Noor Fatima

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Education

BS in Computer Engineering 2023 – Expected 2027
University of Engineering and Technology, Lahore, Pakistan *CGPA: 3.86/4.0 (Top 3 in session)*

Experience

Research Intern Jun 2026 – Sep 2026
MITACS Globalink Research Internship, University of Saskatchewan, Saskatoon, Canada

- Will research a **hybrid AI–Quantum framework** for efficient variational circuit design and optimize ansatz structure using PennyLane/Qiskit.
- Will benchmark hybrid approaches against standard VQE/QAOA baselines and collaborate with an international team to produce **publication-ready results**.

Research Intern May 2025 – July 2025
National Center for Quantum Computing (NCQC), Lahore, Pakistan

- Developed **QAOA-based optimization algorithms** for NP-hard feature selection problems in healthcare diagnostics, processing 2000+ patient samples.
- Implemented Variational Quantum Classifier (VQC) achieving **98.4% accuracy**, demonstrating **quantum advantage** over classical baselines (+3.7% improvement).

Research Assistant June 2024 – Present
Al-Khawarizmi Institute of Computer Science (KICS), Lahore, Pakistan

- Built end-to-end **ML pipelines** for EEG-based emotion recognition across 3 datasets (150+ subjects).
- Developed predictive models for Alzheimer's/MCI classification using 80+ patient EEGs and integrated computational neuroscience models for improved stress-decoding.

Machine Learning Intern Mar 2024 – Jun 2024
Datalabb, Lahore, Pakistan

- Designed and optimized U-Net segmentation framework for 10k+ medical images, achieving **90% mean Dice score**.
- Fine-tuned domain-adapted LLMs for clinical text, improving reliability by **22%** and delivering production-ready models.

Machine Learning Fellow Jun 2024 – Sep 2024
Bytewise Limited, Lahore

- Selected among top **9% of 2,300+ applicants**; completed 8+ ML modeling and optimization projects.
- Automated preprocessing workflows, reducing runtime from 2 days to under 6 hours.

Research Assistant Jul 2025 – Present
Dpoint Technologies Ltd, Cyprus

- Researched Predictive Maintenance systems for industrial cranes, improving operational reliability and reducing downtime.
- Analyzed sensor data (vibration, temperature, current) to identify patterns leading to mechanical failures.
- Developed ML models for anomaly detection and fault prediction, integrating results into real-time dashboards.

Teaching Assistantship

Teaching Assistant Spring 2026
University of Cyprus

- Assisted in teaching **Programming Fundamentals** and **Information Security**.
- Supported students through lab sessions, assignments, and conceptual clarifications.

Teaching Assistant Fall 2025
University of Cyprus

- Assisted in delivering **Software Engineering** and **Computer Graphics** courses.
- Guided students in project development, debugging, and applied problem-solving.

Selected Projects

NeuroAI Platform | Deployed App | GitHub June 2025 – Present

Tech Stack: Python, PyTorch, MNE, ReactJS, Docker, AWS

- Built scalable ML platform with automated parameter prediction for EEG model benchmarking, reducing testing time from **2–3 days to minutes**.
- Implemented **intelligent system** for data ingestion and annotation workflows, tested by 5+ researchers in production environment.

Real-time Seizure Detection & Classification May 2025 – July 2025

Tech Stack: Python, PyTorch Geometric, GNNs, Optimization Algorithms

- Developed GNN-based optimization system for seizure detection on **TUH EEG** dataset, achieving **90% detection**, **87% classification**, and **84% early prediction**.
- Applied advanced **hyperparameter optimization** techniques to approach published clinical benchmarks on complex medical data.

Energy-Efficient Sleep Stage Classification Feb 2025 – March 2025

Tech Stack: Python, TensorFlow, snnTorch, MNE

- Implemented Spiking Neural Networks (SNNs) for **ISRUC-Sleep** dataset (118 subjects), optimizing for low-power edge computing.
- Achieved **82% accuracy** while reducing energy consumption by **35%** through systematic parameter optimization for mobile devices.

