

Mason Kurek

 Mason Kurek |  mason.kurek@gmail.com |  (403)-614-3822 |  masonkurek.com

TECHNICAL SKILLS:

Languages: C/C++ | Python | MATLAB

Robotics and Embedded: Arduino, Raspberry Pi, VEX, bare-metal AVR, sensor actuator integration, soldering

ML and Vision: OpenCV, YOLOv8, PyTorch, speech pipelines (wake-word, STT, local LLM, TTS)

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

WORK EXPERIENCE:

Maker Space Assistant

Victoria, BC, CA

May 2026 – Aug 2026

University of Victoria Maker Space

Led and developed hands-on workshops in soldering, tap and die use, laser cutting, 3D printing, and more for groups of 2–15 participants. Created lesson plans and designed custom training components for workshops, strengthening leadership skills through technical instruction, facility tours, and direct student support.

Estimating Engineering Intern

Vancouver, BC, CA

Jan 2025 – Apr 2025

PCL Canada

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

Technology and Innovation Intern

Victoria, BC, CA

Jan 2024 – Apr 2024

Babcock Canada

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. Specifics under NDA.

3D Design/Entrepreneurship

Calgary, AB, CA

Oct 2021 – Aug 2024

AD ASTRA 3D

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

EDUCATION:

University of Victoria

Victoria, BC, CA

Sept 2022 – Aug 2027

Bachelor of Mechanical Engineering

Specialization in Mechatronics

West Island College

Calgary, AB, CA

Sept 2019 – June 2022

Highschool

Graduated with Honors and the Engineering Institute Certificate

ROBOTICS AND ENGINEERING PROJECTS:

Autonomous “WALL·E” Robot: Local Voice Agent + Tracking:

Victoria, BC, CA

Oct 2025 – Present

UVic Mechatronics Club Lead

Grew a personal build robot into the club's flagship project, now leading 10+ students across five divisions. A Raspberry Pi 5 runs a fully local voice pipeline (wake-word, speech-to-text, quantized LLM, text-to-speech) at 2 to 3 second response with no cloud dependency, and an Arduino Mega drives the neck, drivetrain, and arm. A state machine between model and hardware maps language onto a fixed command set rather than commanding actuators directly. Designed a 4-DOF servo arm and 3D printed all mounts and enclosures.

UVic Formula SAE: Aerodynamics and Composites:*Victoria, BC, CA***Feb 2023 – Present****UVic Formula Motorsport**

Worked across both the combustion and electric cars, spanning the accumulator, drivetrain, and aerodynamics sub teams, including designing the accumulator mounting tray and installing the pack on the EV. Now focused on aerodynamics and carbon fiber molding for sidepods, vortex generators, rear wing elements, gooseneck mounting, and undertray. Ran multiphysics simulation in Star-CCM+ on wing elements and the full aero package.

Robotic Detection and Sorting System:*Victoria, BC, CA***Dec 2025 - Apr 2026****Mechatronics (MECH 458)**

Designed and programmed a bare-metal C inspection and sorting system on an ATmega2560, developing the embedded architecture, selecting sensors and actuators, and implementing interrupt-driven real-time control. Restructured ADC sampling to re-trigger from inside the interrupt, eliminating the dominant failure mode of merging closely spaced pieces, and sorted 48 objects in 29.7 s with zero errors against a 60 s requirement.

P.A.R.K.R. (Parking Automated Recognition Kit for Reminders):*Victoria, BC, CA***Jan 2025 - Jun 2025****Personal Project**

Built a dashcam prototype on a Raspberry Pi 4B, training a YOLOv8 detector in PyTorch on a hand-annotated dataset and running real-time OpenCV inference with no GPU to flag parking enforcement vehicles and send GPS-tagged reminders before a session expired. Identified training set size and headlight false positives as the limiting factors on accuracy.

Custom Solar Plant Transmission:*Victoria, BC, CA***Fall 2024****MECH 360, 5-person team**

Designed a high-power speed reduction gearbox coupling a 6,000 RPM steam turbine to a 450 RPM generator for a 30 MW concentrated solar plant split into two parallel 15 MW lines. 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, sizing a multi-stage geartrain at 96% assumed efficiency. Specified shafts, gears, bearings, couplings, and a serviceable two-piece housing to an infinite-life target with a minimum 1.4 safety factor over a 25 year life.

Rover + 5-Axis Robotic Arm:*Victoria, BC, CA***Dec 2022 - Apr 2023****UVic Robotics Club**

Programmed ultrasonic obstacle detection and avoidance for a land rover entered in the Canadian International Rover Challenge in Drumheller, implementing stop-and-reverse and path replanning behaviors in response to detected obstacles. Programmed and built a 5-axis robotic arm for the 2023 competition rover to flip switches, turn knobs, and carry a 2.0 kg payload.

