Shobhit Parvan

Jawaharlal Nehru University, New Delhi – 110067

+91-9696333766

shobhit.parvan@gmail.com srijanm04@gmail.com

Portfolio GitHub Profile LinkedIn Profile

Education

Integrated B.Tech in Electronics and Communications Engineering + M.Tech in R.F. and Microwave Engineering *2020 – 2026*

Jawaharlal Nehru University, New Delhi CGPA: 5.225/9.00 (57.25%)

Central Board of Secondary Education (CBSE) *2018 – 2020*

Marry Gardiner's Convent School, Lucknow Percentage: 88.00%

Indian Council of Secondary Education (ICSE) *2016 – 2018*

City Montessori School, Lucknow Percentage: 94.00%

Academic Projects

A Multimodal Deep Learning Framework for Post-Traumatic Stress Disorder Detection and Depression Screening

Developed a deep learning framework for PTSD and depression detection *Aug 2025 – May 2026*

- Built a multimodal depression screening system on the DAIC-WOZ dataset (189 participants),combining transformer-based text analysis and handcrafted acoustic feature pipelines aligned with AVEC 2017 challenge splits
- Fine-tuned RoBERTa-base for clinical transcript classification; achieved AUC=0.65 and balanced accuracy=0.64 on the held-out dev set
- Extracted 300+ frame-level prosodic, spectral, and temporal speech features (MFCCs, F0, formants, pause/speech ratios, entropy measures) using librosa; identified *pause_ratio* and *speech_ratio* as the most discriminative acoustic markers via mutual information feature selection.
- Engineered a 7-model audio comparison pipeline (RF, SVM, LR, GBM $\times$ SelectKBest/PCA) with SMOTE oversampling, stratified 5-fold cross-validation, and balanced-accuracy threshold tuning to address a 1:2.6 class imbalance (30 depressed / 77 non-depressed)
- Applied partial layer freezing of RoBERTa (top 3 encoder layers unfrozen), AdamW optimizer with linear warmup scheduling, and inverse-frequency class weighting via weighted CrossEntropyLoss to stabilize training on a small, imbalanced clinical corpus

Memristor-Based Non-Volatile Memory Cell Design & Simulation

Created a circuit designed to emulate non-volatile memory using Memristors *Aug 2024 – April 2025*

- Designed and simulated 1T-1R memristor-based memory cell (non-volatile SRAM alternative) with read/write logic using Cadence OrCAD achieving near 0.4 μs write, 0.2 μs read operations
- Characterized memristor emulator circuit (NMOS + RC tank) across 50–200 kHz; validated hysteresis behavior and demonstrated data retention after power-off
- Implemented hardware breadboard prototype with oscilloscope validation; measured transient response and temperature-dependent behavior (-50°C to +80°C)
- Analyzed trade-offs vs. DRAM/SRAM: lower power, non-volatility at cost of access latency

Microstrip Patch Antenna Design (2.4 GHz S-Band)

A Simple Microstrip-patch antenna designed on Ansys HFSS *Aug 2023 – Dec 2023*

- The Design served as study for Antenna systems used on Mobile Devices.
- Designed rectangular microstrip patch antenna (2.4 GHz S-band) using HFSS with FR4 substrate; achieved 608 MHz bandwidth and -14.44 dB return loss.
- Implemented iterative optimization loop to tune resonance frequency and impedance matching; validated against theoretical models.
- Applied transmission line theory (EM field calculations, effective dielectric constants, length correction factors) for antenna fabrication.

Personal Projects

OpenSubDL: Interactive Multi-Platform Subtitle Downloader

A terminal-based application built with Rust, Python, OpenSubtitles API, Docker for downloading subtitles within terminal with minimal headache and no Ads. *May 2026*

- Developed a high-performance interactive TUI (Terminal User Interface) tool for automated subtitle retrieval using the OpenSubtitles.com REST API.
- Engineered a custom regex-based parsing engine to identify TV series metadata (e.g., S01E01) from user queries to automate season/episode-specific API requests.
- Optimized Rust binary size by 83% (60MB to 10MB) through Link-Time Optimization (LTO), binary stripping, and profile-guided space optimizations for minimal resource footprint.
- Implemented a robust network layer to handle API rate-limiting (HTTP 429), malformed JSON responses, and secure API key management via system environment variables.
- Architected a cross-compilation pipeline using Docker and the 'cross' framework to deploy standalone binaries for Linux, Windows, and Android (Termux).

