

DARREN LIU

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Technical Skills

Software: Python, Java, C, C++, HTML/CSS, JS, Git, VSCode

Embedded Systems: Arduino, ESP32, STM32, Raspberry Pi, Soldering, Circuit Design, Altium

Projects

Differential Swerve Drive | C++, ESP32, Control Systems Jun 2024

- Wrote low-level **firmware** in C++ on a motor & encoder, creating a motor controller on a **ESP32 Microcontroller** with a PID feedback loop to allow precise control of speed and position and wrote higher-level code to allow full control of the module in two axes of rotation

Smart Trash Bin | C++, ESP32, OpenCV, Python - **Hack The 6ix** Jul 2024

- Incorporated ultrasonic and motion sensors along with a servo motor controlled by an **ESP32** with C++ to auto sort waste based on results from a camera running **Python** with an OpenCV model utilizing the serial library
- Collaborated with a team to make a garbage bin gamifying the recycling process, rewarding points to users on a Flask server based on correct guesses. Points were routed to a leaderboard stored on a database

Smart Plant Pot | C++, Arduino, OpenCV, Python - **Hack The Valley 8** Oct 2023

- Used **Arduino** and C++ with sensors to track humidity, light, and other stats, using an LLM to communicate its needs with TTS, to make owning a plant more engaging
- Coordinated the sensors with an LED matrix and LCD with **I2C** communication protocol & C++ to display stats

Experience

First Robotics Competition Team 7902 Oct 2022 – May 2024

Programming Lead

Markham, ON

- Utilized and taught subsystem-command based approach to robotics coding in **Java** in the WPILib software library
- Applied control systems concepts such as PID feedback loop, feedforward, and command groups to control 12+ motors through **CAN** and **PWM** to create complex commands that ran autonomously
- Implemented a **Raspberry Pi** based vision processing client and data analysis to triangulate the robot's distance from the target and automatically adjust the arm angle accordingly
- Led a team of 6, delegated members to subsystems, conducted rapid prototyping, managed and merged projects from multiple branches using **Git** and **Github**
- Operated robot & won finalist and judges awards at Centennial & Durham events out of **30** teams & **1000** participants

Midnight Sun Solar Race Car Team Sep 2024 – Present

Firmware Developer

Waterloo, ON

- Developing an IMU Driver in C using an **STM32** and **SPI**. Used datasheets to fetch accelerometer values from correct registers, calibrate offsets and gains, and scheduled tasks using **RTOS**.

University of Toronto Jan 2024 – May 2024

Pure Math Research Mentee

Toronto, ON

- Presented a research project alongside another student regarding our research findings on the composition of covering maps on topological spaces, touched on fields of math such as group theory, abstract algebra, and combinatorics

AliceHacks Mar 2023 – Nov 2023

Outreach Coordinator

Markham, ON

- Coordinated logistics, scheduling, and events for an online Hackathon resulting in the engagement of over **400** registrants in **30+** different countries with over **90** group project submissions. assisted in acquiring over **\$1000** in funding

Mathnasium Aug 2022 – Aug 2024

Math Instructor

Markham, ON

- Improved confidence and achievement in **60+** students per shift from a K to grade 12 level through Socratic questioning and strategic intervention, ensuring deep understanding of concepts.

Education

University of Waterloo 2024 – 2029

Candidate for BAsC in Electrical Engineering, Telus Scholar

Waterloo, ON

- Academic Class Representative for Electrical Engineering 2029 Cohort