

Pahal Dhruvin Patel

✉ Email 📞 Contact Number 🌐 Personal Website in LinkedIn 🐙 Github

Education

- Indian Institute of Technology Kanpur** Nov'22 - May'26
Major in Physics, Minor in Machine Learning and Literature
CPI : **8.5/10** , Machine Learning CPI : **9.5/10**
- Delhi Public School Surat - Grade 11 & 12** April'20 - March'22
Central Board of Secondary Education, Percentage : **97.8 %**

Research Experience

- Knowledge Distillation in Super Resolution** 🌐 Jul'25 - Present
Reserach Intern | Brown University, Supervisor: Dr. Loukas Gouskos 🌐
 - Designed a **cross-resolution 2D CNN** for jet classification on the ATLAS Top Tagging dataset
 - Implemented **super-resolution** models such as **ESRGAN** on the BSD300 image dataset and ATLAS dataset
 - Preprocessed data into **high- and low-resolution jet images** to enable multi-resolution comparative training
 - Integrating **knowledge distillation** to compress models and improve efficiency and scalability on larger datasets
- Explainability in Graph Neural Networks for Jet Tagging** 🌐 Apr'24 - present
Research Intern | IIT Kanpur, Supervisor: Dr. Sanmay Ganguly 🌐
 - Developed a specialized **graph neural network** for **binary jet-tagging** using **PyTorch Geometric** framework
 - Enhanced **interpretability** and **trustworthiness** by integrating **explainable AI** tools (e.g., GNNExplainer, Shapley values) to align model behaviour with physics principles
 - Preprocessed raw jets into structured **graph representations** using the **FastJet** and **ROOT** analysis frameworks
 - Trained and optimized the model to capture detailed **jet substructure**, improving jet-tagging performance.
- Multi-modal Semantic Communication in VQA task** Aug'25 - present
Research Intern | Intent Lab, Supervisor: Dr. Subrahmanya Swamy Peruru 🌐
 - Implemented a **multi-modal** semantic communication framework for VQA using **MU-DeepSC**.
 - Extended the system with **Vision Transformer** encoders, evaluating multi-scale ViT modules.
 - Achieved **78.6%** accuracy using the baseline CNN encoder and improved performance to **82.9%** with a ViT-based semantic extractor under identical channel conditions

Key Achievements

- Achieved a CPI of **9.4** and stood among the **top 10%** of the class for the academic year 2024-25
- Ranked in the **top 15%** out of 1,200 students across the entire campus population in undergraduate studies
- Secured All India Rank in the **top 1%** in JEE Mains 2022 among 1.5 million applicants across India
- Secured All India Rank in the **top 3%** in JEE Advanced 2022 among 200K selected candidates

Course Projects

- Privacy in RAG** | CS787: Generative AI 🌐 Aug'25 - Nov'25
 - Built **privacy-evaluation pipeline** for RAG systems to check leakage detection, mitigation, and utility assessment
 - benchmarked privacy defenses (**PII sanitize**, **summarization**, **prompt engineering**) leakage-utility tradeoffs
 - Conducted **membership-inference auditing** via **S-RAG**, analyzing implicit privacy risks in RAG systems
- Unsupervised Domain Adaptation** | CS771: Introduction to Machine Learning 🌐 Oct'24 - Nov'24
 - Studied **Continual Domain Shift Learning** and analyzed methods such as **RandMix**, **pseudo-labelling**, and **prototype contrastive alignment** for improving cross-domain generalization.
 - Evaluated how these strategies enhance **model adaptability** with shifting data distributions
 - Presented findings to an audience of **50+ students**, highlighting practical trade-offs and best practices for domain adaptation in real-world ML systems

Predictive Modeling and Representation Learning | CS771: Intro to ML

Aug'24 – Oct'24

- Built **binary classification** models on **3 datasets** using **n-grams**, **XGBoost**, and **deep neural networks**
- Applied preprocessing techniques such as **one-hot encoding**, **emoji-to-text**, and **BERT embeddings** to study cross-dataset feature correlations
- Achieved **97.13%**, **98.77%**, and **93.05%** accuracy through **GridSearchCV**-based optimization

Mentoring Experience

Culinary Arts Club Leader | Media and Cultural Council

July'24 – Sep'24

- Led the **first tenure** with a **20-member team**, managing operations, logistics, and large-scale event planning
- Organised a **community outreach event** teaching **30+ children** from villages on **food safety and nutrition**
- Conduct cooking sessions and competitions that enhance members' culinary skills while fostering team bonding

Student Guide | Counselling Service

Dec'23 – Feb'23

- Mentored six first-year students, supporting them with their arrival, orientation, and transition into IIT Kanpur
- Provided academic, social, and emotional support to help students adapt smoothly to college life and build a strong foundation

Relevant Courses

• Introduction to Machine Learning • Generative AI • Computational Physics • Statistical Mechanics • Probability and Statistics • Linear Algebra • Fundamentals of Computing • Multivariate Calculus • Coursera - Data Structures