ADDITIONAL INTERESTS:

Online Formula 1 and Motorsport: Longstanding interest in Formula 1 and endurance racing. Assembled a racing simulator from a kit and ran it with Gran Turismo and F1 24.

CERTIFICATIONS:**Turbomachinery for Emerging Space Applications: Liquid Rocket Propulsion****April 2024****American Institute of Aeronautics and Astronautics**

References available upon request

Mason Kurek

MECHANICAL ENGINEERING AT THE UNIVERSITY OF VICTORIA

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UVic Mechatronics Club Lead: Autonomous “WALL·E” Robot (Oct 2025 – Present)



What?

- Build a fully autonomous tracked robot with on-device voice control and no cloud dependency, leading a team of 10+ students.
- Prove that wake word detection, speech to text, language understanding and speech synthesis can all run on a single Raspberry Pi 5.

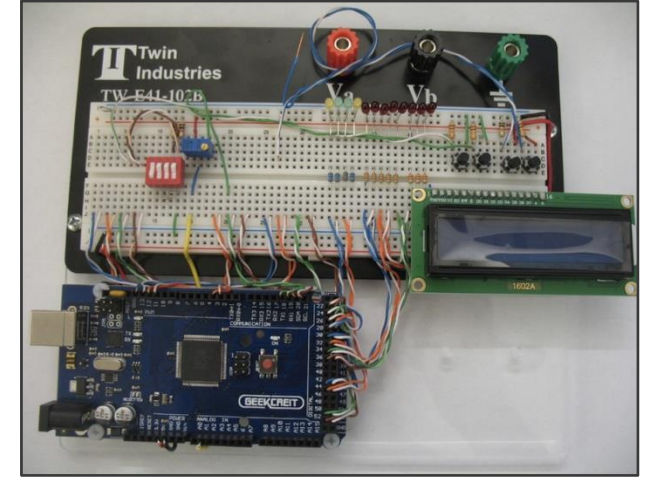
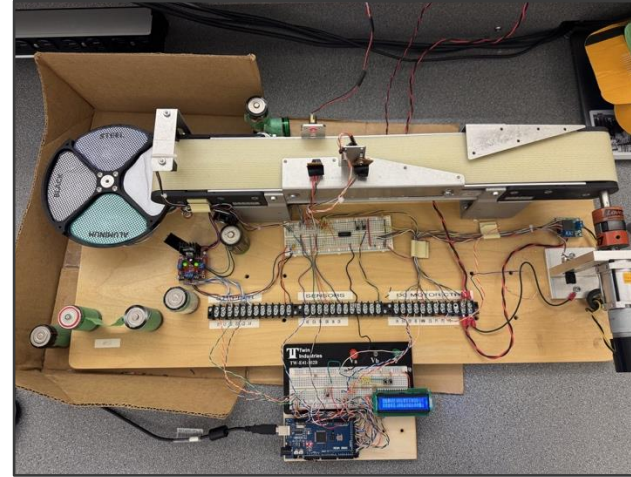
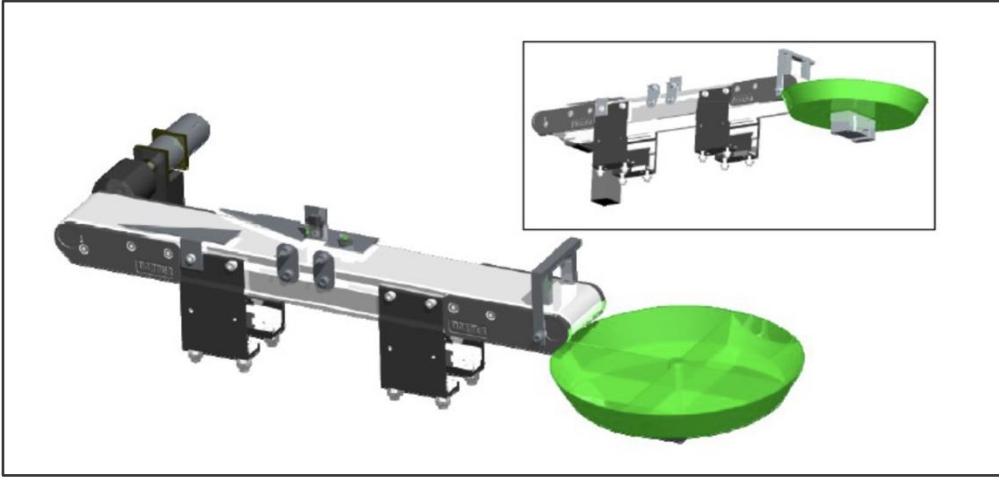
How?

