Chiranjivan Krishnakumar Nirmala

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EDUCATION

George Mason University — Fairfax, VA
Master of Science in Computer Engineering; GPA: 3.72 — *Aug. 2022 – Aug. 2024*

Anna University — Chennai, India
Bachelor of Engineering in Electronics and communication — *Aug. 2015 – May. 2019*

PROGRAMMING SKILLS

Languages: C, C++, C#, Embedded C (BareMetal), CUDA, Python, VHDL, Verilog, RTL Design, PSQL
Technologies & Protocols : Azure, AWS, Hyper-V, HTML, GPIO, ADC, PWM, UART, I2C, MQTT, RTOS
Tools: Xilinx Vivado, Quartus Prime, ModelSim, Cube IDE
Boards: STM32, RaspberryPi, Jetson Nano, ESP32, Spartan6, pynq z2

EXPERIENCE

George Mason University — Fairfax, VA
Graduate Research Assistant — *Summer 2023*

- **Quantum ML**: Contributed to the development of variational quantum circuit using QNN compression to approximate the unitary operators of organic chemical compounds.
- **ML for Mobile Healthcare**: Developed a ML based Android app for skin diseases, leveraging FaHaNa model to eliminate gender and skin-type bias in dermatology. Achieved edge device deployment, thus enhancing the accessibility and accuracy of dermatology assistance.

Air Liquide Medical System Pvt Ltd — Chennai, India
Intern — *May 2018*

- **Electronic Board Sub-Assembly & Testing**: Contributed to the production and quality assurance process including sub-assembly and testing of the Orion-G (ventilator) printed circuit boards.

PROJECTS

- **Reliable Multiplier Design Implementation on FPGA with Adaptive Hold Logic**: Mitigated delay issues in the system caused by transistor aging effects by implementing an Adaptive Hold Logic (AHL) circuit, Error Detection Correction Pulsed Latch (ECPL) for timing error detection, and a radix-4 booth multiplier, achieving improved performance validated on Xilinx Spartan6 FPGA. - *Published in Journal of Emerging Technologies and Innovative Research (JETIR)*

- **Designing Hyperdimensional Computing Systems with FPGA Technology**: Pioneered FPGA-based Hyperdimensional Computing (HDC) framework, optimizing resource utilization and demonstrating the feasibility of HDC in tasks like image classification using MNIST.

- **Quantum Gate Simulation Optimization - CUDA Performance Analysis with Memory Configurations**: CUDA program for quantum-bit gate simulations, conducted performance comparisons between Unified Virtual Memory and Separate Host/GPU Memory configurations, and provided insights to optimize quantum gate simulations on GPUs.

- **Dynamic Instruction Scheduling Simulator**: Simulated a dynamic instruction scheduling for out-of-order processor, implementing the Tomasulo algorithm with a Reorder Buffer to optimize execution performance.

- **Cache Simulator**: Designed and implemented a C++ cache simulator that emulates Level 1 (L1) and Level 2 (L2) cache behavior, analyzes performance metrics (miss rate, memory access time), and employs LRU eviction for various cache configurations and write policies, including tracking Valid, Dirty bits, and Tag fields.

- **Combating Against SEM IC Reverse Engineering through Localized Adversarial Perturbations**: Developed a defense mechanism against SEM-based IC reverse engineering by introducing localized adversarial patches into logic gate GDSII. This strategy effectively fools CNNs, strengthening intellectual property protection and information security.

Licenses & certifications

- **IBM Qiskit Global Summer School 2023 - Quantum Excellence**: Completed intensive hands-on labs, acquiring strong quantum computation skills with Qiskit, bridging quantum theory to real-world applications using physics, math, and Python.

- **NVIDIA**: Scaling Workloads Across Multiple GPUs with CUDA C++

Academic Projects

- **Learning in SNNs, Quasi Back Propagation-Based**: Researched SNN training challenges, evaluating Temporal Spike Sequence Learning Via Backpropagation and Spike Layer Error Reassignment in Time (SLAYER) algorithms for improved accuracy and other performance metrics for standard datasets.

- **Adversarial Attack Evaluation using ART**: Evaluation of adversarial machine learning attacks on MNIST using the ART library, identifying the hyperparameters that leads to vulnerabilities, which in turn help to create strategies to enhance model robustness and security.

- **Big Data Analysis of Anime**: Conducted a comprehensive big data analysis of anime using Spark libraries for Python, extracting valuable insights into viewer preferences and content tailoring from a dataset of over a million user reviews and ratings.

- **Stock Prediction**: Development of a comprehensive stock analysis application, integrating data from multiple sources including Alpha Vantage API, Investopedia.com, and CSV files, and implementing machine learning with LSTM models to provide users with stock prices, company information, and 7-day closing price predictions for informed investment decisions.

- **Fruit Classification Using CNN**: Applied CNNs to classify fruits from labeled images, and further optimized model size using pruning to deploy on edge devices (Raspberry Pi), strengthening image classification and deep learning skills.

- **Flood Monitoring System, Embedded Systems**: Designed and implemented a cost-effective, reliable early warning system for flood-prone areas, utilizing sensors, ADC, and Raspberry Pi to monitor and send email alerts to authorities based on key flood parameters, enhancing flood preparedness and safety measures.

- **Smart Dustbin**: Implemented a Smart Dustbin using Arduino, featuring servo motors for lid automation controlled by an ultrasonic sensor. Utilized an Arduino motor shield for bin movement and integrated a Bluetooth module for smartphone-based remote operation.

Professional Experience

- **Vembu Technologies Pvt.Ltd**   Chennai, India
  Software Engineer   *Oct 2019 - 2022*

  - **Restore to Azure**: Developed a workflow for restoring VM to Azure Cloud Environment, ensuring minimal downtime during critical incidents. Used tools such as Microsoft Azure Management Fluent SDK for C# and PowerShell scripts.

  - **Tape Backup**: Implemented a robust backup feature for standalone tape drives, utilizing Win32 API (winbase.h, winnt.h), which enabled customization of retention policies for backups stored in a Tape Infrastructure, improving data retention compliance and reliability.

  - **Microsoft AD** : Involved in collection and management of Microsoft Active Directory structure data using LDAP protocols to facilitate backup processes for AD Users, Groups, and OUs.