Josh Westlake

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Technical Skills

- **Mechanical Design Tools:** SolidWorks, Fusion 360, Inventor, GD&T, Mechanism Design (Linkage), FEA
- **Fabrication & Assembly:** Rapid Prototyping, FDM 3D printing, laser cutting, Soldering, Basic Machining
- **Electronics:** Sensor & Actuator Integration, power distribution systems, PCB Design, Micro-Controllers
- **Programming & Controls:** C/C++, Python, ROS2, SLAM, NAV2, MATLAB, Linux/Bash scripting, PID control Systems

Education

BASc, Queen's University
Bachelor of Applied Sciences – Mechatronics and Robotics Engineering
Anticipated Graduation Spring 2027

Achievements
Dean's Scholar Distinction
GPA: 3.82

Experience

Systems Engineering Intern, Ontario Power Generation **May 2025 - Present**

- Monitoring and analyzing robotic fuel-handling system, ensuring reliability, operability, and compliance with design-basis and nuclear safety requirements through field inspections, walkdowns, and functional checks under System Performance Monitoring Plans (SPMP).
- Assisted in the design and development of a **DAQ system** for vibration monitoring on pumps, including sensor integration, wiring, data acquisition, and Python-based automation.
- Supporting the integration and testing of robotic inspection platforms, including **mobile robots** and **aerial drones**.
- Developed **Python-based applications** to streamline system monitoring, converting operator walkdowns into digital notebooks, creating visual dashboards, and building GUIs for data acquisition units.

Teaching Assistant – APSC 142, Queen's University **Jan 2025 – April 2025**

- Delivered instructional support to over 150 first-year engineering students, guiding them through fundamental programming concepts in **C**.
- Facilitated weekly lab sessions, promoting hands-on learning and practical application of course materials.

Hardware Team Lead, Queen's Autodrive **Sept 2024 – April 2025**

- Led a cross-functional team in the end-to-end design, prototyping, and testing of autonomous vehicle hardware.
- Collaborated with the perception sub-team to determine the desirable orientation of sensory components, which was further optimized using MATLAB Simulations, resulting in an increase of over 10° in the FOV compared to the previous year.
- Utilized SolidWorks for the design and development of the prototypes, ensuring compliance with official SAE standards through thorough FEA and GD&T analyses.
- Oversaw assembly of the components, improving functionality and precision through integration of 3D-printed components, aluminum extrusions, and sheet metal fabrication.
- Conducted functional testing and validation of hardware assemblies, troubleshooting and iterating designs to achieve reliable performance under dynamic conditions.

SCADA Summer Student, Durham Region **Summer 2023, 2024**

- Assisted in the comprehensive maintenance, support, and deployment of Supervisory Control and Data Acquisition (SCADA) Systems, ensuring seamless operations across water and wastewater facilities in the Durham region.
- Collaborated with multidisciplinary teams to design and implement SCADA system upgrades and expansions, optimizing process performance and scalability.
- Independently developed and implemented Programmable Logic Controller Programs using Ladder Logic, Functional Block Diagrams, and Structured Text, resulting in more robust and reliable system operations.
- Demonstrated expertise in handling software and hardware components related to industrial and engineering domains, including PLC, RTU, HMI, OIT, and UPS Systems.

Hardware Team Member, Queen's Autodrive **Sept 2023 – Aug 2024**

- Collaborated with **cross-functional teams** of Mechanical, Electrical, and Mechatronics Engineers to conceptualize and implement sensor mounts for LiDAR, Cameras, and SAE Blue Light for autonomous vehicles.
- Contributed to the development process of the roof-mounted sensor mount assembly, serving as the primary interface between the vehicle and sensory devices, thereby improving data accuracy and reliability.
- Contributed to the assembly process of the final sensor mount, enhancing functionality and precision through the integration of 3D printed sensor mounts, proficient sheet metal fabrication, and utilizing aluminum extrusions.

Autonomous Team Member, Queen's aQuatonomous **Nov 2023 – Apr 2024**

- Supported autonomy development for autonomous surface vessels (ASVs) for the RoboBoat Challenge, an international competition promoting maritime robotics for various applications, including environmental monitoring, research, and rescue missions.
- Leveraged **ROS2** and **Gazebo** to simulate operating conditions, debug autonomy behavior, and reduce risk before physical deployment.

Customer Service Associate, Lowe's Canada **May 2021 – Aug 2023**

- Anticipate and address customer needs, and provide timely and satisfactory solutions, while building positive relationships, enhancing customer satisfaction and loyalty.
- Consistently met or exceeded sales targets through proactive engagement and solution-oriented service.

Projects

Autonomous Vehicle Sensor Suite

- Led the mechanical redesign of a **modular sensor mounting assembly**, integrating multiple LiDARs, cameras, and GNSS hardware with precise alignment, achieving reliable operation under dynamic conditions.
- Designed **vibration-dampened mounts** and implemented **environmental sealing (IPX4)**, improving measurement stability under vehicle motion and rough terrain by 60%.
- Integrated a **localized power distribution** architecture using custom PCBs and watertight connectors, reducing cable length by over 80% and improving reliability and ease of integration.
- Prototyped and fabricated components using **3D printing, aluminum, and sheet metal**, iteratively refining designs through hands-on testing for robust field operation.

Modular Cycloidal Gearbox

- Designed and 3D printed a compact **20:1 cycloidal gearbox**, focusing on eccentric offset, pin geometry, and disc profile to balance torque amplification, efficiency, and minimize backlash.
- Modeled contacts, clearances, and bearings in **SolidWorks**, then conducted iterative **physical testing** to evaluate torque efficiency, backlash, wear, and failure modes, using results to refine geometry and material selection.
- Gearbox is being developed as a modular actuator component for future integration into a custom robotic arm.

Crank-Slider Manipulation Robot

- Designed and fabricated a two-wheeled differential-drive robot with a custom crank-slider sliding arm for object manipulation, balancing reach, torque, and structural robustness.
- Iterated all components using **SolidWorks**, validating linkage motion, clearances, and actuation profiles through motion studies and kinematic simulation, and hands-on prototyping.
- Integrated **encoder-based odometry** and **PID motor control** on a Raspberry Pi Pico W to support coordinated motion between the drive system and manipulation mechanism.
- Conducted functional testing under load conditions, iterating mechanical design and control parameters to improve accuracy and reliability, resulting in a **top 10 finish** in a class of 80+ students.

Autonomous Mobile Robot

- Designed and fabricated a complete **compact mobile robot**, integrating chassis, drivetrain, power distribution, and sensor integration, utilizing Raspberry Pi, Arduino, and Lidar sensors for autonomous operation.
- Iterated chassis geometry and mounting features in SolidWorks, validating component fit, wiring routes, and assembly sequence through **3D Printing** and physical testing.
- Assembled and soldered **cable harnesses** for motors, encoders, power delivery, and sensors, ensuring reliable operation during testing.
- Enabled **LiDAR-based localization** and navigation using SLAM/ROS2, resulting in reliable autonomous motion that validated chassis stability and sensor integration.

Automated Pet Feeder

- Designed a **stepper-driven Archimedes screw dispensing mechanism**, balancing screw geometry, motor torque, and housing tolerances to achieve repeatable portion control (±0.1 g), achieved through iterative prototyping and testing.
- Engineered the mechanical enclosure and feed path to prevent jamming and accommodate pellet size variability.
- Integrated a vision-assisted control system using an Arducam and a YOLO model to verify the target animal prior to dispensing, paired with timed release logic, contributing to the project finishing **1st overall** in a competitive design course.