# Shaheer Rana

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Mechatronics Engineering | University of Waterloo

## SKILLS

**Software:** C, C++, Python, CUDA, Assembly, Bash, GCC, OpenMP, DMA
**Embedded**: ARM Cortex-M, CAN, SPI, I²C, BLE, TCP/IP, UDP, Ethernet
**Hardware:** Signal Processing, Power Electronics, Motor Control, Logic
**OS:** RTOS, Linux, ROS, Kernel
**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 their first dedicated embedded hire
- Writing cross-compiled device drivers, OS images, and **ROS2** nodes in **C**, **C++** for **NVIDIA Jetson**
- Programming a custom power distribution board interfacing with ADC, battery management, and hot-swap circuits through SPI, I²C, and CANFD
- Designing a high-speed carrier board for **NVIDIA SoC** supporting **10GbE** over **PCIe** and a motor control sensing and interface PCB using **Altium**

**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 with **C++**
- Parallelized the memory block transfers and wrote **CUDA** accelerated waveform generation algorithms, **reducing execution time by 63.6%**
- Created real-time atom detection and spatial configuration library using Python **OpenCV**, **OpenMP**

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

- Independently launched development of an ultra-low-power IoT node for audio signal processing
- Programmed EFR32 in **bare-metal C** to amplify and de-noise signals through 2nd-order filters
- Built an end-to-end **real-time data pipeline** by optimizing **DMA** buffer handling, 12-bit ADC sampling, and transmission frequency
- Validated signal integrity using logic analyzers, oscilloscopes, and graphically using PyQt and **Python**

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

- Owned the development of a multi-axis linear actuator testing acoustic sensors for Mars
- Wrote PWM 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 using **Python** sockets
- Programmed and designed demultiplexing relay driver PCB for 4-speed motor control using **Altium**

## EXTRACURRICULARS

**Project Manager** | Waterloop Sep 2020 – Dec 2022

- Making a faster world by leading 100 members building Canada's Hyperloop
- Established a software team developing firmware in **C** and scripting in **Python** for custom motor controller, battery management system, and CAN Library
- **Altium** schematic capture and layout of a 4-layer 3-phase DC/AC motor controller powering a 48V linear induction motor, ripple and parasitic effects minimized with **PSIM** circuit simulations
- Programmed fault-tolerant STM32 motor controller in **C** with 15 sensors, SVPWM, and SPI
- Organizer of North America's only current Hyperloop competition, author of rulebook

**Hack the North**

*scaNFT (2021 Winner)* A 3D-scanner that automates the process of minting NFTs
Secure Ethereum wallet and NFT authentication pipeline in JavaScript

*instAd (2022)* AI ad generator using multi-step stable diffusion AI and NLP in JavaScript

**Other Competitions**

*Ontario Engineering Competition (2023 Winner)* Designed and built an autonomous robot in **C++**
*ActInSpace Canada (2022 Winner)* Machine learning for urban development

## EDUCATION

**University of Waterloo** | BASc in Mechatronics Engineering, Option in Quantum Physics 2020 – 2025