

Mason Kurek

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EDUCATION

University of Victoria

Fifth Year

B.Eng. Mechanical Engineering, Specialization in Mechatronics

Graduation Aug 2027

Design: SolidWorks (surfacing, FEA), Star-CCM+ (CFD and multiphysics), Blender, 3D printing, laser cutting, composite layup and molding, vacuum bagging

Skills: C/C++, Python, MATLAB, bare-metal AVR, Arduino, Raspberry Pi, VEX, sensor and actuator integration, soldering, OpenCV, YOLOv8, PyTorch, local speech pipelines (wake-word, STT, LLM, TTS)

WORK EXPERIENCE

Maker Space Engineering Assistant

May 2026 - Aug 2026

University of Victoria Maker Space

Victoria, BC

- Developed and Led hands-on workshops in soldering, tap and die, laser cutting, CNC, and 3D printing for groups of 2 to 15 participants.
- Created lesson plans and custom training components and supported students through technical instruction and facility tours.

Mechanical Engineering Intern

Jan 2025 - Apr 2025

PCL Canada

Vancouver, BC

- Performed quantity take-offs and cost analysis on major civil projects including Metro Vancouver's \$3.86B North Shore Wastewater Treatment Plant and CSRC.
- Coordinated with subcontractors and project teams to refine estimates against timelines and budgets using Stack, Excel, and Revizto.

Mechanical Engineering Intern

Jan 2024 - Apr 2024

Babcock Canada

Victoria, BC

- Developed and tested machine learning tools for predictive analytics across maritime and aerospace defense systems, spanning risk analysis, part failure prediction, and document classification.
- Researched 12+ technology partnerships and university investments, delivering recommendations to Babcock leadership. Project specifics under NDA.

Design and Entrepreneurship

Oct 2021 - Aug 2024

Ad Astra 3D

Calgary, AB

- Led a team of three delivering custom 3D projects, recreating out-of-market exterior lighting, stonework, and other pieces and freelance work at roughly \$5,000 annual profit.
- Experimented with fiberglass and composites to enhance structural rigidity for demanding sports applications.

EXTRACURRICULAR

Founder and Club Lead

Oct 2025 - Present

UVic Mechatronics Club

Victoria, BC

- Founded the club around a personal build and grew it to 10+ students across five divisions: controls, mechanical, composites, electrical, and business.
- Built a fully local voice pipeline on a Raspberry Pi 5 (wake-word, speech-to-text, quantized LLM, text-to-speech) at 2 to 3 second response with no cloud dependency, with an Arduino Mega driving neck, drivetrain, and arm systems.
- Placed a state machine between the model and the hardware so language maps onto a fixed command set rather than commanding actuators directly. Designed a 4-DOF servo arm and 3D printed all mounts and enclosures.

Aerodynamics and Composites Team

Feb 2023 - Present

UVic Formula Motorsport (FSAE)

Victoria, BC

- Ran multiphysics simulation in Star-CCM+ on wing elements and the full aero package, and modeled UV24 side panels with SolidWorks surfacing off chassis geometry at a 0.1 in offset.
- Designed the accumulator mounting tray and installed the pack on the EV. Developed sidepods, vortex generators, rear wing elements, gooseneck mounting, and undertray.

Structures, Composites and Recovery

2022 - 2025

UVic Rocketry, Xenia-1 & 2

Victoria, BC

- Performed carbon fiber layups for the fuselage and researched technique to improve part-to-part consistency. Built a static motor thrust test stand, and fabricated and sewed the recovery parachute.
- Used MATLAB for trajectory and drag coefficient calculation, structural load and stress analysis, parachute deployment shock, and filtering of noisy altimeter and accelerometer flight data.
- Vehicle flew to 9,340 ft against a predicted 9,593 ft, a 2.6% deviation from simulation, and earned an honorable mention for fastest recovery at Launch Canada 2023.

CERTIFICATIONS

Introduction to ROS, ROSCon

Sept 2026

Turbomachinery for Emerging Space Applications: Liquid Rocket Propulsion, AIAA

Apr 2024

UVic Mechatronics Club - Autonomous "WALL-E" Robot



Objective

Build a fully autonomous tracked robot with on-device voice control and **no cloud dependency**. Prove that wake word detection, speech to text, language understanding and speech synthesis can all run on a single Raspberry Pi 5.