Multiview Neural Decoding with Attention Nov 2024 – Jan 2025

Tech Stack: Python, PyTorch, Attention Mechanisms, Parameter Tuning

- Built attention-based decoder combining temporal, spectral, and spatial features with optimized architecture.
- Outperformed prior work by +2.3% achieving **93.3% accuracy** on Tsinghua & PhysioNet datasets (500+ subjects) through systematic optimization.

Audio-Analyzer: Intelligent Audio Processing Web Application August 2024

Tech Stack: Flask, React.js, JWT, MySQL, Groq API, Librosa, Pydub

- Developed a secure full-stack app for audio diarization, transcription, feature extraction, and chatbot querying via Groq LLM.
- Implemented JWT-based authentication in Flask backend with a responsive React.js frontend.
- Integrated Librosa and Pydub for signal processing and audio feature extraction.

EduPath: AI-Powered Academic and Relocation Advisor March 2025

Tech Stack: Python, NLP, LLMs, Flask, React

- Built an AI-powered assistant with voice/chat interface using LLMs to recommend academic institutes and cities.
- Applied multi-criteria decision algorithms considering tuition, rankings, lifestyle, and personal preferences.
- Used Flask for API logic and React for user interface design and interaction.

AI-powered Dental DICOM Annotation System June 2025

Tech Stack: Python, PyTorch, U-Net, pydicom, OpenCV, 3D Slicer, Dragonfly

- Developed a U-Net-based AI model to segment dental CT scans, identifying nerves, roots, and enamel structures.
- Preprocessed 3D volumetric data using pydicom and OpenCV for compatibility and augmentation.
- Visualized segmentation results using 3D Slicer and Dragonfly tools.

GroqVision: Vision-LLM Powered OCR and Document Analysis Tool July 2025

Tech Stack: Python, Streamlit, Groq Chat API, Pillow, Custom CSS

- Built a Streamlit web app enabling OCR and document understanding from uploaded image files (receipts, certificates, notes).
- Integrated vision-enabled Groq LLM to answer questions and infer document structure or intent.

- Auto-structured OCR output into Markdown format with support for headings, lists, and code blocks.
- Engineered a clean UI with animated progress bars, alerts, full-width previews, and downloadable output.
- Demonstrated versatility in digitizing academic papers, official records, and handwritten documents.

LahoreLegacy: AI-Powered Historical Guide May 2025

Tech Stack: Python, Streamlit, HuggingFace Transformers, OpenAI, FAISS, LangChain, PyMuPDF

- Designed and developed an AI-powered web app to explore Lahore's history using LLMs and semantic search.
- Implemented FAISS vector search to retrieve relevant information from Wikipedia, websites, and PDF documents.
- Added PDF upload functionality to search and summarize custom documents using LangChain and PyMuPDF.

LawyerAssistant: Intelligent Legal Support System Feb 2024

Tech Stack: ReactJS, Flask, Langchain, LLMs, VectorDB, REST API

- Engineered a full-stack AI legal assistant for lawyers to perform case research, document summarization, and case law referencing.
- Connected a responsive ReactJS frontend with Flask backend via REST APIs, leveraging Langchain for LLM-powered workflows.
- Integrated VectorDB for contextual retrieval and semantic querying of large legal document corpora.

Madina Visiting Assistant Chatbot Jan 2024

Tech Stack: Twilio API, WhatsApp Business, Flask, Python, LLMs, Webhooks, Ngrok

- Developed an intelligent WhatsApp chatbot to guide Madina visitors on key topics such as religious sites, prayer timings, and local etiquette.
- Integrated Twilio API with a Flask backend to enable multilingual real-time messaging on WhatsApp Business.
- Used webhook-based architecture with Ngrok for live testing and seamless message delivery between users and LLM engine.

CraneGPT: Industrial AI Chatbot April 2023

Tech Stack: LLaMA-2, Langchain, VectorDB, ReactJS

- Built an AI-powered chatbot to assist industrial crane operators by providing answers from operation manuals and troubleshooting guides.
- Leveraged Langchain with VectorDB to enable context-aware retrieval and multi-language query handling.
- Integrated a ReactJS frontend with LLM backend workflows, achieving 75% faster task resolution during pilot testing.