- 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, keeping servo current transients off the compute board.

Results

- Roughly 2 to 3 seconds from spoken request to robot motion, entirely offline.
- Neck dynamics and arm kinematics working on the bench, with integration onto the 0.75 m tracked base underway.
- Organized the club into five divisions: controls, mechanical, composites, electrical, and business.

Robotic Detection and Sorting System (Dec 2025 – Apr 2026)



What?

- Sort 48 dimensionally identical blocks across four material types in a single continuous run.
- Classify on surface reflectivity alone, measured by an optical sensor as each piece crosses a sampling window.

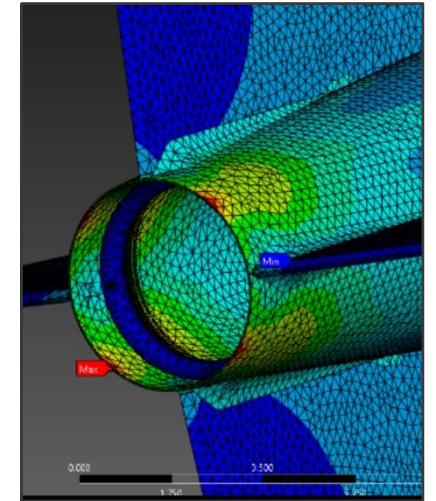
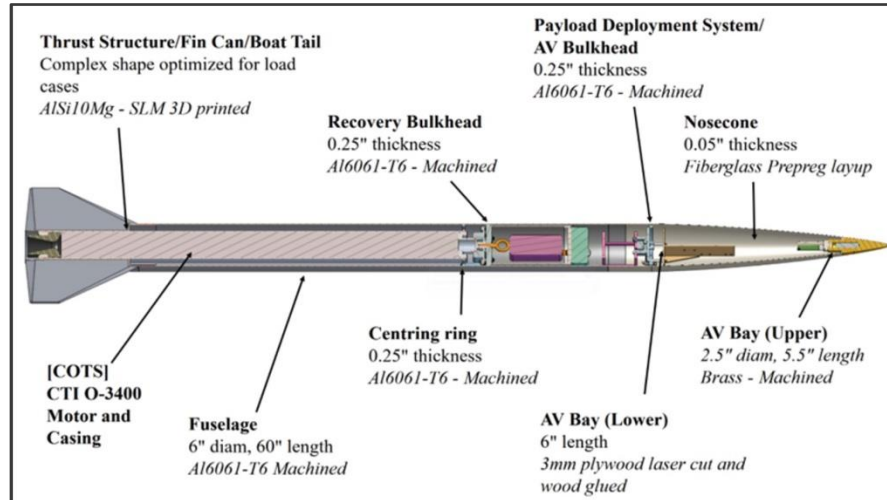
How?

- Wrote bare metal C on an ATmega2560 handling ADC sampling, classification, conveyor PWM, stepper positioning and the LCD.
- Split the architecture so time critical sensing lives in interrupt service routines and classification sits in the main loop.
- 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.
- Trapezoidal stepper profile and a 53% conveyor duty cycle for reliability under load.

UVic Rocketry Xenia-2 Structures and Recovery (2022 – 2025)



What?

- Contribute to structures, composites, recovery and propellant work on Xenia-2, the second rocket in UVic Rocketry's Xenia class.
- Produce a carbon fuselage with repeatable layup quality, since a layup flaw stays invisible until it becomes a failure.

