Falak Parmar

M.Sc. Data Science — Dhirubhai Ambani University
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Education

Dhirubhai Ambani University (formerly DAIICT) 2025 – Present
M.Sc. Data Science *CPI:* 6.9 *Gandhinagar, Gujarat*

The Maharaja Sayajirao University of Baroda 2022 – 2025
B.Sc. Physics (Honours) *CPI:* 6.4 *Vadodara, Gujarat*

Experience

Research Lab, Dhirubhai Ambani University Feb 2026 – April 2026
Research Assistant *Gandhinagar, Gujarat*

- Developing hybrid **Quantum-Classical CNN (QCNN)** architectures for medical image classification, studying the interaction between quantum feature maps and classical learning components.
- Implemented variational quantum circuit training pipelines using **PennyLane and PyTorch**, focusing on optimization behavior and stability of hybrid models.
- Explored alternative quantum feature representations (**MERA, Fractal encodings**) to analyze trade-offs in representational expressivity and computational efficiency.
- Optimized quantum circuit simulations on **Apple Silicon (M-series GPUs)** using **MLX**, reducing computational overhead and improving experimental throughput.

Technical Skills

Programming: Python, SQL
Machine Learning: PyTorch, Scikit-Learn, NumPy, Pandas
Mathematical Foundations: Linear Algebra, Probability, Optimization Basics
Scientific & Quantum Computing: PennyLane, JAX, MLX
Tools: Git, Docker, Jupyter
Databases: PostgreSQL, MySQL
Languages: English (Fluent), Gujarati (Native)

Projects

Logical Fallacy Detection and Controlled Text Generation | *Python, Transformers, NLP (Work in Progress)*

- Formulated an exploratory NLP framework designed to isolate and study the divergence between structural reasoning capability and surface-level linguistic fluency in neural language models.
- Established initial data cleaning and context extraction pipelines for the **7.7K+ record CoCoLoFa dataset** to prepare for multi-class classification across **8 unique fallacy categories**.
- Outlined baseline modeling architectures and structured training loops for planned fallacy detection (**DeBERTa**) and Controlled Text Generation (**GPT-2/T5**) tasks.
- Currently executing preliminary data exploration and baseline testing to formalize evaluation design and define downstream metrics for early-stage model iteration.

HEP Event Classification via Variational Quantum Circuits | *Python, PennyLane, Quantum ML*

- Implemented a hybrid quantum-classical machine learning pipeline to reproduce and extend high-energy physics event classification workflows on the **UCI HIGGS dataset**.
- Developed Variational Quantum Classifiers (VQC) using **PennyLane** paired with the high-performance **lightning.qubit** C++ simulator backend, benchmarking performance directly against classical baseline MLPs.
- Conducted systematic ablation studies across structural quantum parameters, exploring feature scaling (**2 to 8 qubits**), circuit depth variations (**1 to 4 layers**), and state preparation techniques (**Angle vs. Amplitude vs. Data Re-uploading**).
- Investigated a quantum **"Small-Data Advantage"** using scaled-down data subsets and structurally validated final model robustness within a leak-free evaluation pipeline using **5-seed statistical averaging**.

Achievements

- **iQuHack 2026 (MIT)** — Ranked **8th out of 578 teams worldwide** in the international quantum computing hackathon. Recognized for technical contribution in the **BlueQubit Challenge**.