

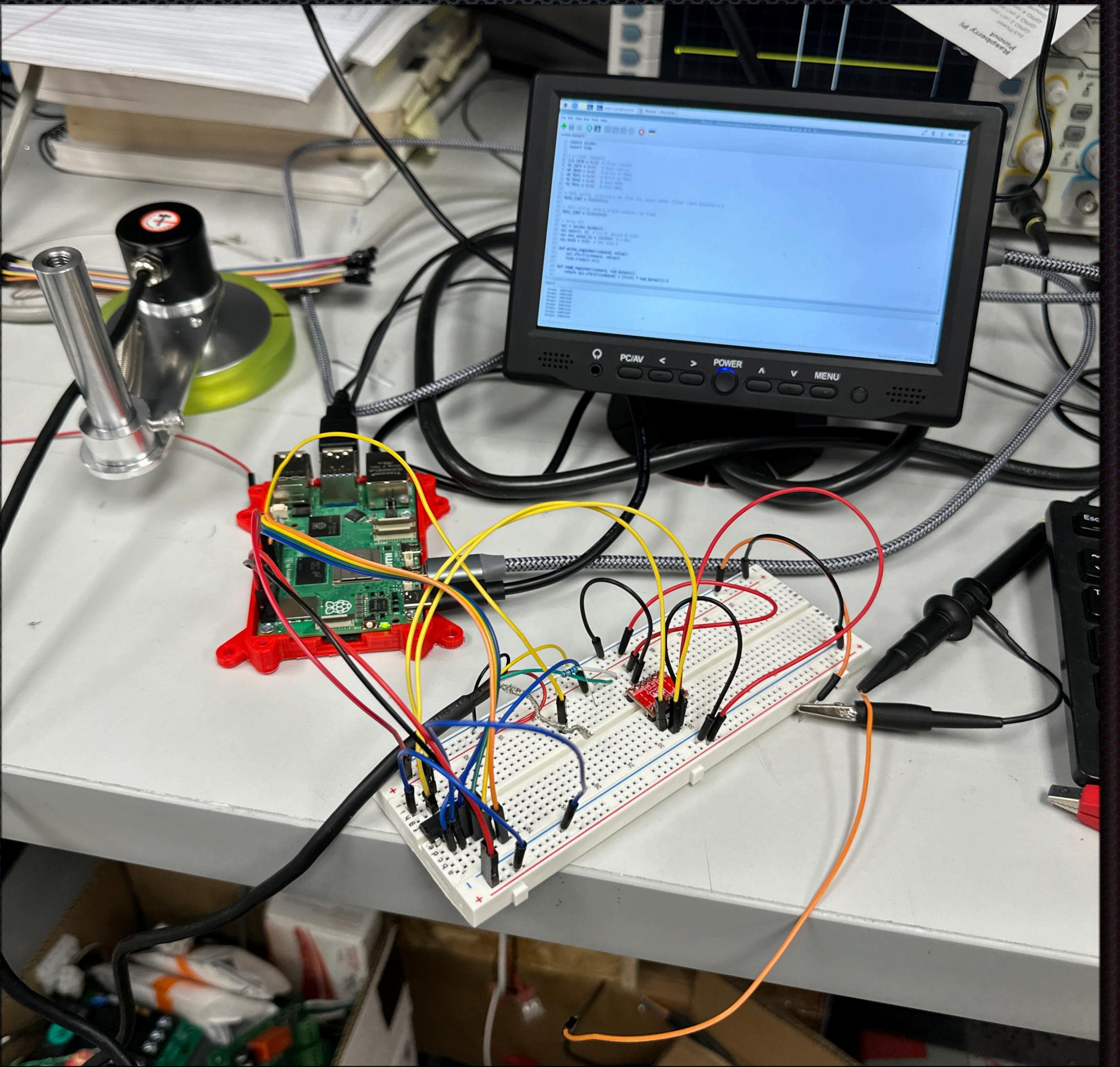
Isaac Sudweeks Engineering Design Portfolio

