Sahej Singh

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Education

University of Illinois at Urbana-Champaign **Graduation: May 2026**

BS in Computer Engineering *GPA: 4.0*

Coursework: Artificial Intelligence, Principles of Safe Autonomy, Applied Parallel Programming, Analog Signal Processing, Communication Networks, Computer Security, Computer Systems Engineering, Algorithms and Models of Computation, Operating Systems, Digital Systems Laboratory, Data Structures, Discrete Structures, Linear Algebra with Computational Applications, Vector and Tensor Calculus, Statistics and Probability I & II

Experience

Haylon Technologies **Jun 2024 – Aug 2024**

Machine Learning and IoT Software Engineer Intern *Edison, NJ*

- Developed embedded Machine Learning models using **SKLearn and TensorFlow** with online training for use on hardware. Allow for prediction of future current spikes with 98% accuracy.
- Implemented Machine Learning algorithms on Particle Argon hardware using **C++**, analyzed frequency and power.
- Developed containerized **AWS** Lambda cloud computing application for training models on TimeStream data.
- Set up GitHub actions as **CI/CD** platform for future changes to container or function.

Autonomous and Unmanned Vehicle Systems Laboratory (AUVSL) **May 2023 – Present**

Research Intern *Urbana, IL*

- Developed a **CANBus** hardware to **ROS2** Embedded Systems Topic node that allows researchers to subscribe for vehicle robotics data. Used by all researchers on test vehicle.
- Developed team **Github Actions** workflow for automatic documentation publication to Github Pages. Used on 100% of all repositories in organization.
- Worked on development of adaptive control systems architecture using **Lipschitz** Neural Networks with ROS.
- Developed an in-house simulation platform of our 6x6 test vehicle using **PyTorch** neural network modules and statistical models on collected data, achieves sub-1 loss.

Quant Illinois **Sept 2023 – Dec 2024**

Director of Software *Urbana, IL*

- Developed robust and extensible **backtesting** framework using **Yahoo Finance** for organizational use. Used by all researchers in organization.
- Developed and optimized **engine**, **order**, and **trade** classes.
- Planned and directed **EV** and **arbitrage** sports betting project.

Projects

F1Tenth Autonomous Racecar | *ROS, OpenCV Git* **Oct – Nov 2024**

- Implementation of autonomous racetrack-following software on an F1Tenth vehicle.
- Uses **OpenCV** to create a birds-eye view of position on the track, which allows ROS to communicate with hardware for racetrack-following using **PID controller**.
- Implemented Cascade Classification algorithm to detect signs and send signals to controller when necessary.

Unix-Like Kernel | *C, RISC-V, GDB, QEMU* **Oct – Nov 2024**

- Wrote a **Unix-like** kernel in RV64 **assembly** and C.
- Implemented thread **scheduling**, device **driver firmware**, a filesystem abstraction, program loading, **virtual memory**, processes, system calls, forking, and locking.
- Made extensive use of **GDB** for debugging and **Git** for version control.
- Allows users to run programs from a shell on top of a virtual **QEMU** system.

Hardware-Accelerated Neural Network | *FPGA, SystemVerilog, Vivado Git* **Apr 2024**

- Developed FPGA **neural network** hardware for the acceleration of deep learning.
- Uses BRAM to store data, weights, biases for online training and classification of data on button press.
- Achieved 90 percent accuracy with **online training** approach.

Parallelized CNN Model with CUDA | *CUDA* **Jan – Apr 2024**

- Used NVIDIA's **CUDA** framework with GPU cluster access to implement **CNN** model from scratch.
- Leveraged parallel computing optimization paradigms and computer architecture considerations in **C** (streams, DRAM memory coalescing, caching, and unrolling) to achieve 1000x faster computation than CPU equivalent.

Skills

Languages: Strong in C/C++ and Python, Proficient in SystemVerilog, comfortable in other Object Oriented Languages (Rust, Java, JavaScript) and statiscal languages (SQL, R, MATLAB)

Software & Tools: FPGA development, CAN, SPI, ROS, Linux, Xilinx Vivado, CUDA, Git Version Control, Docker, Android Software Development Kit, React.js, Express.js, MongoDB, Node.js, Tailwind, Flask