Jonathan Jacob Koshy

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Skills

- **Programming:** C, C++, Python, Bash, CMake, Make, RISC-V
- **Embedded Systems:** STM32, ESP32, FreeRTOS, Embedded Linux, Raspberry Pi
- **Hardware & Design:** SPI, I^2C, UART, BLE, TCP/IP, Altium, KiCAD
- **Software & Tooling:** LVGL, CTest, Git, Docker, MATLAB, COMSOL

Experience

Embedded Systems Intern – AeroCardia – Montreal, QC — Sep 2025 – Dec 2025

- Shipped production sensor drivers in **C** for IMU, temperature, and PPG data used in a wearable health prototype
- Built a **FreeRTOS** task pipeline streaming biosensor data under **50 ms** with **BLE** packet loss below **1%**
- Enabled firmware updates by implementing secure **BLE OTA** with image verification and rollback support
- Improved hardware reliability by designing low-noise PCBs around an **ESP32-S3** and biosensors
- Increased firmware stability by validating drivers and inter-task communication with **CTest**
- Spearheaded a mobile app using **Expo** with **CI/CD** pipelines to automate build and deployment workflows
- Built a secure web dashboard for patients and clinicians to review health metrics and experiment data

Embedded Flight Systems – UWARG – Waterloo, ON — Nov 2024 – Present

- Improved fixed-wing flight handling by implementing firmware for roll and yaw mixing
- Enabled stabilized pilot control by implementing fly-by-wire assist using **PID** attitude control
- Reduced integration risk by validating ESC behavior with a custom motor test platform

Firmware Member – Electrium Mobility – Waterloo, ON — May 2025 – Sep 2025

- Designed a **FreeRTOS** task architecture to handle **BLE** events without blocking control or UI tasks
- Integrated **VESC** motor and battery telemetry on **ESP32** for real-time diagnostics

Information Technology Intern – ECE Department, University of Waterloo — Sep 2024 – Dec 2024

- Unblocked research workflows by debugging **OS**, driver, and networking failures across lab machines
- Reduced setup time by automating system provisioning with **scripting**
- Restored system reliability by diagnosing hardware and peripheral integration issues

Projects

High Speed Autonomous Disk Launcher

- Achieved low-latency autonomous targeting using **YOLOv8** on **Raspberry Pi 5** with a **Hailo-8** accelerator
- Enabled closed-loop tracking by mapping detections to angular setpoints for **PID** pan-tilt control on **ESP32-S3**
- Increased launch safety by gating firing logic with **LiDAR** range validation
- Delivered repeatable launch behavior by controlling dual flywheel motors under real-time constraints

ESP32 Wi-Fi Media Controller

- Built a standalone **ESP32** media controller with an **LVGL** touchscreen UI
- Enabled real-time telemetry and playback visibility by streaming data from a **Python** backend
- Maintained UI responsiveness by prioritizing **Wi-Fi** transport for telemetry and media updates

Claude-Powered Firmware Assistant

- Built a full stack AI assistant supporting firmware development with real time streaming responses
- Implemented retrieval augmented generation over indexed documentation to improve answer relevance
- Reduced hallucinations by constraining context selection through semantic vector search

Education

University of Waterloo — Waterloo, ON

B.S in Electrical Engineering — 2023 – Present

Courses: Computer Architecture, Electronic Circuits, Digital Logic Design, Data Structures