Arduino based Fingerprint Scanner

C++, Arduino CLI, Adafruit Library, Python, Sensor R307S *April 2026*

- Engineered a biometric data acquisition system utilizing an Arduino Uno R3 (tested on Uno R4) and a R307S optical sensor to capture and process fingerprint templates.
- Developed C++ firmware to extract raw 534-byte binary templates from the sensor's character buffer using the Adafruit Fingerprint library.
- Implemented a custom synchronization protocol to stream raw data packets over a serial interface to a host machine for local storage.
- Architected a Python-based backend to automate the reception of binary data, detecting headers and saving timestamped `.bin` templates for database integration.
- Optimized the development lifecycle by utilizing the Arduino CLI within an Arch Linux environment for streamlined compilation and hardware deployment.

Text-to-Audio Conversion Application

Offline Python web app generating human-like speech in English & Hindi using TTS models; CPU & GPU Docker builds for HuggingFace Spaces and local deployment. *Feb 2026*

- Architected modular engine system (Piper, Facebook MMS, XTTS-v2) with environment-based routing; engineered three-way fallback handling for API compatibility across piper-tts versions.
- Implemented dual-build Docker pipeline: lightweight CPU variant for cloud (HuggingFace free tier) and GPU-optimized build with NVIDIA passthrough for local inference.
- Built intelligent text chunking by paragraph/sentence boundaries with WAV stitching; added speed ($0.5-2.0\times$) and pitch (± 6 semitones) controls via numpy/scipy resampling.
- Debugged and resolved low-level WAV header configuration issues; integrated PDF/TXT parsing with 50K character limit and graceful long-text handling.

Local RAG-based AI Assistant for System Knowledge Retrieval

Built a local RAG-based AI assistant using semantic search and LLMs to retrieve and answer queries from structured ArchWiki documentation. *Jan 2026*

- Built a local Retrieval-Augmented Generation (RAG) system for querying ArchWiki documentation using semantic search and LLMs (Ollama).
- Designed a custom ingestion pipeline to convert and clean Markdown documentation into structured, section-aware chunks for improved retrieval accuracy.
- Implemented vector search using SentenceTransformers (bge-small-en) and ChromaDB with metadata-based filtering (document + section-level context).
- Enhanced retrieval quality by preparing the system for hybrid search (BM25 + embeddings) and reranking strategies for technical queries.
- Developed both CLI and Streamlit-based interfaces for interactive querying with contextual grounding and source-aware responses.

Experience

2-month AWS Cloud Internship *July 2024–Sept 2024*

Edu-Versity Online

- Architected and deployed serverless Applications Pipeline using Lambda, S3, and API Gateway; reduced inference latency by 40% vs. on-premises
- Containerized multi-service application with Docker; orchestrated deployment across AWS EC2 and Google Cloud instances
- Configured VPC, IAM policies, and security groups for multi-tier application; implemented least-privilege access model

1-month Summer Internship *June 2024–July 2024*

Banaras Locomotive Workshop Varanasi, On-site

- Received practical training in SCADA, TAS, TELE.EXCHANGE, and LTS
- Gained hands-on experience in the maintenance and operation of locomotive systems, contributing to the efficient functioning of railway operations.
- Developed a comprehensive understanding of the technical aspects of locomotive systems, including control systems, communication protocols, and safety measures.

Technical Skills

Languages: Python, C/C++, Bash, Rust, SQL, LaTeX, Lua

ML/Deep Learning: PyTorch, TensorFlow, Scikit-Learn, XGBoost, RoBERTa, Wav2Vec, semantic embeddings

Specializations: Multimodal ML, Speech Processing, hyperparameter optimization, class imbalance handling

Audio & NLP: COVAREP, librosa, speech processing, multimodal fusion, TTS (Piper, XTTS-v2)

LLMs & RAG: Ollama, ChromaDB, vector embeddings (SentenceTransformers), retrieval-augmented generation

Data Processing: Pandas, NumPy, SciPy, feature engineering, Class Imbalance handling

Deployment: Docker (CPU & GPU), Streamlit, Flask, FastAPI, HuggingFace Spaces, GitHub API

RF/Microwave Design: Ansys HFSS, CST Studio Suite, Cadence OrCAD Capture, Arduino IDE/CLI, Arduino Uno R3 and R4, R307S fingerprint sensor

Systems & Tools: Linux (Arch, Ubuntu), Bash scripting (Bash, Zsh), Git/GitHub

Certificates

AWS Cloud Virtual Internship Certificate of Participation, Certificate of Internship, Certificate of Industrial Training

Summer Internship at B.L.W. Certificate

Training Workshop Certificates Certificates

Positions of Responsibility

Co-founder, Event Manager — Ephirium Gaming Club - School of Engineering *Oct 2022 – Dec 2023*

- Organized 5 tournaments (Valorant, CS:GO, Call of Duty Mobile) with 150+ attendees
- Managed end-to-end event logistics: registration, bracket scheduling, prize distribution.
- Collaborated with campus tech clubs to expand gaming ecosystem