Ethan Ieong

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Personal Statement: Computer Engineering student specializing in real-time embedded systems with hands-on experience developing low-latency firmware for ARM Cortex-M microcontrollers using C/C++ and FreeRTOS. Seeking an embedded software internship

SKILLS

Languages: C/C++, Python, VHDL, HCS12 Assembly, C#, PHP, TypeScript, JavaScript, Java
Firmware/Embedded: STM32, RP2040, FreeRTOS, I2C, SPI, UART, CMake, Make, CAN
Platforms & Tools: Linux, Git, GitHub Actions, Docker, OpenCV, Visual Studio, Multimeters, Soldering, Oscilloscope

EXPERIENCE

MetRocketry – TMU Student Design Team **Toronto, ON**
Control Systems Assistant *September 2024 – Present*

- Architected **≤3 ms** end-to-end latency by leading **4** developers to build a canard-actuation stack on an **STM32** under **FreeRTOS**
- Deliver **500 Hz**, **2ms-period** attitude estimates by implementing a **Madgwick orientation filter** by fusing IMU and magnetometer data, enabling stable quaternion and Euler roll-angle outputs for real-time ground testing of the closed-loop canard control
- Retrieve time-aligned **500 Hz 6-DoF IMU** and **3-axis magnetometer** data via data-ready interrupts with circular-**DMA** streaming, by developing **C SPI** drivers feeding deterministic, low-jitter inputs into an attitude and heading reference system (**AHRS**)
- Caught **~47%** of PRs with CI gates by adding ELF builds and **Cppcheck** in **GitHub Actions**, cutting review time and defects
- Eliminate control jitter at **333 Hz** by driving two canard servos with **STM32** timer-based **PWM** for precise actuation
- Produce altitude and vertical velocity estimates via **complementary filter** by fusing **AHRS** and barometric pressure for apogee detection

MACH (Metropolitan Aerospace & Combustion Hub) – TMU Student Design Team **Toronto, ON**
Avionics Member *September 2025 – Present*

- Enabling real-time inter-board communication across **5+** custom **PCBs** by developing a **CAN** bus driver in **C++** for an **RP2040**
- Validated the **C++ CAN** driver's data integrity by instrumenting firmware to log inbound packets to a **PuTTY** serial terminal

First Insurance Funding of Canada **Toronto, ON**
Full-stack Developer Intern *May 2025 – August 2025*

- Enabled a successful security audit by resolving **900+ Checkmarx SAST** findings in a **C#/ASP.NET** codebase using **Microsoft Visual** Studio, centralizing validators, adding redirect allowlists, canonicalizing file paths, and tightening error handling

First Insurance Funding of Canada **Toronto, ON**
IT Support Intern *May 2024 – August 2024*

- Automated inactive-user removal in **Python**, reducing stale-account exposure and saving **~2–3 hours per day**; replaced manual data pulls with a pandas pipeline that performed deduplication, formatting, and field selection across **10+ Excel sheets**

PROJECTS

6-DoF Robotic Arm

- Built a **C++ inverse-kinematics** solver using **Denavit-Hartenberg parameters** for a **6-DoF** pick-and-place robotic arm that computes joint angles from targets, enforces angle limits, detects singularities and unreachable targets, reducing operator intervention
- Achieved smooth, collision-free motion by adding per-joint calibration, rate-limited ramps and limit enforcement by developing a **C** PCA9685 driver outputting synchronized **50 Hz PWM** over **I2C** (**400 kHz)** across **6** joints for basic pick-and-place routines
- Achieved continuous angle streaming by configuring the **STM32 ADC** and **circular DMA** with half/full callbacks under **FreeRTOS**

8-Bit FPGA Processor

- Designed a modular 8-bit processor in **VHDL**, integrating an **ALU**, 8-bit registers, and a control unit on an **Intel/Altera FPGA**
- Implemented the control unit using a **9-state Moore FSM** and 4-to-16 decoder to generate a unique **16-bit microcode** for 9 distinct operations and verified all logic via **waveform simulations** and validated hardware operation with a **7-segment BCD display**

HCS12 Robotic Car Guidance

- Achieved a **2.25x (55%)** reduction in maze completion time on the final run by developing a search algorithm in **HCS12 Assembly** that "learned" the correct path after one pass of venturing down incorrect branches and recovering from dead-end errors
- Ensured **100% error-free navigation** on the final run by implementing an interrupt-driven state machine that reliably caught bumper-actuated dead ends, executed **180-degree** recovery turns, and stored the correct path in a hyper-efficient **7-byte** data structure

EDUCATION

Toronto Metropolitan University **Toronto, ON**
B.Eng. in Computer Engineering *Expected April 2027*

- **Achievements:** Dean's Honours List (3x) – Fall 2023, Winter 2024, Winter 2025
- **Relevant courses:** COE428 - Data Structures & Algorithms, COE528 - Object Oriented Design, COE538 - Microprocessor Systems