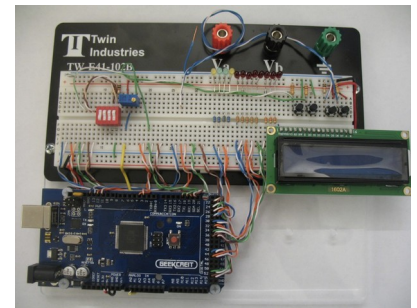
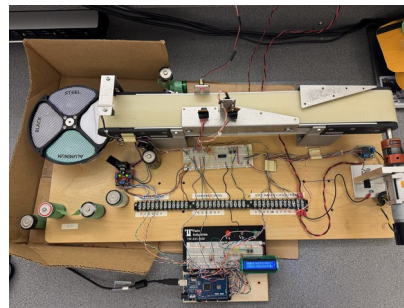
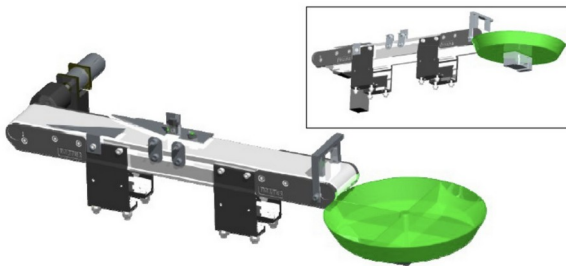
Approach

Chained openWakeWord, whisper.cpp, a quantized 3B model via llama.cpp, and Piper into one fully local pipeline. Placed a **state machine between the model and the hardware** so language maps onto a fixed command set, never straight to actuators. Built a 4 DOF arm driven by a PCA9685 on an isolated supply.

Results

Roughly **2 to 3 seconds** from spoken request to robot motion, entirely offline. Neck dynamics and arm kinematics working on the bench. **Founded the club** and organized 10+ students into five divisions: controls, mechanical, composites, electrical and business.

MECH 458 - Robotic Detection and Sorting System



Objective

Sort **48 dimensionally identical blocks** across four material types in a single continuous run, classifying on surface reflectivity alone as each piece crosses a sampling window.

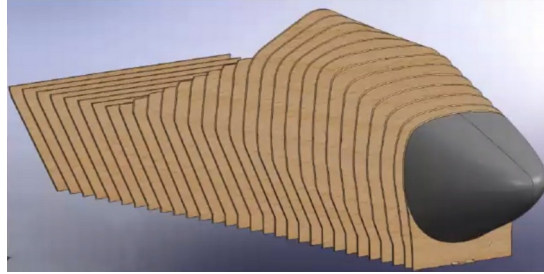
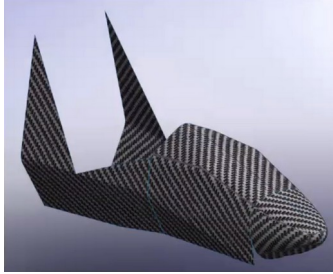
Approach

Wrote **bare metal C on an ATmega2560** handling ADC sampling, classification, conveyor PWM, stepper positioning and the LCD. Re-triggered each ADC conversion **from inside the ADC interrupt itself**, giving near continuous sampling of the minimum reflectivity.

Results

Best run of **29.7 seconds with zero errors**, against a 60 second target. Eliminated the primary failure mode, which was merging two closely spaced pieces into one reading.

UVic Formula Motorsport - Aerodynamics and Composite Bodywork



Objective

Convert aerodynamic intent into parts that hold their shape under load, across three seasons of UVic Formula SAE. Own sidepods, vortex generators, rear wing elements, gooseneck mounting and undertray.

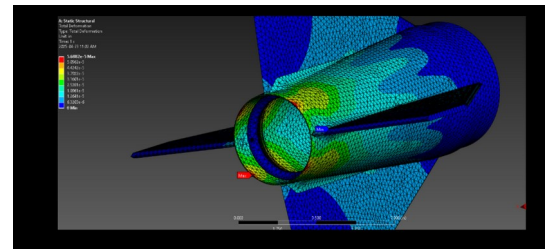
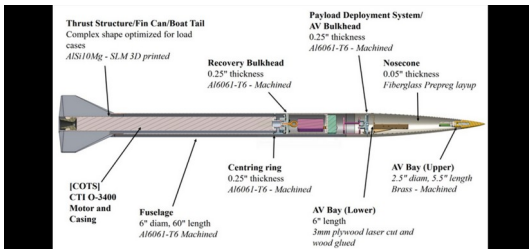
Approach

Ran **multiphysics simulation in Star-CCM+** on wing elements and the full aero package. Modelled UV24 side panels with SolidWorks surfacing off chassis geometry at a 0.1 in offset. Rebuilt a destroyed UV25 mold from **laser cut profiles on a profiled spine** with a 3D printed nose.

Results

Panels came out lightweight, dimensionally accurate and compliant with 2024 FSAE rules. Rebuilt mold reproduced the machined original at **roughly 75% less cost and time**, delivered in two weeks on a \$500 budget.

