

# Alvin Li

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## SKILLS

**Tools:** SolidWorks, Onshape, Ansys, C++, Python, MuJoCo, AutoCAD, Excel, 3D Printing, Git, GitHub, FastAPI, NumPy

**Professional Skills:** GD&T, Technical Drawings, DFM, Machining, Technical Writing

**Certifications:** Certified SolidWorks Associate, WHMIS, Engineering Student Machine Shop, Standard First Aid w/ CPR

## EDUCATION

2025 - 2030 **University of Waterloo**

Waterloo, ON

Bachelor of Applied Science in Mechatronics Engineering, *Cumulative GPA: 90.27%*

## EXPERIENCE

### Mechanical Engineering / Testing Intern

May 2026 – August 2026

*Forcen Inc., Toronto, ON*

- Owned an aluminum lamination fixture for a 6-DOF Hyperslim sensor from concept to final assembly, covering CAD in Onshape, FEA, technical drawings, machining and validation testing; used to laminate 10+ sensors
- Raised 3-DOF sensor calibration pass rate from 60% to 80% by redesigning the contact plate to remove fixture interference and reworking the calibration script to flag highest Mx, Mz and Fz error points for targeted recalibration
- Doubled 6-DOF sensor shipment throughput by redesigning alignment inserts from circular to rhomboidal for a repeatable fit and developing a sensor-cleaning process to eliminate overload errors in functional test
- Calibrated 60+ sensors across both product lines against all shipment deadlines, shipping out ~\$400,000 of sensors, and designed and assembled calibration fixture enclosures that improved operator safety

### Mechanical Designer

September 2025 – Present

*UWaterloo Rocketry Controls Subteam, Waterloo, ON*

- Led R&D on the team's first four-actuator control system, the first design enabling full 3-axis flight control, by building the complete SolidWorks (SW) assembly, implementing a DC motor and worm gear mechanism to counteract aerodynamic loads derived with CFD and verifying the structure through structural FEA
- Designed the full SW assembly for an independently actuated, unlinked canard control system, resulting in an optimized system through mass reduction of ~600 g and freeing up space for 50% additional component volume
- Modeled a full-scale SW assembly of an 8 × 18 ft complex rocket transport trailer, defining precise measurements to integrate the launch base to restrain the rocket in transit without interference

### Aerodynamics Team Member

September 2025 – December 2025

*UWaterloo Formula Electric, Waterloo, ON*

- Remodeled the formula car wing in SW, translating aerodynamic concepts into manufacturable geometry by analyzing load paths through static structural FEA, thickness, and mounting constraints, ensuring a Factor of Safety of 2.3 under a 1500N downforce load
- Manufactured the front wings through carbon-fiber layup, machining, epoxy resin application, and vacuum bagging, enabling the team's first ever inward-swept, cambered wing flaps

## PROJECTS

### 3 DOF Robotic Arm

December 2025 – March 2026

- Designed and 3D-printed a 3-axis mechanical robotic arm in a full SW assembly, accounting for tolerances, servo placement, Arduino integration, wiring management, and maintenance constraints
- Programmed forward and inverse kinematics in C++ to convert camera-derived object coordinates into real-time joint angles for autonomous object localization and grasping, running on a Raspberry Pi with live camera input
- Developed kinematic and motion-planning calculations to control release timing and trajectory, enabling the arm to throw lightweight objects reliably

### Autocleat (3rd place, EngHacks 2026)

March 2026

- Co-designed and CAD-modeled in Onshape a size-adjustable, servo-actuated shoe attachment with retractable TPU ice spikes for automated indoor/outdoor transitions
- Engineered Arduino-based sensing and control that pairs a temperature sensor for icy conditions with an ultrasonic sensor to deploy spikes during swing phase, preventing actuation under load

### VEX Robot Maze Navigation + Object Retrieval

October 2025 – December 2025

- Built and programmed, in a team of 2, a VEX robot with 3-wheel drive and a motorized claw, developing a C++ autonomous control system using vector-based navigation and shortest-path algorithms for object retrieval within a maze

### Web-Based NYT Connections Solver

December 2025 – January 2026

- Built a CLI and web-based solver with Python and NumPy using semantic similarity scoring, heuristic weighting, and backtracking search, resulting in 65-75% top-3 solution accuracy on 43 real puzzles
- Reduced a 1,820-combination search space by >90% with pruning and constraint logic, achieving <50 ms solve times; deployed through a FastAPI backend and an HTML/JavaScript frontend with robust input handling and failure-safe outputs