Summer 2025

Work Projects

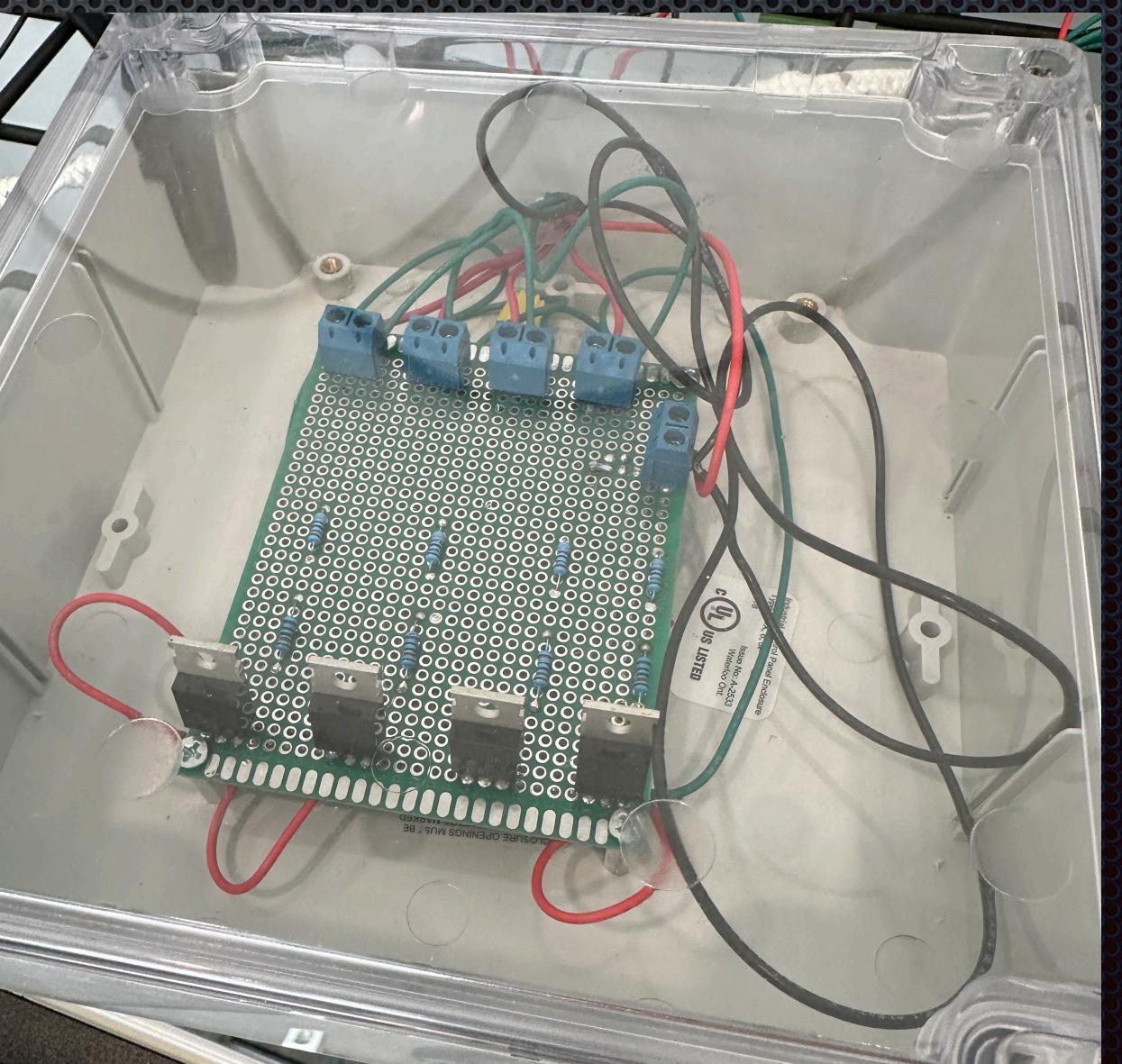
Webbing Counter

- Designed, and built a machine to autonomously dispense a length of webbing fabric, increasing manufacturing efficiency.
- Learned principles of creating and testing durable electronic designs, gaining experience working with Raspberry Pi, encoder counter chips, encoders, serial communication, and AC motor drivers.



