

Daniel Xie

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SKILLS

Design & CAD: SolidWorks (CSWA Certified), AutoCAD, Creo Parametric, Ansys, FEA, MATLAB, GD&T, DFM, DFA, FMEA.

Robotics: C/C++, Python, Java, JavaScript, OpenCV, Computer Vision, Kinematics, Control Systems, MAVLink, Flask, Git, Excel.

Mechanical: Engineering Drafting, Rapid Prototyping, CNC Workflows (Lathe, 5-Axis Mill), Laser Cutting, 3D Printing.

Electronics & Hardware: PCB Design, KiCad, Microcontrollers, Arduino, ESP32, STM32, Sensor Integration, Actuators.

EXPERIENCE

Mechatronics Engineering Teaching Assistant

September 2025 – December 2025

Faculty of Engineering – University of Waterloo | Waterloo, Ontario

- Instructed **SolidWorks, AutoCAD, and robotics** systems labs covering sensor selection, actuator interfacing, and integration into embedded control architectures.
- Applied **GD&T tolerancing, DFM/DFA** principles, and **assembly design standards** to mechatronic systems of 20-50+ components across weekly lab sessions.
- Advised on **electromechanical integration** including motor driver selection, power budgeting, wiring practices, and safety considerations for actuator subsystems.

Manufacturing Engineering Intern

January 2025 – April 2025

FS Tool Corporation | Toronto, Ontario

- Modelled 50+ multi-purpose metal cutters using **Creo Parametric**, suitable for unique wood-cutting profiles.
- Maintained outdated company product catalogs by updating **AutoCAD drawings** for over 100 company parts.
- Performed **tolerance and fit analyses** throughout the machining process, identifying dimensional non-conformances and verifying parts met engineering specifications prior to shipping.

PROJECTS

4-DOF High Torque Robot Arm

- Engineered a 4-degree-of-freedom robotic arm in **SolidWorks**, integrating custom-designed **harmonic drive transmission systems** to maximize torque-to-weight ratio.
- Designed a harmonic drive assembly, modeling the flex spline, wave generator, and circular spline, and analyzed mechanical load limits to ensure compatibility with **NEMA 17 stepper motors** under dynamic loading conditions.
- Derived **forward kinematics** for the 4-DOF configuration, computing **end effector position** by chaining joint transformations across all degrees of freedom to model the arm's reachable workspace.

RepAI – AI Based Workout Assistant

- Engineered a real-time **computer vision** pipeline using **YOLOv8n** pose estimation to extract 17 skeletal keypoints per frame, applying vector-based joint angle analysis to autonomously count reps across 8 exercises at sub-second latency.
- Architected a **full-stack mobile PWA** with a **Flask** inference backend and single-file frontend, integrated with **Claude API** for real-time AI coaching and **MediaRecorder API** for annotated skeleton replay.

AutoThaw – Intelligent Driveway Salt Dispenser

- Designed and 3D printed a custom enclosure in **SolidWorks** using **PLA**, driving a DC motor via MOSFET switching circuit controlled by **ESP32 GPIO signals**, with tight tolerances for a rigid backlash-free drivetrain.
- Developed ESP32-based firmware in C++ to poll a **live weather API** and autonomously trigger salt distribution, integrating **Gemini AI** for intelligent dispensing decisions and **ElevenLabs** for live voice alerts.

Autonomous Drone Stabilization System

- Built a closed-loop drone stabilization system in **Python**, processing dual-camera input and streaming real-time correction commands over **TCP** to autonomously maintain a 0.5m hover for 60 seconds.
- Developed a dual-camera **OpenCV pipeline** using a **Roboflow-trained object detection model** to estimate altitude and lateral drift from visual input alone, after onboard IMU data proved too noisy for precise correction.

EDUCATION

University of Waterloo

Bachelor of Applied Science in Honours Mechatronics Engineering | GPA: 4.0

September 2024 – April 2029 (Expected)

Waterloo, Ontario