Abtin Aryanpour

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Education

University of Waterloo — Waterloo, ON
Candidate for BASc in Computer Engineering, Co-op Program — *Sep. 2026 – Apr. 2031*

Technical Skills

Languages: C, Python, C++, Java, JavaScript, SQL
Embedded & DSP: Pico SDK, Arm Cortex-M33, PIO, DMA, I2S, PWM, watchdog, fixed-point math, FFT, log-mel
ML & Vision: PyTorch, scikit-learn, OpenCV, NumPy, CNNs, Gaussian mixtures, int8 quantization, RANSAC
Tools & Platforms: Git, GitHub Actions (CI), CMake, pytest, Django, SQLite, AWS EC2

Experience

Autonomy Software Member — Sep. 2026 – Present
Waterloo Aerial Robotics Group — *Waterloo, ON*

Groundside Image Stitcher — PR #215 (merged)
- Built a Python stitcher (PyTorch, OpenCV, XFeat, RANSAC) that merges out-of-order, GPS-tagged photos from 3 drones into one georeferenced map; sole developer, merged with 130 tests
- Designed a least-squares pose refinement that cut mean simulated misalignment from 13.6–69.8 cm to 4.0–8.3 cm
- Solved feature matching across 180° row turns, then used drone yaw to extract features once per photo, cutting simulated time per photo from 0.42–0.75 s to 0.13–0.19 s
- Implemented lens undistortion and blur, exposure and tilt checks that keep unusable photos out of the map

Swarm Spacing (Lloyd's Algorithm) — PR #247 (in review)
- Built a swarm-spacing module (Lloyd's algorithm, Voronoi cells, Shapely) that spreads drones evenly over concave, GPS-bounded fields, cutting spacing variation (CV) from 0.46 to 0.06 in simulation

Homework Helper & Assistant Teacher — Sep. 2022 – Jul. 2025
Spirit of Math Schools Inc. — *Richmond Hill, ON*
- Ran a drop-in homework classroom as one of two staff (2024–2025), helping about 30 students per session
- Taught 1–2 classes a week of up to 16 students (2022–2024), covering lessons and contest-style algebra

Projects

Andon: Machine-Sound Anomaly Detection | *Python, C, Raspberry Pi Pico 2* — Oct. 2026 – Present
- Developed a Pico 2 andon system that hears a fault through an I2S mic and cuts the fan's power via a MOSFET, stopping each of 3 real fans by itself 3.461–11.661 s after an injected fault
- Wrote real-time C firmware (I2S capture via PIO and DMA, FFT log-mel features, per-fan Gaussian mixture scoring) that matches Python's scores on the board at 1.684 ms per 32 ms audio frame
- Trained a PyTorch CNN on healthy audio only, reaching 92.13% mean AUC on held-out DCASE 2020 data vs. 79.70% for the baseline autoencoder I reproduced
- Proved the model hears more than loudness: with volume matched it still caught both real-fan faults at 100% AUC, while a level meter reached only 63.34% AUC on the DCASE dev set
- Quantized the CNN to int8 (383.0 KB to 98.7 KB at 92.08% AUC) and ported it to C, bit-exact with Python on the Pico 2's Cortex-M33

CyberShield: Full-Stack Discussion Forum | *Python, Django, JavaScript, Tailwind CSS* — 2025
- Built a full-stack forum as the only developer on a 3-person team using Django, jQuery (AJAX) and SQLite, winning 1st of 32 teams at CNLC 2025
- Implemented voting, sorting, filtering and fuzzy search (Fuse.js) through JSON endpoints, with no page reloads
- Secured accounts with Django auth, CSRF protection, reCAPTCHA and moderator roles; deployed on AWS

Awards

Canadian National Leadership Conference: 1st place (2025) and 4th place (2024), Coding & Programming
Waterloo Math Contests, 2025–26: Euclid (86/100), Hypatia (33/40) Honour Roll; Fermat, CSMC Distinction
Bayview Secondary School: Excellence in Mathematics (2025, 2026)