

KHIZAR ANJUM

RESEARCH SCIENTIST

Highland Park, NJ 08904 | 9089637363 | khizaranjum28@gmail.com | [LinkedIn URL](#)

QUALIFICATIONS SUMMARY

Innovative professional with progressive experience creating ultra-low power neural network architectures, embedded AI systems, and hardware-software co-design. Proven track record in deep learning, digital signal processing, and computer vision applications across resource-constrained and real-time environments. Demonstrated success in authoring publications, filing patents, and securing NSF funding. Skilled in formulating and deploying scalable ML pipelines, on-board UAV inference systems, and underwater acoustic communication models. Expert in leading advanced research projects, conducting experiments, analyzing data, and contributing to development of innovative solutions. Proven ability to work independently and collaboratively in a multidisciplinary team environment.

AREA OF EXPERTISE

- Artificial Neural Networks
- Mathematical Modeling
- Stable Diffusion
- Natural Language Processing (NLP)
- Medical Imaging
- Data Analytics
- Critical & Analytical Thinking
- Conflict Resolution
- Attention to Detail

TECHNICAL PROFICIENCIES

ML/AI & Generative AI: PyTorch, TensorFlow, Scikit-learn, Hugging Face, Transformers, LangChain, Prompt Engineering, Instruction Tuning, RAG, Foundational Model Fine-Tuning

Data Engineering: Data Pipelines, ETL Processes, SQL/NoSQL Databases, Pandas, Data Preprocessing, Tableau

Cloud & HPC: AWS, Azure (Databricks, Azure AI Studio), GCP (Vertex AI), SLURM, Distributed Training

MLOps & Deployment: Docker, CI/CD, FastAPI, Flask, Model Monitoring, Cloud-Based ML Deployment

Development Tools: Git/GitHub, Linux, VS Code, Jupyter, Version Control, OpenCV, GNU Radio, ROS

Programming & Languages: Python (Advanced), C++, JavaScript, SQL, MATLAB, Bash, Chisel HDL

PROFESSIONAL EXPERIENCE

Graduate Research Assistant, CPS Lab, Rutgers University, Piscataway, NJ, US **2019 – Present**

Carry out micro-watt power consumption for neural networks by creating ultra-low power circuit designs. Enable on-board crowd pattern recognition by engineering ultra-lightweight identification algorithms. Collect, clean, and analyze research data by utilizing statistical or analytical software. Maintain research records and follow institutional policies and IRB protocols.

- Secured three patents and \$1.135M in NSF funding by pioneering innovative research and demonstrating high-impact proposals.
- Established first-ever underwater acoustic communications dataset in New Jersey to support accurate channel estimation.
- Authored four peer-reviewed journal publications and 14 conference papers across internationally recognized venues.
- Enhanced deep learning performance on resource-constrained devices by designing optimized neural network architectures.

Research Assistant, Communications Lab, LUMS, Lahore, Pakistan **2017 – 2019**

Coordinated research schedules, participant recruitment, and communications. Coordinated meetings, interviews, and research activities. Conducted literature reviews and summarized research findings. Assisted in research design, survey development, and study protocols. Prepared research reports, presentations, and manuscripts.

- Maximized ROC AUC performance to 89% from 56%, driving 23% enhancement via model optimization and data refinement.
- Ensured Parkinson's detection on multimodal data by creating and implementing advanced Convolutional Neural Network classifier integrated with a Bi-LSTM evidence aggregation model.

ADDITIONAL EXPERIENCE

Program Coordinator, ECE Department's first-ever Graduate Student Association (GSA), Piscataway, NJ

EDUCATION

PhD Candidate & Master of Science (MS), Electrical & Computer Engineering (ECE)

Rutgers University, New Brunswick, NJ, 2019 – 2026

Grade Point Average (GPA): 3.92/4; Advised by Dr. Dario Pompili

Bachelor of Science (BS), Electrical Engineering (EE) – Gold Medalist

Lahore University of Management Sciences (LUMS), Lahore, Pakistan, 2015 – 2019

Grade Point Average (GPA): 3.86/4; Advised by Dr. Muhammad Tahir and Dr. Momin Uppal

KEY PROJECTS

Ultra-Low Power Analog Neural Network Design for Health Monitoring, 2022 – 2025

Scaled neural network performance by formulating custom Python generation script for ngspice circuit simulations.

