Shaheer Rana

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Mechatronics Engineering | University of Waterloo

SKILLS

Software: C, C++, CUDA, DMA, OpenMP, Python, Assembly, OpenCV, GCC
Embedded: ARM Cortex-M/A, CAN, SPI, I^2C, PCIe, Ethernet, TCP/IP, UDP
Hardware: Signal Processing, Power Electronics, Motor Control, Digital Logic
OS: RTOS, Linux, Kernel, ROS 2
Debug: OpenOCD/GDB, Valgrind
PCB: Altium Designer, PSIM

EXPERIENCE

Embedded Intern | Collaborative Robotics (co.bot) Santa Clara, CA | Sep 2023 – Present

- Assisting Cobot ship their initial product as the first embedded hire
- Writing cross-compiled **Linux** device drivers, OS images, and **ROS 2** nodes in **C**, **C++**
- Programming a custom power distribution board with BMS and hot-swap circuits
- Designing a high-speed **10GbE** carrier board for **NVIDIA SoC** and a motor control sensing PCB

Software Algorithms Intern | Institute for Quantum Computing Waterloo, ON | Sep 2022 – Dec 2022

- Built a low-latency, multi-threaded control system for a quantum simulator
- Parallelized the memory block transfers in **C++** and wrote **CUDA** accelerated waveform generation algorithms, **reducing execution time by 63.6%**
- Created real-time atom detection and relocation Python library using **OpenCV** and **OpenMP**

DSP Firmware Intern | Dragonfly Systems Ottawa, ON | Jan 2022 – Apr 2022

- Independently built an end-to-end **real-time data pipeline** to prototype a new ultra-low-power IoT product
- Programmed filters in **bare-metal C** on EFR32 to amplify and de-noise audio
- Optimized **DMA** buffer handling, ADC sampling, and transmission frequency
- Validated audio quality using logic analyzers, oscilloscopes, and **Python** PyQT

Robotics Intern | VN Instruments (NASA Project) Brockville, ON | May 2021 – Aug 2021

- Owned a multi-axis linear actuator testing acoustic sensors for Mars
- Wrote control algorithms in **C** on **TI-RTOS Kernel**, reduced interrupt handling time by 35%
- Built a telematics control unit and data logger for 8 motors over **Python** sockets
- Programmed and designed demultiplexing relay driver PCB

PROJECTS

Technical Director | Waterloop Sep 2020 – Dec 2022

- Led 100 members competing in and organizing North America's only active Hyperloop competition, authored the rulebook
- Established an Agile firmware team developing custom motor controller, BMS, and CAN library
- **Altium** schematic capture and layout of a 4-layer 3-phase DC/AC motor controller powering a 48V linear induction motor, simulated in **PSIM**
- Programmed fault-tolerant STM32 motor controller in **C** with 15 sensors and SVPWM

Hack the North

scaNFT (2021 Winner)	Automatic 3D NFT scanner, secure minting and Ethereum transactions
instAd (2022)	AI ad generator using multi-step stable diffusion AI and NLP

Other Competitions

Ontario Engineering Competition (2023 Winner)	Built and programmed an autonomous mobile robot
ActInSpace Canada (2022 Winner)	Machine learning for urban development

EDUCATION

University of Waterloo | BASc in Mechatronics Engineering Sep 2020 – Apr 2025