

Rishabh Jain

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EDUCATION

Indian Institute of Technology (IIT), Delhi

B.Tech in Engineering & Computational Mechanics

GPA: 9.07/10.0 | Dept. Rank: 4

Thesis: Accelerating Design Exploration and Optimization with Surrogate Machine Learning Models

New Delhi, India

Aug 2022 – May 2026

CONFERENCE / PUBLICATIONS

RCA-Agent for Z AIOps | IBM Internal Conf. | Research Intern

Jul 2025

- Authored and presented a paper on a custom RAG pipeline using LangGraph and IBM Granite LLMs.
- Proposed a "Mixture of Experts" LLM-as-a-Judge framework, improving retrieval accuracy by **35%**.
- Work resulted in a Pre-Placement Offer (PPO) for a Research Engineer role at **IBM Research**.
- Paper available: [Link to Draft](#)

Surrogate Physics Models Optimization | ASME Conference (Hackathon) | B.Tech Project

Aug 2025

- Presented a novel inverse design framework at the American Society for Mechanical Engineers (ASME) conference.
- Demonstrated a neural network-based surrogate model maximizing surface area under flow constraints.
- Accelerated design convergence using Bayesian Optimization and Active Learning, achieving a **2.36%** increase in heat exchange performance while reducing data requirements by **60%**.
- GitHub: [Link to Repository](#)

RESEARCH INTERNSHIPS

Siemens Energy @ Gurgaon, India

Dec 2024 – Jan 2025

Machine Learning Intern

Advisor: Mr. Arun Gupta

Machine Learning Applications in Computational Fluid Dynamics (CFD)

- Researched on accelerated simulations using surrogate modeling for lube-oil degasification process within gas turbines.
- Explored the integration of Physics-Informed Neural Networks in CFD applications for reduced computational costs.
- Authored a comprehensive [technical report](#) for future integration of ML methodologies in CFD workflows.

MathEXLab, National University of Singapore (NUS) @ Singapore

May 2024 – Jul 2024

Research Intern, Dept. of Mechanical Engineering

Earthquake Prediction using Seismic Electrical Signals

Advisor: Prof. Gianmarco Mengaldo

- Modeled time series data of seismic electrical signals to predict earthquake occurrence in the next 45 time steps.
- Trained and compared CNNs, LSTMs, and Transformers, leveraging Weights & Biases for hyperparameter optimization.
- Implemented post-hoc interpretability methods (DeepLift, KernelSHAP) to identify key earthquake precursor indicators.

PROJECTS

Stochastic Process Emulator for Reliability-Based Design Optimisation [\[GitHub\]](#) Aug 2025 – Nov 2025

Advisor: Prof. Souvik Chakraborty, IIT Delhi

Product Reliability

- Developed a Generalized Lambda Model (GLaM) emulator to approximate conditional densities of limit state function.
- Enhanced GLaM training stability by implementing a moment-based initialization strategy and employing the BFGS algorithm, successfully mitigating convergence to local minima during Maximum Likelihood Estimation.
- Optimized stochastic I-beam design using a sequential SLSQP framework, achieving 54.9% mass reduction.

Comparative Analysis of Deep RL Algorithms for Continuous Control [\[GitHub\]](#) Aug 2025 – Nov 2025

Advisor: Prof. Raunak Bhattacharyya, IIT Delhi

Deep RL

- Designed a comparative study of DQN, Double DQN, and Actor-Critic architectures to solve the non-linear Lunar Lander control problem, analyzing trade-offs between sample efficiency and stability.
- Addressed maximization bias in Value-Based methods by implementing Double DQN, decoupling action selection from evaluation to stabilize Q-value convergence.
- Implemented Actor-Critic from scratch in PyTorch using 1-Step TD residuals for advantage approximation, demonstrating superior convergence speed over epsilon-greedy DQN strategies.

