

MUHAMMAD TAHA

AI Engineer | Computer Vision & Embedded Systems Specialist

Islamabad, Pakistan | +92 317 5434059 | ch.tahaarif2005@gmail.com | LinkedIn: [LinkedIn Profile URL]

PROFESSIONAL SUMMARY

Final-year Computer Engineering student with a comprehensive portfolio bridging Generative AI, Computer Vision, System Software, and Embedded Hardware. Demonstrated expertise in fine-tuning Large Language Models (LLMs) with RAG, designing hybrid deep neural networks for signal processing, and engineering processor-less hardware solutions on FPGA. Proven track record of delivering end-to-end complex systems, from custom digital logic design to deploying real-time AI inference pipelines.

TECHNICAL SKILLS

Generative AI & NLP: LLMs (LLaMA-3), RAG (Retrieval-Augmented Generation), LoRA fine-tuning, LangChain, Transformers (BERT), prompt engineering, Hugging Face.

Computer Vision: Micro-Expression Analysis, face anti-spoofing, optical flow, 3D-CNNs, lane detection, MediaPipe, OpenCV, Fourier transforms, YOLO.

Software Engineering: C++ (Qt, SFML, console graphics), Java (Swing, multithreading), Python, OOP, data structures (Trie), algorithms, design patterns.

Networking & Systems: IPv6 design, OSPF, VLANs, router-on-a-stick, Linux, Cisco Packet Tracer, OS scheduling.

Hardware & IoT: FPGA (Verilog), ESP32, Raspberry Pi, Arduino, digital logic design, custom processor architecture, sensors (LiDAR, PIR).

Signal Processing: Librosa, MFCCs, spectrogram analysis, speech emotion recognition, CNN-1D, BiLSTM.

Tools & DevOps: Docker, Git, SQL, Flask, Xilinx Vivado, Jupyter Notebooks, VS Code.

PROFESSIONAL EXPERIENCE

Computer Vision Intern | TruID Technologies

National Science and Technology Park (NSTP), Islamabad | Jul 2025 – Aug 2025

- Engineered face anti-spoofing algorithms to detect liveness and differentiate between real users and screen/paper attacks.
- Developed a document verification system using texture analysis to classify identity cards as physical originals vs scanned photocopies.
- Designed and trained signature forgery detection models to classify genuine vs forged signatures for banking applications.
- Optimized computer vision pipelines for real-time inference and collaborated with engineering to integrate models into the core product.

PROJECTS

SERENITY: Smart Emotion Recognition & Neural Intervention (Final Year Project)

- Built a multimodal system combining micro-expression recognition (CV) and LLMs (NLP) to detect suppressed emotions and provide empathetic counseling.
- Fine-tuned LLaMA-3 (8B) using LoRA on psychological datasets; implemented RAG grounded in verified CBT clinical guidelines.

- Engineered a vision pipeline using optical flow and 3D-CNNs to detect rapid facial micro-expressions (<500ms) using SAMM and CASME II datasets.
- Implemented real-time prompt context updates driven by detected non-verbal cues.

Robust Speech Emotion Recognition via Hybrid Deep Neural Networks

- Designed a CNN-BiLSTM-Attention network to capture spectral (CNN) and temporal (LSTM) dynamics for speech emotion recognition.
- Aggregated a 50,000+ sample super-corpus from 9 datasets (RAVDESS, CREMA-D, IEMOCAP) to improve in-the-wild generalization.
- Achieved 78.41% test accuracy on unseen data by mitigating channel overfitting.

Lung & Colon Cancer Classification (Medical AI)

- Developed a CNN for histopathology image classification into 5 categories; achieved 98.6% validation accuracy via architectural tuning (dropout, max-pooling).

Real-time Image Analysis for Self-Driving Capabilities

- Built real-time lane detection and obstacle recognition using OpenCV (edge detection / Hough transform).
- Implemented decision logic to compute steering vectors based on color-coded obstacles in video streams.

White Blood Cell Analysis & Classification (DIP)

- Implemented sharpening using Fourier transforms and Butterworth high-pass filters on microscopic cell images.
- Extracted LBP texture features and Hough transform shape features; achieved 66% test accuracy across 5 cell types.

Audio Classification using Neural Networks

- Extracted MFCCs, ZCR, and energy features from the MUSAN dataset using Librosa.
- Trained an MLP (94% accuracy) to classify speech/music/noise and deployed via a Flask web interface.

Comprehensive OS Scheduler & Disk Simulator

- Built a Java application simulating CPU scheduling (Round Robin, EDF) and disk scheduling (SCAN, C-SCAN) with Gantt chart visualization.
- Used SwingWorker for concurrent simulation without blocking the UI.

Search Engine Desktop Application (Data Structures)

- Developed a file search engine using a Trie (prefix tree) for optimized O(L) lookups and Boolean queries (AND/OR).
- Built a Qt (C++) GUI to parse directories, index terms, and execute queries.

IPv6 WAN Design & Inter-VLAN Routing (Computer Networks)

- Designed a scalable IPv6 WAN in Cisco Packet Tracer and implemented router-on-a-stick for inter-VLAN routing.
- Configured OSPFv3 dynamic routing and VLAN segmentation across Cisco 2911 routers and 2960 switches.

FPGA Implementation of Advanced Snake Game with AI

- Implemented a processor-less game engine on Xilinx FPGA using Verilog HDL and VGA output (640x480 @ 60Hz).
- Built hardware AI logic using Manhattan-distance minimization to autonomously track the player.

Custom Harvard-Architecture Processor

- Designed a 16-bit processor in Verilog, including custom ISA, control unit, datapath, and register file.

Autonomous Robo Cop (Security & IoT)

- Built an ESP32-based security vehicle integrating PIR motion sensors for intruder detection and IR sensors for automated fire extinguishing.

Remote Weather Detection IoT Car

- Built a remote-controlled rover using ESP32/Arduino and LoRaWAN to transmit temperature/humidity telemetry to a web dashboard.

LEADERSHIP & EXTRACURRICULAR

Lead of Human Resources (HR) | COMPPEC (Computer Project Exhibition Competition) (Apr 2024 – May 2026)

- Managed recruitment and coordination of volunteers to ensure smooth execution of the university's largest project exhibition.

Class Representative | NUST (Sep 2024 – May 2026)

- Served as primary liaison between faculty and students, resolving academic concerns and coordinating class schedules.

Event Management | BurRaq (NUST Debating Society) (Nov 2022 – Sep 2024)

- Organized debating events and declamation contests, managing logistics and participant engagement.

Awards

- Winner: Declamation Competition, BurRaq Extempore Competition (Nov 2022).

EDUCATION

Bachelor of Computer Engineering | National University of Sciences and Technology (NUST) | Islamabad, Pakistan

2022 – 2026 | CGPA: 3.11/4.0

CERTIFICATIONS

- Deep Learning Specialization (DeepLearning.AI)
- Machine Learning Specialization (Stanford Online)
- AI for Everyone (DeepLearning.AI)
- Meta Introduction to Front-End Development (Meta/Coursera)
- CS50: Introduction to Programming with Python (Harvard University)