UVic Rocketry - Xenia-2 Structures and Recovery



Objective

Contribute to structures, composites, recovery and propellant work on Xenia-2. Produce a carbon fuselage with repeatable layup quality, since a layup flaw stays invisible until it becomes a failure.

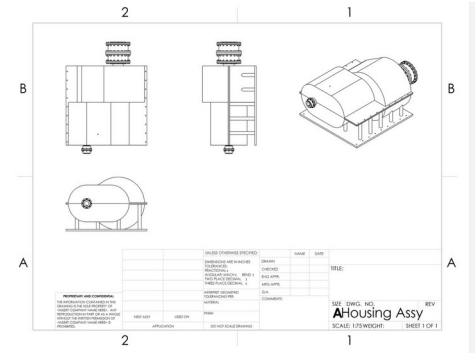
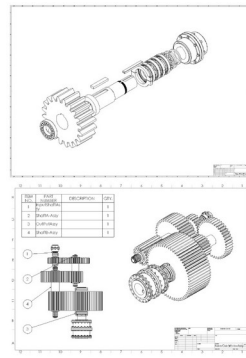
Approach

Performed carbon fiber layups and researched technique to improve part-to-part consistency. Built a **static motor thrust test stand**, then fabricated and sewed the recovery parachute. Used MATLAB for trajectory, drag, structural loads and parachute deployment shock.

Results

Flew to **9,340 ft** at Launch Canada 2023 against a predicted 9,593 ft, a **2.6% deviation** from simulation. 21.0 kg lift-off mass on a Cesaroni M2505, Mach 0.93. Honorable mention for fastest recovery.

MECH 360 - Custom Solar Plant Transmission



Objective

Design a high power speed reduction gearbox coupling a **6,000 RPM steam turbine** to a **450 RPM generator**, serving a 30 MW concentrated solar plant split into two parallel 15 MW turbine lines.

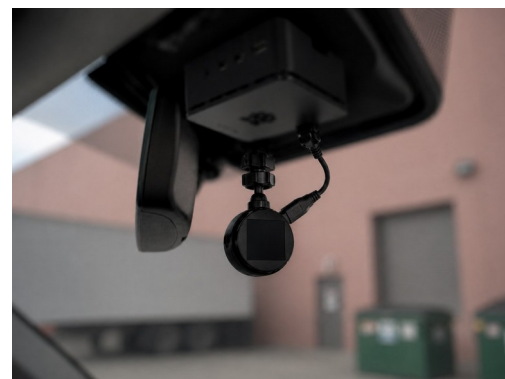
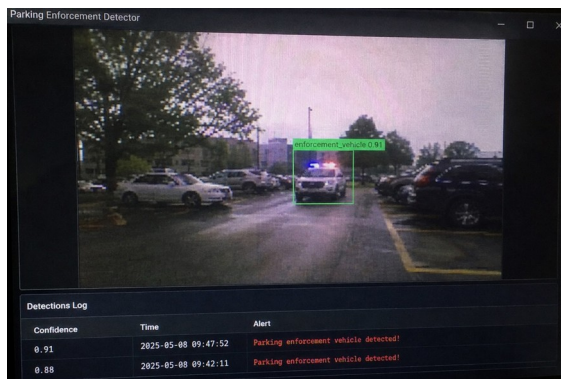
Approach

Worked from plant level requirements down to shaft by shaft targets, 16.276 MW in at 6,000 RPM against 331.6 kNm out at 450 RPM. Sized a multi stage geartrain at 96% assumed efficiency. Treated the nightly duty cycle as a **fatigue problem** rather than a peak power problem.

Results

13.3:1 reduction with shafts, gears, bearings, couplings and a serviceable two piece housing. Infinite life target with a minimum **1.4 safety factor** over a 25 year service life. Documented assembly sequencing and an overhaul schedule.

P.A.R.K.R. - Parking Automated Recognition Kit for Reminders



Objective

Build a dashcam based vision system that watches for parking enforcement vehicles from a parked car, sending a reminder to top up before the session lapses rather than acting on the driver's behalf.

Approach

Ran **YOLOv8 inference** on a **Raspberry Pi 4B** with no GPU, holding frame rate high enough to catch a passing vehicle. Trained the detector in PyTorch on hand annotated data. Used OpenCV preprocessing to isolate a **flashing light pattern over time**, since the signal is temporal rather than a static shape.

Results

Detection, GPS-tagged logging and alerting working end to end on the Pi. **50% correct detection**, with false positives dominated by oncoming headlights. Root cause was a 25 image training set, too small to separate a flash pattern from night traffic.