/06/2023 - **Coursera**, Machine Learning Algorithms, Jackwang, Sungkyunkwan University
06/06/2023 - **Coursera**, Introduction to iOS Mobile Application Development, Meta

Extracurricular Activities

EV Technology & Public Charging Station Workshop, NIELIT (08/2025)

- Participated in a 5 day workshop to understand the theory behind the Electric Vehicle Technology
- Learned the basics of Battery driven EV and its dynamics, motors, power electronics, batteries, charging, etc.

Facilitator, Faculty Development Program, Cluster Innovation Centre (11/2023)

- Hosted a two-day workshop on Blender 3D, building animations to visualise scientific phenomena (electron transmission through a wire, longitudinal/transverse wave propagation).
- Demonstrated how 3D modelling, lighting, and animation tools can assist teachers in communicating complex scientific phenomena to students.

Team Leader, Think Beyond Exams Hackathon, BeyondExams (11/2022)

- Led my team to first place, transforming educational classification models into a web application.
- Developed a web-based application to let users get the prediction for subcategories, and educational content percentage of a YouTube video or a complete playlist with just a URL.

Certificate of Participation, Science Olympiad Foundation SOF (04/2021)

- Participated in the International Mathematics Olympiad conducted by SOF.

Indian Computing Olympiad - Zonal Round (12/2020)

- Zonal Informatics Olympiad 2021: Indian Association for Research in Computing Science}