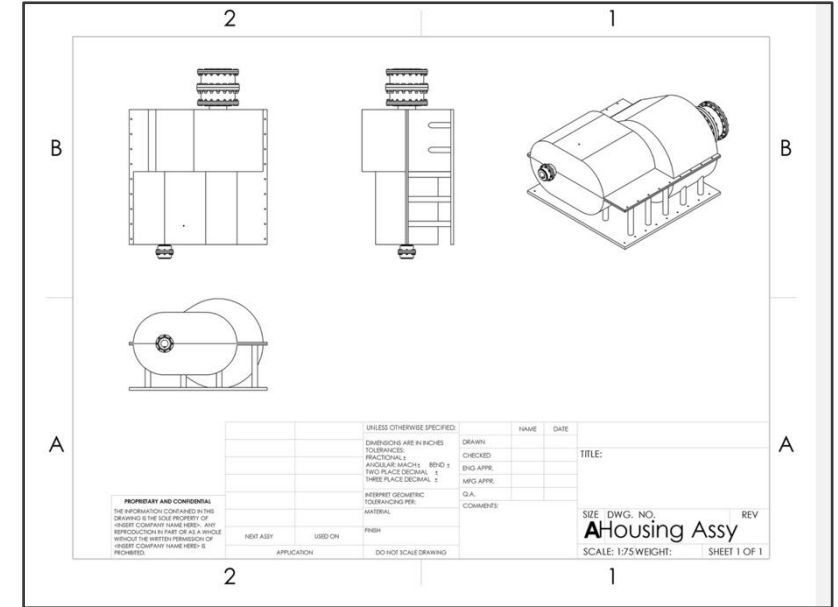
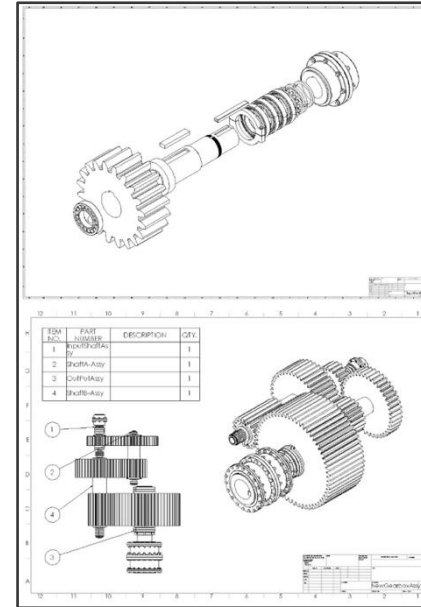
How?

- Performed carbon fiber layups for the fuselage and researched techniques to improve consistency between parts.
- Built a static test stand for motor thrust characterization, then fabricated and sewed the recovery parachute.
- Contributed to nozzle design and propellant research alongside the fuel and combustion team.

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, 2953 N peak thrust, Mach 0.93 top speed.
- Earned an honorable mention for fastest recovery.

Custom Solar Plant Transmission (Fall 2024)



What?

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

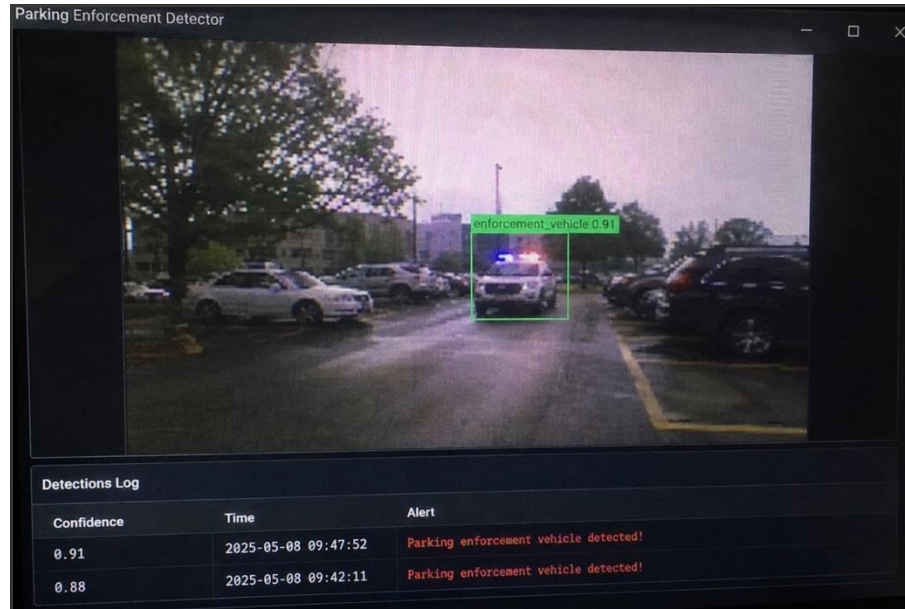
How?

- 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 an assumed 96% overall efficiency to account for realistic drivetrain losses.
- Treated the nightly 5 PM to 5 AM 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, since plant downtime is lost revenue.

P.A.R.K.R. Parking Automated Recognition Kit for Reminders (Jan – Jun 2025)



What?

- Build a dashcam based vision system that watches for parking enforcement vehicles from a parked car.
- Send a reminder to top up before the session lapses, rather than acting on the driver's behalf.
- Remove the need to track an expiring session manually while heads-down at work or in class.

How?

- Ran YOLOv8 inference on a Raspberry Pi 4B with a Camera v3 and no GPU, holding frame rate high enough to catch a passing vehicle.
- Trained the detector in PyTorch on hand annotated Labellmg data gathered across varying lighting and weather.
- 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 a Pi with no GPU.
- 50% correct detection, with false positives dominated by oncoming headlights. Root cause was a 25 image training set, too small to separate a temporal flash pattern from ordinary night traffic.