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Swapnil Bhole

University of Michigan - Ann Arbor

Portfolio
LinkedIn

Professional Summary

Real-time systems engineer with 6 years building and debugging 5G PHY and embedded systems on FPGA and ARM, plus GPU performance work (355x CUDA speedup). Strong at integrating hardware, firmware and ML under strict latency limits

Education

University of Michigan, Ann Arbor | Masters in Electrical & Computer Engineering **Aug 2024 — May 2026**

- Coursework: EECS 470: Computer Architecture, EECS 570: Parallel Computer Architecture, Applied GPU Programming, Embedded Systems, Wireless Communication GPA: 3.7/4.0

VNIT Nagpur, India **Jul 2014 — Aug 2018**

- Bachelor of Engineering in Electronics and Communication Engineering GPA: 8.9/10.0

Skills

- **Wireless & PHY:** 5G NR, LTE, OFDM, MIMO, PHY/RF validation, 3GPP, EVM, spectrum/constellation analysis
- **RF Lab:** Spectrum Analyzer, VSA, Signal Generator, Keysight UXM/5G NR, Amarisoft, TM500
- **Programming/Modeling:** MATLAB, Python, C/C++, Embedded C
- **Embedded/SoC:** Zynq-7000, ARM Cortex-A9, FPGA, PetaLinux, AXI/DMA, SPI/I2C/UART
- **Verification:** Vivado ILA, VCS, Verdi, test automation, root-cause analysis

Selected Projects

ML-Based Joint Coded Modulation for LoRa

- Ported a deep-learning Joint Coded Modulation framework from Low Energy Bluetooth to LoRa chirp spread spectrum; characterized SF7 to SF9 baseline at 1e-4 BER, -16 dB SNR, and matched it with a GRU codec under 10% phase noise

CUDA Acceleration of CNN Inference

- Cut a two-layer CNN forward pass from 13.5 s to 0.038 s on a Tesla V100 (355x, 3.4x past target) via Nsight-guided shared-memory tiling, thread coarsening, register tiling and kernel specialization

2-Way Superscalar Out-of-Order RISC-V Processor

- Designed and verified a complete out-of-order CPU in SystemVerilog with R10K-style register renaming, branch prediction, L1 I/D caches. Executed verification test cases using Synopsys VCS.

Experience

Centre for Development of Telematics (C-DOT), Bengaluru **Aug 2018 — Jul 2024**

India's national telecom R&D lab under the Ministry of Communications

Senior Engineer (Level EII) **2021 — Jul 2024**

- Built and integrated a 5G O-RU PHY testbed on Zynq-7000 FPGA/ARM with Intel FlexRAN, supporting end-to-end 5G NR system validation
- Debugged spectral regrowth / PHY signal-quality degradation by correlating FPGA ILA captures with MATLAB reference models; isolated fixed-point truncation in the signal-processing chain
- Root-caused packet loss under a 245.76 Mbps IQ stream to lwIP buffer exhaustion; optimized buffering to achieve 1.6M+ packets with zero drops
- Implemented deterministic FPGA-ARM data movement using shared-memory ping-pong buffering and AXI DMA, sustaining 30.72 MB/s

Engineer (Level EI) **Aug 2018 — 2021**

- Characterized and debugged EVM, ACLR, sensitivity, BLER, throughput vs. SNR/RSRP, TX power, spectrum and constellation using Keysight UXM, Amarisoft and TM500; root-caused RF/PHY performance and stability failures
- Developed and executed 3GPP LTE conformance and system-validation tests across S1/X2/Uu interfaces, covering Releases 9–12, FDD/TDD, 2×2 MIMO, VoLTE and NB-IoT

Software Lead, Open Exo Team

- Lead the data-collection software for a wearable exoskeleton research platform, extending the open-source OpenExo C++ firmware (Teensy) and a Raspberry Pi Pico W sensor platform to stream IMU, EMG and FSR data to a Python/Qt GUI

Publications

- ATRNN: Using Seq2Seq Approach for Decoding Polar Codes, *COMSNETS*, 2020
- Compact Planar Antenna for TV White Space Applications, *SCEECS*, 2018

- DNNStream: Deep-learning based Content Adaptive Real-time Streaming, *SPCOM*, 2020
- Deep Learning based Object Detection Framework for the Visually-Impaired, *ICCMC*, 2020

Leadership and Activities

- **LeaderShape Institute, University of Michigan** | 2026 | Week-long leadership program built on forced-consensus and constrained-role exercises. In the role-restricted build challenge, where one teammate could speak but not touch and another could move pieces but not speak, our eight-person team produced the tallest structure.
- **Workshop Chair, Scientific Computing Club (SC2)** | Designed and delivered a quantum computing workshop for graduate students across departments.
- **Public Relations Board Member, Indian Students Association** | Run communications and outreach for the organization.
- **Semifinalist, Michigan Business Challenge (Innovation Track)** | SmartQRX, a color-indicating QR system for moisture, temperature and tamper detection.

Additional

i) **COVID-19 volunteer** at the Community level; ii) Certification in **Options Trading** from Elearnmarkets; iii) Awarded **Best NCC Cadet and Black Belt Dan-2 in Karate**; iv) Organized cultural events and won various **basketball tournaments** in office.