UNMESH RAJ

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Skills

Languages: Python, Java, C, JavaScript, SQL
Tools: Burp Suite, Wireshark, Docker, Git, WebRTC, Neo4j
Frameworks: Flask, Streamlit, React, Next.js, Tailwind
Libraries: PyTorch, scikit-learn, OpenCV, MediaPipe, NumPy, pandas, matplotlib
Concepts: Data Structures & Algorithms, System Design, Networking, Cryptography, Machine Learning, Computer Vision, Cybersecurity

Experience

HPE CPP3 Project Intern *ongoing*

- Designing and implementing a Hardware Topology & Health Management System for enterprise storage test environments.
- Modeled storage infrastructure (hosts, switches, arrays, ports, disks) from CLI outputs using ontology and graph-based representations.
- Implemented a deterministic query engine for natural language-like inputs using rule-based intent detection and regex-based entity extraction.
- Simulated real storage system behavior using parsed CLI outputs to enable testing without physical hardware.
- Tools Used: Python, Graph Databases (Neo4j), Regex/NLP, Data Modeling, Systems Design

Samsung PRISM Project Intern *ongoing*

- Contributed to post-training quantization (PTQ) experiments for the transformer-based Video-Depth-Anything model using Qualcomm AIMET as part of the project team.
- Independently designed and implemented a Quantization-Aware Training (QAT) pipeline for mixed-precision (**INT8 + FP16**).
- Replaced memory-efficient attention layers with native PyTorch operations to enable graph-level quantization and transformer compatibility with AIMET.
- Engineered selective FP16 protection for 136 sensitive transformer layers to preserve spatial depth and temporal consistency.
- Built fine-tuning and export workflows using AdamW, cosine annealing, ONNX export, and hardware calibration encodings for deployment on edge NPUs.
- **Tools:** Python, PyTorch, Qualcomm AIMET, Transformers, ONNX, Computer Vision

Education

RV College of Engineering **Sept 2023 - Aug 2027**
Bachelor of Engineering in Artificial Intelligence and Machine Learning

- CGPA - 9.20/10

Projects

SatyaTicketing — Secure Blockchain-Based Ticketing System *live*

- Designed a **secure identity-bound ticketing system** to prevent black-market resale.
- Implemented **face recognition with liveness detection** for **one-ticket-per-person** verification.
- Built **blockchain-backed ticket authenticity** using NFT-like tokens for immutable ownership tracking.
- Developed a **QR-based cryptographic verification flow** for secure venue entry.
- **Tools:** Python, Flask, PostgreSQL, MongoDB, OpenCV, DeepFace, Next.js, Tailwind CSS, Hugging Face

Quantum Risk-Aware Adaptive Post-Quantum Cryptography Framework *GitHub*

- Designed a **risk-driven framework** for adaptive deployment of **PQC** across heterogeneous systems.
- Developed a **Quantum Risk Index (QRI)** model to quantify risk using factors like data sensitivity, exposure, and others.
- Built a **context-aware decision engine** to dynamically select cryptographic schemes (Kyber, Dilithium, hybrid modes).
- Simulated **multi-device environments** (IoT, workstations) to evaluate performance, scalability, and decision efficiency.
- Implemented **post-quantum cryptographic operations** using Python libraries for practical demonstration.
- **Tools:** Python, oqs-python / pqcrypto, Streamlit, Simulation Framework

Automated Speech Recognition for Dysarthria *live*

- Developed a **dysarthric speech recognition pipeline** using **Whisper** and **LoRA-based fine-tuning** to improve transcription accuracy for impaired speech.
- Built an **audio augmentation pipeline** using librosa and nlpaug for robust speech recognition.
- Generated **16,000+ synthetic speech samples** across **8 speakers** using **XTTS-v2** to improve dataset diversity and model generalization.
- Reduced **Word Error Rate (WER)** from **32.15% to 16.12%**, achieving nearly **50% improvement** over the baseline model.
- **Tools:** Python, PyTorch, Hugging Face Transformers, Whisper, LoRA, XTTS-v2, librosa, nlpaug

Leadership & Cybersecurity Activities

Cybersecurity Head, Coding Club RVCE *ongoing*

- Led the cybersecurity wing of the Coding Club, driving security-focused initiatives across the campus tech community.
- Organized and hosted multiple CTF (Capture the Flag) competitions with 400+ cumulative participants across 140+ teams, including an international CTF in collaboration with THWS Germany and an offline blockchain-themed CTF.
- Designed and deployed CTF challenges covering web exploitation, cryptography, forensics, and reverse engineering; performed vulnerability analysis and basic exploit validation.
- Tools Used: Burp Suite, Wireshark, Linux, Docker, Python