# Muhammad Uzair

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Islamabad, Pakistan

## Education

**National University of Sciences and Technology, Islamabad** November 2021 – June 2025
*Bachelor of Engineering – Software Engineering*

- **CGPA:** 3.61/4.0
- **Relevant Coursework:** Machine Learning, Reinforcement Learning, Large Language Models, Probability and Statistics

## Publications

**Multiagent Reinforcement Learning for Joint Spectrum and Energy Optimization in CR-NOMA Enabled Internet of Unmanned Agents** IEEE IoT Journal 2025

Saleha Ahmed, ***Muhammad Uzair***, Syed Asad Ullah, et al.

**Energy Efficient Uplink Communications for Wireless Powered Networks with EH Diversity: A DRL-driven Strategy** IEEE ICC 2025

Saleha Ahmed, ***Muhammad Uzair***, Syed Asad Ullah, et al.

## Experience

**Artificial Intelligence Engineer** November 2025 – Ongoing
Adept Tech Solutions – Islamabad, Pakistan

- Built end-to-end voice AI pipelines using VAPI and Deepgram STT, handling inbound and outbound call flows with real-time transcription latency under 400ms.
- Engineered a multi-agent LLM orchestration system using FastAPI microservices and PostgreSQL, reducing manual task handling time for enterprise clients.
- Developed a RAG-powered knowledge retrieval layer using sentence-transformers (MPNet, 768-dim) and pgvector.
- Implemented automated email intelligence agents with intent detection and context-aware reply generation via OpenAI APIs, processing 500+ emails per day.

**Research Intern** June 2025 – August 2025
McMaster University – Hamilton, Ontario, Canada

- Completed a fully funded Mitacs Globalink Research Internship focusing on guided policy optimization in sequential decision-making environments.
- Implemented and benchmarked REINFORCE and PPO algorithms in the Gymnasium Pac-Man environment, tuning reward shaping and entropy regularization to improve exploration-exploitation balance.
- Integrated human advisory signals into the RL training loop via subjective logic-based belief modeling, enabling uncertainty-aware guidance that accelerated policy convergence over standard PPO.

**Research Collaborator** June 2024 – September 2025
Information Processing & Transmission Lab – Islamabad, Pakistan

- Trained and benchmarked DDPG, TD3, and PPO for continuous-action transmit power optimization in wireless-powered networks under stochastic fading channels.
- Developed a multi-agent DRL framework for joint spectrum access and power control in CR-NOMA IoT networks, with distributed agents learning cooperative policies under partial observability.
- Evaluated MRC, SC, and EGC diversity-combining schemes, analyzing trade-offs in SNR and energy harvesting efficiency under Rayleigh fading models.

## Scholarships & Awards

- Fully funded MITACS Globalink Research Internship, 2025
- 4x FBISE HSSC merit scholarship recipient (2021 – 2025)

## Technical Skills

**Programming:** Python, C++, JavaScript, SQL

**AI / ML:** PyTorch, TensorFlow, Scikit-Learn, Stable Baselines3, Gymnasium, Sentence Transformers, PEFT, LoRA, OpenAI API

**Voice & Agentic AI:** VAPI, Deepgram, Multi-Agent Orchestration, RAG Pipelines, Tool Use, Prompt Engineering

**Backend & Data:** FastAPI, PostgreSQL, pgvector, NumPy, Pandas, Matplotlib

**Infrastructure & Tools:** Docker, Git, Google Cloud Platform, Azure IoT Hub, OAuth 2.0, REST APIs

## Selected Projects

**Federated Learning in Information Ranking**

- Designed and implemented a Federated Learning system for privacy-preserving information ranking, demonstrating comparable accuracy to centralized approaches.
- Utilized distributed training with TensorFlow's Federated Averaging to enhance user data privacy in information ranking, validated on the ANTIQUE dataset.

**PPO for Gymnasium Inverted Pendulum Environment**

- Developed a PPO agent to solve the Inverted Pendulum problem in MuJoCo, achieving optimal performance through a meticulously designed shaped reward function and extensive hyperparameter optimization using Optuna.

**RAG-Based Banking Assistant**

- Developed a domain-specific AI assistant for banking using LLaMA-3.2-3B-Instruct, FAISS, and FastAPI.
- Implemented semantic search with Sentence Transformers and real-time document ingestion via Streamlit.
- Applied LoRA-based fine-tuning (PEFT) for efficient adaptation of LLMs to banking data.

**AI-Driven Air Quality Monitoring System**

- Implemented an end-to-end IoT solution for air quality monitoring, integrating ESP32 with Azure IoT Hub and PowerBI for real-time data acquisition and visualization.
- Trained and validated a machine learning model for AQI prediction, achieving 75% accuracy, leveraging a custom dataset derived from data stored within Azure Blob Storage.

## Extra-Curricular Activities

- Member, NUST Cricket Team, PCB HEC Intervarsity Cricket Championship (2023, 2024)
- Deputy Director, SGA Sports Council (2022–2023); led organization of SEECS Sports Gala 2023

## Volunteering & Community Engagement

- Participated in university-led plantation and environmental sustainability drives, contributing to the maintenance of campus green spaces.
- Led a student-driven fundraising and coordination initiative to support the installation of a solar energy system at an underprivileged school.
- Delivered introductory computer science lectures at underprivileged schools, promoting digital literacy and access to education.