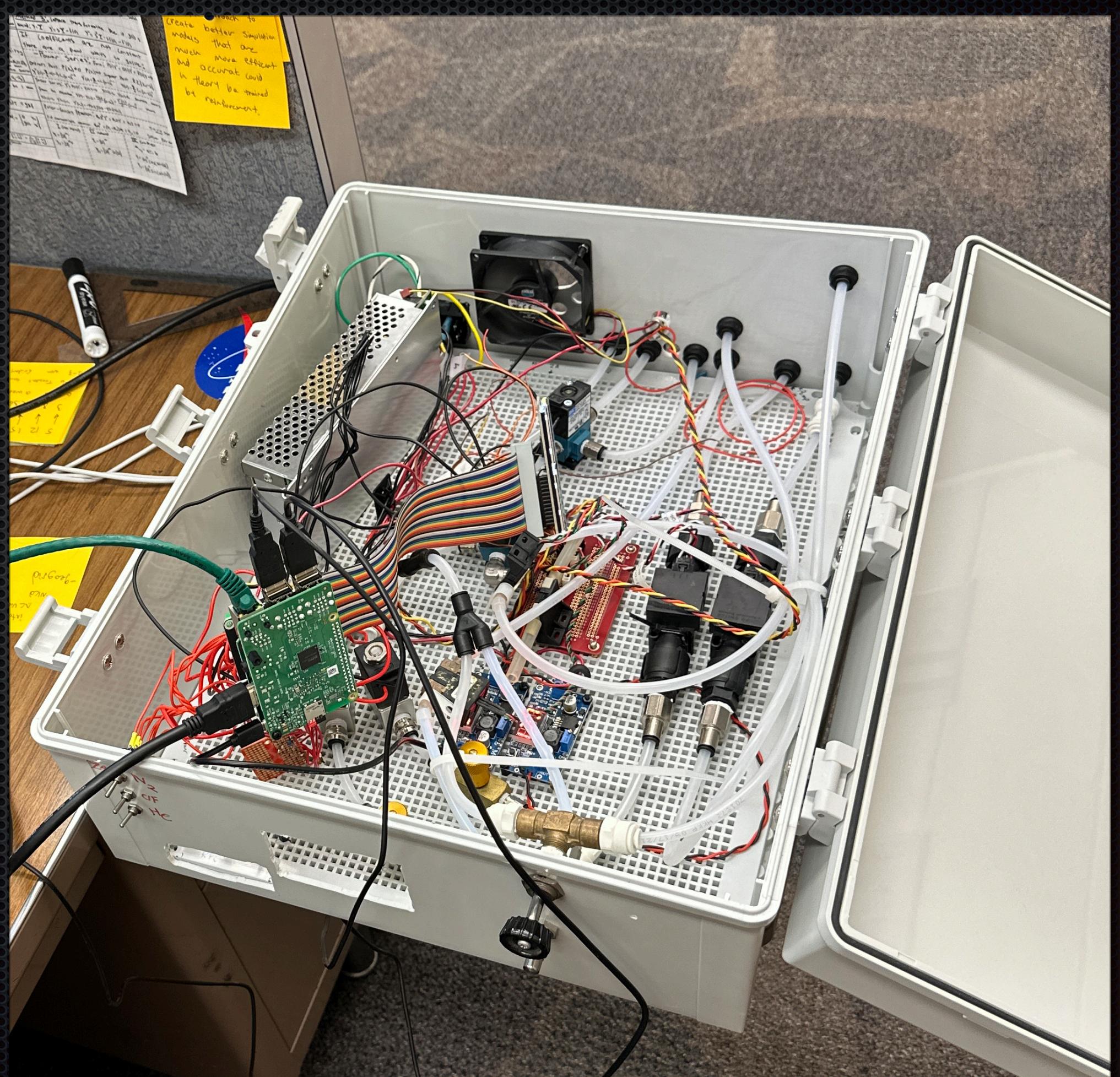
Servo Testing Rig

- Created a modular servo rope testing rig using Arduino and PLC-like servo drivers
- Created a custom transistor circuit to interface between the Arduino and the PLCs
- The rig has been successfully used for thousands of hours of testing.



