Rajeev B. Botadra

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Education

University of Washington, *MS in Electrical Engineering* Sep 2023 – Jun 2025
- **Coursework:** Computer Vision, LLM Systems, Models of Robots, Machine Learning Theory, Parallel Architectures

New Jersey Institute of Technology, *Dual BS in Computer Engineering & Mathematics* Sep 2019 – May 2023
- **Coursework:** Data Mining, Statistical Learning, Intensive Programming in C++, Operating Systems, Embedded Systems Lab

Technical Skills

Languages: ANSI C, C++, Python (Pytorch, Tensorflow, OpenCV), MATLAB, Bash, Typescript, RISC-V & x86 Assembly, SystemVerilog

Tools: LangChain, LangGraph, FreeRTOS, ROS 2 Humble, Huggingface, Ardupilot, HLS4ML, Docker, GCP, Git, Vitis HLS, ns3

Experience

University of Washington, Adaptive Computing Machines & Emulators Lab *Seattle, WA*
Graduate Researcher Jun 2023 – Present
- Accelerated DNN architectures on FPGAs enabling microsecond processing of neural signals for real-time in-vivo experiments
- Reduced closed-loop BCI roundtrip latency by 59% by optimizing inter-process communication with lock-free ring buffer in C++
- Constructed, trained, and quantized VAE-RNN, LSTM, and Transformer models with TensorFlow, QKeras to decode brain dynamics
- Deployed models on Alevo FPGA, achieving a 1650x/118x reduction in inference latency compared to server class CPUs/GPUs

L3Harris Technologies *Camden, NJ*
Embedded Software Engineer Intern Jun 2022 – Sep 2022
- Designed an identification tree algorithm in ANSI C for power-optimized feature extraction of radio data targeting a RISC-V SoC
- Developed signal processing pipeline with optimized FFT algorithm on emulated network testbed with gRPC communication
- Evaluated multiple ML-based spectral signal classification algorithms including MLPs, Random Forests, and GBDTs via Tensorflow

R&D Software Engineer Intern Jun 2021 – May 2022
- Created a network controller using Fuzzy Logic to reprioritize mission-critical packets in constrained networks with DSCP tagging
- Developed a parallelized Genetic Learning algorithm to train policies in C++ using OpenMP, leading to a 3.8x training speedup
- Reduced UDP packet loss of critical traffic by 172% relative to baseline policy in real-time emulated testbed with trained controller
- Monitored real-time network statistics with Prometheus server, visualized metrics with Grafana for customer demonstration

Projects

Multi-Agent LLM Task Completion System Sep 2024 - Dec 2024
- Implemented dual and hierarchical agent coordination systems for open-ended queries using LangGraph with Llama 3.2
- Equipped ReAct agents with tools including a RAG database, web searching, and code execution in Python REPL

Email Summarizer App Oct 2024 - Nov 2024
- Integrated an LLM agent with RAG of email history to summarize email chains and highlight useful marketing promotions to user
- Filtered 4000+ emails emails, flagging and summarizing materials relevant to user queries with 96.3% average precision

Wildfire Prevention & Response Drone (Capstone Project) Sep 2022 – May 2023
- Designed and built a semi-autonomous Wildfire response drone with camera payload to surveil areas at high risk of wildfire
- Dockerized and deployed tuned Mask-RCNN, YOLOv5 models to onboard Nvidia Jetson co-computer for semantic segmentation
- Integrated airspeed, GPS, thermal, and gyroscopic sensors with a PX4 controller, tested with HITL simulations in Ardupilot

Tweets Toxicity Analyzer using a LLM (App Landing Page 🔗) Mar 2023 - Apr 2023
- Developed a Tweet toxicity classification model with Meta's RoBERTa model for automated monitoring and content flagging
- Built app interface using Streamlit and hosted on Hugging Face spaces, tuned model achieves 86% test set accuracy

Modeling Pyramidal Neuron Excitability Jan 2022 - Jun 2022
- Developed UKF and 4D-Var models in Matlab to estimate brain state assuming Hodgkin-Huxley model, presented at FACM 2022
- Reconstructed Pyramidal neuron firing rates with 82.5% accuracy across multiple cell groups from Layer II Visual Cortex in-vitro

Awards & Activities

Active Secret Security Clearance Feb 2022 - Present
Paper Submission – *IEEE EMBS EMBC 2025 (Under Review)* Feb 2025
Presenter – *EPFL AMLD 2025* Feb 2025
Presenter – *FACM 2022* Jun 2022