

# Akash Ahilan

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## EDUCATION

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### McMaster University

Hamilton, ON

*B.Eng. Mechatronics and Biomedical Engineering, 3.8 GPA*

*Expected Graduation: April 2027*

- **Relevant Coursework:** Embedded Systems, Digital & Analog Circuits, Signals & Systems, Control Systems, Software Design.

## EXPERIENCE

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### IEEE RoboArm — McMaster IEEE

Sep. 2025 – Present

*Founder & Controls Lead*

*Hamilton, ON*

- Founded a student team to design and build a **6-DOF robotic arm** driven by **BLDC motors** with closed-loop **AS5048A magnetic encoders** for per-joint position control.
- Architecting **bare-metal C/C++ firmware on STM32G4 (ARM Cortex-M4)** using a **finite-state machine, timer-driven interrupts**, and **DMA** for deterministic motor command dispatch.
- Implementing **cascaded PID** position/velocity loops with **FreeRTOS** task separation between the real-time control ISR, comms, and supervisory logic.
- Designed HIL-style bench fixtures and bring-up scripts to verify motor, encoder, and bus subsystems before full-arm integration, reducing integration debug time.

### Royal Bank of Canada (RBC)

May 2025 – Sept. 2025

*Technical Systems Analyst (Intern)*

*Toronto, ON*

- Engineered a production **Java database migration tool** for enterprise banking systems, processing **1M+ records** with emphasis on data integrity and reliability.
- Reduced end-to-end migration time by **35%** by introducing **multi-threaded schema transfers**, enabling parallel migration of independent schemas.

### McMaster Sumobots Robotics Competition

Sep. 2024 – Sep. 2025

*Embedded Software Developer*

*Hamilton, ON*

- Programmed **embedded C++** firmware with a **<10 ms control loop** for real-time edge detection and collision avoidance using a reactive state-based controller.
- Won **Best Algorithm Award** at the 2025 McMaster Sumobots competition.
- Designed a lightweight chassis in **SolidWorks**, reducing weight by **20%** while improving impact durability and maneuverability.

## PROJECTS

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### VeinVision | Startup; NIR optics, SolidWorks, hardware integration

Jan 2026 – Present

- Designed a **near-infrared vein-visualization device** integrating IR illumination arrays, camera modules, and a custom enclosure across **10+ build iterations** to improve imaging quality and ergonomics.
- Iterated on optical geometry, LED placement, and enclosure form to improve vein contrast; validated designs against clinician feedback from nurses and phlebotomists.
- **Top 3 Medical Innovation in Canada (HOSA)**; ongoing development with St. Joseph's Research Institute.

### MonitorAI | Startup; mmWave radar, OpenCV, Python

Jan 2026 – Present

- Built a **non-contact vitals-monitoring prototype** fusing **mmWave radar** and **computer vision** to estimate **heart rate and respiration rate** at a distance, targeting clinical waiting rooms.
- Combined radar micro-motion signatures with camera-based face/pose tracking to isolate per-patient vitals in multi-person scenes; **Finalist, Harvard AI Hackathon** (further technical detail withheld for IP).

## SKILLS

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**Languages:** C, C++, Python, MATLAB, Java, SQL

**Embedded & Firmware:** STM32 (G4/F4), ARM Cortex-M, bare-metal C/C++, FreeRTOS, interrupts, DMA, finite state machines, UART, SPI, I2C

**Controls & Signals:** PID, cascaded control loops, real-time control, sensor fusion, feedback systems, signal analysis, Simulink, HIL-style testing

**Tools & Debugging:** Oscilloscope, logic analyzer, multimeter, soldering, Git, Linux

**CAD & Mechanical:** SolidWorks, Inventor, 3D printing, DFM