AI-Assisted Clinical Exam Preparation July 2024

Tech Stack: Python, Meditron LLM, LoRA, QLoRA, PEFT, Transformers

- Fine-tuned the Meditron large language model using LoRA and QLoRA techniques to replicate expert-level USMLE-style clinical reasoning.
- Automated the generation of multi-step MCQ justifications, significantly reducing manual annotation workload by 40%.
- Validated generated reasoning with domain experts, achieving over 92% accuracy and improving overall learning efficiency.

NeuroGenesis: Synthetic Brain Tumor Scan Generation March 2022

Tech Stack: PyTorch, DCGAN, NumPy, Matplotlib

- Designed and trained a Deep Convolutional GAN (DCGAN) to generate synthetic MRI images for brain tumor analysis and augmentation.
- Optimized the adversarial training loop, fine-tuning generator-discriminator balance for enhanced visual fidelity and data variety.
- Produced highly realistic scans with >90% authenticity ratings from experienced radiologists, aiding model generalization.

Breast Cancer Detection System Aug 2021

Tech Stack: Python, ANN, Keras, Pandas, Scikit-learn, Seaborn

- Developed an artificial neural network to classify malignant and benign breast tumors using structured tabular features.
- Implemented k-fold cross-validation and data augmentation strategies to boost robustness and mitigate overfitting.
- Achieved 99% classification accuracy on the UCI Breast Cancer dataset, outperforming traditional baselines.

Multimodal RAG for Chest X-ray Analysis (MIMIC-CXR) | GitHub 2025

Tech Stack: Python, CLIP, Groq LLM, FAISS, Streamlit

- Built a multimodal Retrieval-Augmented Generation system for chest X-ray interpretation using image-text embeddings.
- Implemented CLIP-based cross-modal retrieval over MIMIC-CXR with FAISS for fast similarity search.
- Integrated Groq LLM to generate structured radiology findings and impressions from retrieved clinical cases.

Emotion Estimation through Brain Signals Aug 2025

Tech Stack: Python, MNE, EDFlib, Scikit-learn, Streamlit

- Built an EEG-based emotion recognition pipeline with preprocessing, artifact removal, and frequency-band feature extraction.
- Trained machine learning models to classify emotional states from EEG signals with interpretable outputs and evaluation reports.
- Developed an interactive Streamlit dashboard for visualization, confusion matrices, and feature importance analysis.

Variational Quantum Classifier (Quantum ML App) Jul 2025

Tech Stack: PennyLane, PyTorch, Streamlit, Scikit-learn, Plotly

- Designed a variational quantum circuit with entangling gates for binary classification using expectation measurements.
- Integrated hybrid quantum-classical training pipeline with configurable hyperparameters for circuit experimentation.
- Built interactive visualizations for loss curves, decision boundaries, and model performance analysis.

Distributed Quantum Algorithms Simulator Jun 2025

Tech Stack: Python, Qiskit, Streamlit

- Implemented distributed execution of GHZ, QFT, and Grover's algorithms using circuit partitioning techniques.
- Integrated Qiskit Aer noise models to evaluate scalability, fidelity, and performance under realistic constraints.
- Developed an interactive interface for visualizing circuit decomposition and benchmarking quantum performance.

Quantum Gate Visualizer May 2025

Tech Stack: Python, Qiskit, Streamlit, Plotly

- Built an interactive Bloch sphere visualization tool to demonstrate quantum gate operations and qubit transformations.
- Enabled real-time simulation of superposition, entanglement, and phase shifts for educational exploration.
- Designed a Streamlit-based interface with 3D Plotly visualizations for intuitive quantum learning.

End-to-End Quantum Computing & Quantum Machine Learning Platform 2025

Tech Stack: PennyLane, Qiskit, PyTorch, Streamlit, Plotly, Python

- Developed an end-to-end **quantum computing platform** integrating variational quantum machine learning, circuit simulation, and educational visualization tools in a unified system.
- Implemented a **Variational Quantum Classifier** with hybrid quantum-classical training, entangling circuits, and expectation-value-based decision modeling.
- Built a **distributed quantum simulation module** supporting GHZ, QFT, and Grover's algorithms with circuit partitioning and noise-aware benchmarking.
- Designed an interactive **quantum visualization engine** for Bloch sphere dynamics, enabling intuitive exploration of superposition, entanglement, and gate operations.
- Integrated all modules into a single **Streamlit-based research environment** with real-time analytics, performance comparison, and experiment configurability.

