

Neelay Jain

 Neelayjain21 |  Neelayjain21 |  neelayjain957@gmail.com |  +91.80.008.80217 |  Portfolio

SUMMARY

Mechanical Engineering undergraduate with a Minor in Computational Data Science. Strong foundation in CAD, simulations, and thermodynamic systems, with hands-on experience applying machine learning to engineering problems. Led large-scale technical initiatives as President of I-MECH. Interested in combining physics-based modeling with data-driven methods for real-world engineering systems.

EDUCATION

2023 – Present **Pandit Deendayal Energy University (PDEU)**

B.Tech Mechanical Engineering

Minor in Computational Data Science

CGPA: 9.55/10

RESEARCH & WORK EXPERIENCE

Production Engineering Intern — Larsen & Toubro – Precision Engineering & Systems IC, Hazira

May 2025 – July 2025

Designed and validated heavy-duty industrial fixtures including a 24 MT deck fixture (safety factor >1.5) and a 450 MT lifting fixture using Siemens NX FEA and Solid Edge. Developed detailed CAD models, GD&T-compliant engineering drawings, and bills of materials (BOMs) aligned with manufacturing standards. Collaborated closely with shop-floor engineers to ensure practical feasibility, structural reliability, and successful real-world implementation under operational constraints.

Multi-Objective Optimization of Aircraft ECS using NSGA-II — ICMOTA 2026 – IIT (BHU)

March 2026

Developed a physics-based thermodynamic model of a bootstrap air-cycle refrigeration system for aircraft Environmental Control Systems (ECS), incorporating compressor efficiencies, heat exchanger performance, and turbine expansion constraints. Formulated a tri-objective optimization problem balancing cycle efficiency, bleed air consumption, and turbine outlet temperature, and explored the design space using Monte Carlo sampling (20,000 configurations) to identify feasible regions. Implemented NSGA-II (population 5000, 1000 generations) to generate a high-resolution Pareto front, revealing trade-offs between competing objectives. Extracted key engineering insights including the dominance of turbine expansion in cooling performance and the mismatch between ventilation demand and thermodynamic cooling requirements.

Research Paper: Condition Monitoring of Ball Bearings using AI

ICRAM 2025, IITRAM Ahmedabad

Developed a CNN-based deep learning model for condition monitoring of ball bearings using thermal imaging, classifying six defect categories including ball, cage, inner race, outer race, lubrication faults, and healthy states. Applied data augmentation and preprocessing techniques to enhance dataset robustness and reduce overfitting, achieving 99.25% validation accuracy. Performed confusion matrix analysis to evaluate class-wise performance and identify challenges in distinguishing thermally similar defect patterns, demonstrating the effectiveness of AI-driven predictive maintenance systems.

PROJECTS

Formula 1 Race Position Prediction (XGBoost + Optuna)

[GitHub](#)

Developed an end-to-end machine learning pipeline using historical Formula 1 race data (2018–2024), integrating driver, constructor, circuit, grid position, and weather parameters. Performed feature engineering including label encoding and scaling, and benchmarked multiple models (Random Forest, SVM, MLP, Logistic Regression). Applied hyperparameter optimization using GridSearchCV and Optuna to improve generalization. Evaluated performance using ROC-AUC, F1-score, precision-recall metrics, and confusion matrices, selecting the most stable model for race outcome prediction.

NASA Space Apps – Exoplanet Detection (SPECTRA)

[Live](#)

Built a full-stack AI-powered web application for exoplanet classification using React (frontend) and Flask (backend), trained on NASA Kepler datasets. Implemented XGBoost and Multi-Layer Perceptron models to classify celestial objects and predict planetary type, habitability, and surface water probability. Designed an API-driven inference pipeline enabling real-time predictions and visualization. Successfully deployed a live interactive platform, demonstrating strong adaptability in integrating machine learning with web technologies.

Cross-Axis Wind Turbine Design (CAWT)

Proposed and designed a hybrid cross-axis wind turbine capable of capturing both horizontal and vertical wind components for improved efficiency in urban environments. Developed a 3D blade configuration consisting of vertical and horizontal blades using PETG material, coupled with a 5:1 planetary gearbox for optimized torque transmission. Evaluated system feasibility considering aerodynamic performance, scalability, and cost constraints, with a focus on decentralized renewable energy generation.

Robofest Gujarat – Autonomous Robot Architecture

Designed a conceptual AI-enabled autonomous robotic system integrating computer vision (OpenCV, YOLOv8) with sensor fusion (LiDAR, ultrasonic) for real-time perception. Structured an end-to-end pipeline (Perception → Decision → Control → Learning) enabling multi-task capabilities including navigation, object detection, and gesture-based control. Proposed a distributed hardware architecture using Jetson Nano for AI computation and ESP32 for control, along with adaptive feedback mechanisms for system optimization.

Airfoil Noise Prediction (Machine Learning)

[GitHub](#)

Applied regression-based machine learning models on aerodynamic datasets to predict noise levels across different airfoil profiles. Performed data preprocessing, feature selection, and model evaluation to establish relationships between aerodynamic parameters and acoustic output. Improved prediction accuracy by refining input features and validating performance across multiple configurations.

GSLV MkIII Launch Vehicle Simulation (MATLAB)

[GitHub](#)

Developed a numerical simulation of a three-stage launch vehicle (S200, L110, CE-20) in MATLAB, modeling thrust, drag, gravity, and stage separation dynamics. Analyzed trajectory parameters including velocity, altitude, and mass variation throughout flight, providing insights into aerospace system behavior and performance under varying conditions.

LEADERSHIP & EXTRACURRICULARS

President — I-MECH – Rejuvenating Potentials, PDEU

Aug 2023 – Present

Led I-MECH, organizing large-scale technical events including I-MECH 3.0/4.0 (380+ participants) and Mech-A-Thon 2025 (150+ students, 36 teams), simulating real-world engineering workflows. Managed teams, logistics, and industry collaborations to enhance hands-on learning.

Editor— Mech-A-Tech – Department of Mechanical Engineering, PDEU Newsletter

Jan 2023 – Present

Managed end-to-end publication of the departmental newsletter, coordinating content, editing, and layout with faculty and students, ensuring accurate and timely releases.

SKILLS

Software & Tools	SolidWorks, Siemens NX, Solid Edge, ANSYS, MATLAB, Python, Simulink
Core Skills	CAD, FEA, Thermodynamics, Optimization, Machine Learning
Soft Skills	Leadership, Problem Solving, Teamwork, Communication