Demonstrated twofold 6-layer FNN operation at 53 μ W by conceptualizing the Folded Neural Network (FNN) to optimize on-chip area and power consumption versus duty cycle.

Achieved 55.58 mW power consumption for a tessellated 8-DoF convolutional layer by designing the CvPU (Convolutional Processing Unit) analog architecture utilizing anisotropic diffusion.

Deployed digital neural networks on TinyFPGA BX and Xilinx Ultra96-v2 FPGAs by implementing custom neural computation modules in Chisel hardware construction language.

Crowd Prediction & Behavior Assessment Using Adaptive UAVs, 2024 – 2025

Achieved 45 $\times$ reduction in execution time for crowd pattern identification by integrating inter-prediction results from MPEG-4 hybrid video encoder using optimized signal processing techniques.

Matched Deep Learning and optical flow baselines for crowd pattern identification, attaining an Average Angular Error (AAE) of 14.99 $^\circ$ on TUB CrowdFlow Dataset video sequences.

For the automated Volkov block method, the proposed implementation achieves 39–314 $\times$ greater computational speed compared to existing state-of-the-art solvers.

Deep Joint Source Channel Coding for Underwater Image & Video Transmission, 2022 – 2025

Enabled channel-state aware deep joint-source channel coding for underwater image transmission by engineering an LSTM-based sequence-to-sequence model.

Achieved superior compression in low-SNR regimes (0–13 dB) and mitigated cliff-effects by designing variable encoder surpassing traditional JPEG/JPEG2000 performance.

Published ACommSet, the first real-world acoustic communication dataset by capturing data across multiple center frequencies, bandwidths, and TX/RX configurations at Barnaget Bay, NJ, and Atlantic City, NJ.

Improved video quality by +5 dB (19.26%) PSNR and +0.10 (14.28%) SSIM compared to the strongest FEC-protected baselines, while delivering 16 FPS video at a 2.3 kbps data rate.

On-board Inference on Unmanned Aerial Vehicles, 2020 – 2025

Accelerated 40 $\times$ on-board speedup and 96.25% test accuracy by engineering a Convolutional Bi-LSTM auto-encoder for fault-cause detection on a PYNQ-Z1 FPGA (runtime: 2.63 msec).

Attained 0.95 mIOU across varied simulated weather conditions by publishing a context-aware framework for efficient and robust on-board segmentation.

Reduced execution time by 20–70% with only 2% accuracy loss by designing a real-time video-based navigation system for drones using adaptive parameter selection in object detection models.

Communication-Aware Large Language Model Training on HPC Cluster, 2025

Maximized model performance by training LLaMA-3-8B and LLaMA-3.3-70B-Instruct models using Megatron-LM on NERSC Perlmutter GPU cluster.

Analyzed communication patterns across pipeline-, model-, and tensor-parallelism to boost parallel training efficiency.

Deduced through analysis of communication patterns across parallelism strategies that the optimal configuration delivers 163% higher TFLOP/s per GPU compared to the least efficient parallelism setup.

Model Context Protocol (MCP) Design for Security & Legal Applications — 2025

Attained 3rd place in an open hackathon by developing an MCP server for cybersecurity vulnerability assessment, enabling GitHub repository searches, querying NIST NVD, accessing CISA's Known Exploited Vulnerabilities catalog, and analyzing repository contents for CVE research.

Carried out legal research across 3,352 U.S. courts by engineering MCP server leveraging CourtListener API, providing streamlined access to millions of legal documents and PACER data.

HONORS & AWARDS

Rutgers Innovation Awards, Graduate Student Category, 2025 – Honored for pioneering contributions in research and innovative solutions.

Paul Panayotatos Scholarship, 2024 – Awarded for advancing sustainability-focused electrical engineering initiatives.

NSF NOVUS & NSF I-Corps Program, 2022 – Selected to undergo specialized training in innovation and customer discovery methodologies.

Gold Medal, LUMS, 2019 – Achieved top academic distinction for outstanding scholarly performance.

TA Achievement Award, Rutgers, 2020 – Recognized for exceptional teaching support and enhancing student learning outcomes.

PATENTS

WO 2025/064997: Anisotropic Diffusion-based Analog Neural Network Architecture

WO 2024/107672: Techniques for Image Transmission through Acoustic Channels in Underwater Environments

(Pending Application): Methods and Systems for Determining Group Motion Patterns