ML Approach to Crack-Branching Problem [GitHub]

Mar 2025 – Apr 2025

Advisor: Prof. Ibne Rushdie, IIT Delhi

Machine Learning in Mechanics

- Developed LSTM model to predict crack propagation patterns in pre-notched glass plates under tensile loading.
- Designed custom dataset with spatial clipping and autoregressive prediction for sequential learning of crack growth.
- Proposed combined loss function (MSE + Cosine Similarity) balancing pixel-wise accuracy with structural consistency, improving pattern prediction accuracy by 23% over baseline MSE loss.

Intelligent Waste Segregation System [GitHub]

Aug 2024 – Nov 2024

Advisor: Prof. Sitikantha Roy, IIT Delhi

Product Design & Computer Vision

- Developed binary classifier CNN on TrashNet dataset to classify organic vs recyclable waste.
- Designed 3D CAD model prototype using SolidWorks and deployed model on Raspberry Pi using TensorFlow Lite.
- Integrated hardware system with camera module, servo motors, and custom motor driver code for real-time classification.

Parameterized Car Dataset Generation and Aerodynamic Optimization [GitHub]

Aug 2024 – Nov 2024

Advisor: Prof. Sitikantha Roy, IIT Delhi

Generative Design

- Trained Generative Adversarial Network on parameterized DrivAerNet dataset producing high-diversity car designs.
- Customized GAN by introducing drag coefficient values to loss function to generate aerodynamically optimized designs.
- Leveraged IIT Delhi HPC facility (BAADAL) to train PaDGAN on airfoil dataset, generating 36 novel airfoil designs.

SCHOLASTIC ACHIEVEMENTS

- **Semester Merit Award:** In semsester 5 and semester 7 for ranking in the **Top 7 percentile** in the batch
- **Joint Entrance Examination (JEE) Advanced 2022:** Ranked in the **Top 1.6%** of 160,000+ candidates nationwide
- **Graduate Record Examination (GRE):** Score 320/340 (Quant: 167/170, Verbal: 153/170)
- **Joint Entrance Examination (JEE) Mains 2022:** Achieved **99.78 percentile** out of 1 million+ candidates
- **Department Change:** Qualified for department upgrade by ranking in the **Top 10%** of the batch after 1st year
- **CBSE Board:** Scored **100/100** in Mathematics in both 10th and 12th board examinations (**Top 0.1%**)

TECHNICAL SKILLS

Programming Languages: Python, Java, C/C++, MATLAB
ML/DL Frameworks: PyTorch, TensorFlow, Keras, LangChain, LangGraph, scikit-learn
Tools & Platforms: Git, Docker, Weights & Biases, OpenCV, SolidWorks, Raspberry Pi, TensorFlow Lite
Specializations: Physics-Informed ML, Computer Vision, NLP/RAG, Time Series Forecasting, CFD, Finite Element Analysis

RELEVANT COURSEWORK & TEACHING

Teaching Assistant: Machine Learning in Mechanics (Jan 2026 – Present)
Core Courses: Computational Fluid Dynamics, Introduction to Finite Element Method, Data Structures & Algorithms, Machine Learning in Mechanics, Numerical Methods & Computation, Control Theory & Applications, Linear Algebra & Differential Equations, Fluid Mechanics, Digital Electronics, Biomechanics, Deep Reinforcement Learning

LEADERSHIP & EXTRACURRICULAR ACTIVITIES

- **Convener** | CAIC, IIT Delhi Jan 2025 – Present
 - Elected representative of the Engineering & Computational Mechanics batch; bridging students and faculty.
- **Research Executive** | Physics and Astronomy Club (PAC) July 2023 – June 2024
 - Organised the annual *Cosmicon* fest and authored scientific articles for the club magazine *PAC Times*.
- **Sports** | Cricket & Table Tennis (TT) 2014 – Present
 - Runners-Up, BSA General Championship (TT Captain); Represented school team in district-level tournaments.
- **Musician** | Trinity Rockscool of Music June 2019
 - Guitarist with Distinction in Grades 1 & 3 from Trinity Rockscool of Music.