Fawaz Katranji

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Qualifications

- **Mechanical:** SOLIDWORKS, 3D printing, CNC machining, mechanical assembly, tolerance tuning, mechanism design, GD&T.
- **Electrical:** Circuit soldering, wiring, low-voltage systems, schematic reading, electrical lab tools, circuit design, schematic capture, PCB layout, LTSpice, KiCad.
- **Embedded & Programming:** Arduino control, motion control firmware, serial communication fundamentals, Python, C, C++, C#, MATLAB, Simulink, Git.

Education

University of Waterloo — Nanotechnology Engineering — Sept 2025–May 2030
Awards: *Sir Isaac Newton Physics Contest (2024): Ranked 66th in Canada, 109th worldwide* — *GPA: 4.0 / 4.0*

Toronto Metropolitan University — Mechatronics Engineering (Transferred) — Sept 2024–May 2025
Awards: *Dean's Honour List (2024–2025)* — *CGPA: 3.5 / 4.0*

Projects

Two-Stage 3D-Printed Planetary Gearbox — Nov 2025–Jan 2026

- Designed a compact **two-stage 16:1 planetary gearbox** from first principles to achieve high torque density with minimal backlash.
- Performed full **mechanical design and CAD modeling** of **15+ custom components** (sun/planet gears, carriers, ring gears, shafts, spacers) in SOLIDWORKS.
- Evaluated gear and carrier loading through **FEA-based stress analysis**, identifying critical stress regions and informing geometry refinements.
- Fabricated all components using **iterative 3D printing**, completing **2–3 tolerance-refinement cycles** per part to ensure reliable meshing and concentric alignment.
- Assembled and tested the gearbox, measuring **0.6° backlash** and verifying performance against design targets.

CNC Plotting Machine — Jan 2024–Jun 2024

- Designed and built a **2-axis CNC plotting system** using repurposed **hard-drive actuators** to achieve high-resolution linear motion.
- Developed the **mechanical layout and mounting strategy** to ensure axis orthogonality, stiffness, and repeatable positioning.
- Integrated **stepper drivers, limit switches, servos, and power electronics**, performing all soldering, wiring, and system bring-up.
- Programmed **Arduino-based motion-control firmware** supporting coordinated axis motion, homing routines, and smooth acceleration profiles.
- Designed a **servo-driven Z-axis mechanism** to improve line consistency during plotting and reduce tool wear.
- Constructed organized **wiring harnesses with strain reliefs**, improving long-term reliability and serviceability.

Robotic Arm — Apr 2023–Jun 2023

- Designed and fabricated a fully **3D-printed robotic arm** with **four independently actuated degrees of freedom**.
- Engineered joint geometries and link lengths to balance workspace reach, torque requirements, and structural rigidity.
- Implemented **Arduino-based control logic** to achieve repeatable pick-and-place motion through coordinated servo actuation.
- Routed and secured servo wiring through moving joints, mitigating mechanical interference and wire fatigue through iterative testing.

Experience

Robotics Instructor — IntelliBots — Sep 2023–Sep 2024

- Delivered hands-on robotics instruction to classes of up to **20 students**, covering mechanical assembly, electronics, and embedded control.
- Taught core robotics concepts including **mechanisms, sensors, servos, and microcontrollers** through guided builds and experiments.
- Mentored students during live project development by troubleshooting mechanical misalignment, wiring errors, and firmware issues.

Co-op Programmer — GrayCyan — Feb 2023–May 2023

- Worked within a small development team to prototype interactive software systems under tight iteration timelines.
- Used **Git-based workflows** including feature branching, version control, and peer code reviews.
- Assisted with testing, debugging, and documentation to improve overall software quality and maintainability.