Technical Skills

Languages: Python, C++, MATLAB, LaTeX | **ML/AI:** PyTorch, TensorFlow, Scikit-learn, Optimization Algorithms | **Specialized:** Quantum Computing (QAOA, VQC), Parameter Prediction, Continuous Learning | **Tools:** NumPy, Pandas, Matplotlib, OpenCV, MNE | **Interests:** ML for Quantum Computing, NP-Hard Optimization, Predictive Modeling

Publications

1. N. Fatima, G. Nabi "TriNet-MTL: A Multi-Branch Deep Learning Framework for Biometric Identification and Cognitive State Inference from Auditory-Evoked EEG". Accepted at *eNeuro*.

2. N. Fatima and G. Nabi, "Multimodal EEG-Based Classification of Alzheimer's and MCI Using Olfactory Event-Related Potentials and Transformers," Accepted at *Brain-Apparatus Communication*.

Honors & Awards

- **Excellence in Neuroscience Research**, KICS-UET Lahore *June 2025*
  Recognized for contributions to AI/ML pipelines, signal processing, and innovative computational methods.
- **Chief Minister Punjab's Honhaar Scholarship**, Government of Punjab *May 2025*
  Awarded for achieving one of the highest CGPAs (top 1%) in Computer Engineering at UET Lahore.
- **Top 6 at Optimized AI Conference 2025**, Traversaal.ai *Mar 2025*
  Team TROJAN_AI ranked among Top 6 out of 200+ global teams for optimization and AI innovation.
- **CS50x Puzzle Day 2025**, Harvard & MIT (Cambridge) *Apr 2025*
  Recognized for outstanding performance in problem-solving, teamwork, and analytical thinking.

Relevant Certificates

Supervised Machine Learning: Regression and Classification *by DeepLearning.AI*
Deep Learning with PyTorch: Image Segmentation *by Coursera Project Network*
Introduction to Artificial Intelligence *by Google*
Fundamentals of Machine Learning *by Microsoft*
The Nuts and Bolts of Machine Learning *by Google*
Crash Course on Python *by Google*
SQL (Basic, Intermediate and Advanced) *by HackerRank*
AI Agents Fundamentals *by Hugging Face*
Intro to Deep Learning *by Kaggle*

Invited Talks

- **AI for Brain: Unlocking Cognitive Insights with Machine Learning** | Slides
  Invited Talk at *ACM UET Lahore Chapter* *August 2025*
  Engaged 100+ students and faculty in ML applications for neuroscience and predictive modeling.
- **Data-Centric AI: Why Better Data Beats Bigger Models** | Slides
  Invited Talk at *Google Developer Group (GDG), UET Lahore* *August 2025*
  Addressed 50+ AI enthusiasts on data quality and intelligent system development.

Volunteer Experience

Committee Chair (Publicity) & Member Oct 2025 – Present
Mediterranean Conference on Emerging Technologies and Systems (MCETS)
- Serving as **Publicity Chair**, leading outreach and visibility strategies for an international academic conference.
- Coordinating with organizing committees and managing communication channels to enhance global participation.

Member, Society of Artificial Intelligence Aug 2025 – Present
International Association of Engineers (IAENG)

- Actively engaged in **research dissemination**, conferences, and technical forums within the AI community.
- Contributing to discussions on **ethical and impactful AI** across academia and industry.

Content Writer May 2024 – Jun 2024

Dr Coders

- Created engaging educational content on **programming and coding concepts** for aspiring developers.
- Simplified complex topics into concise, accessible formats for broader audience understanding.
- Collaborated with a team to produce structured learning resources.

Ambassador Mar 2024 – Apr 2024

AIRCI Expo

- Led initiatives to **connect industry professionals** and foster collaboration during the expo.
- Executed targeted outreach and content strategies to **increase engagement and event reach**.

Student Volunteer (UTS 4.0) Feb 2024

ACM UET Lahore

- Contributed to the **event décor team**, executing creative concepts to enhance event experience.
- Collaborated effectively within a team to deliver a visually impactful environment.