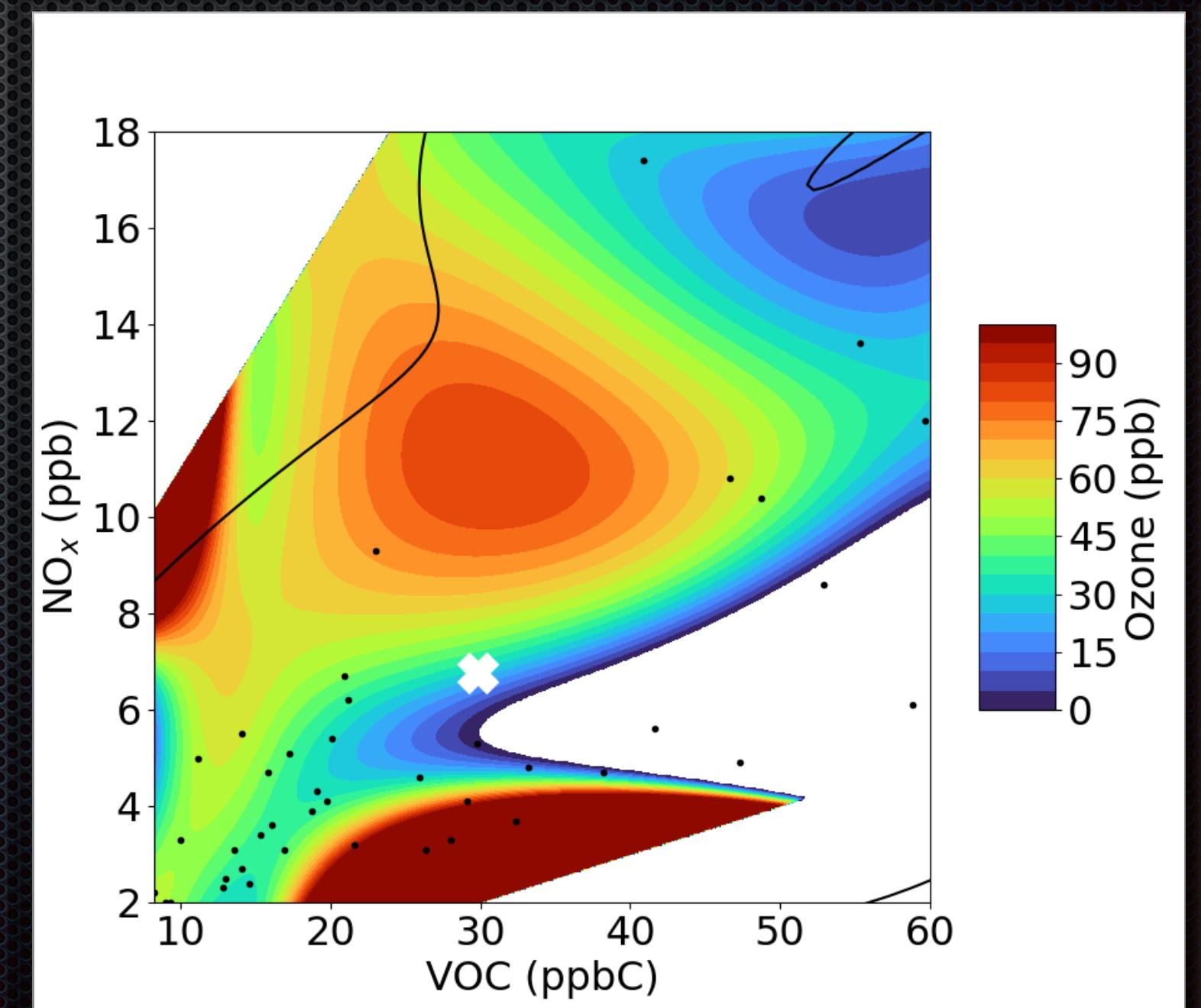
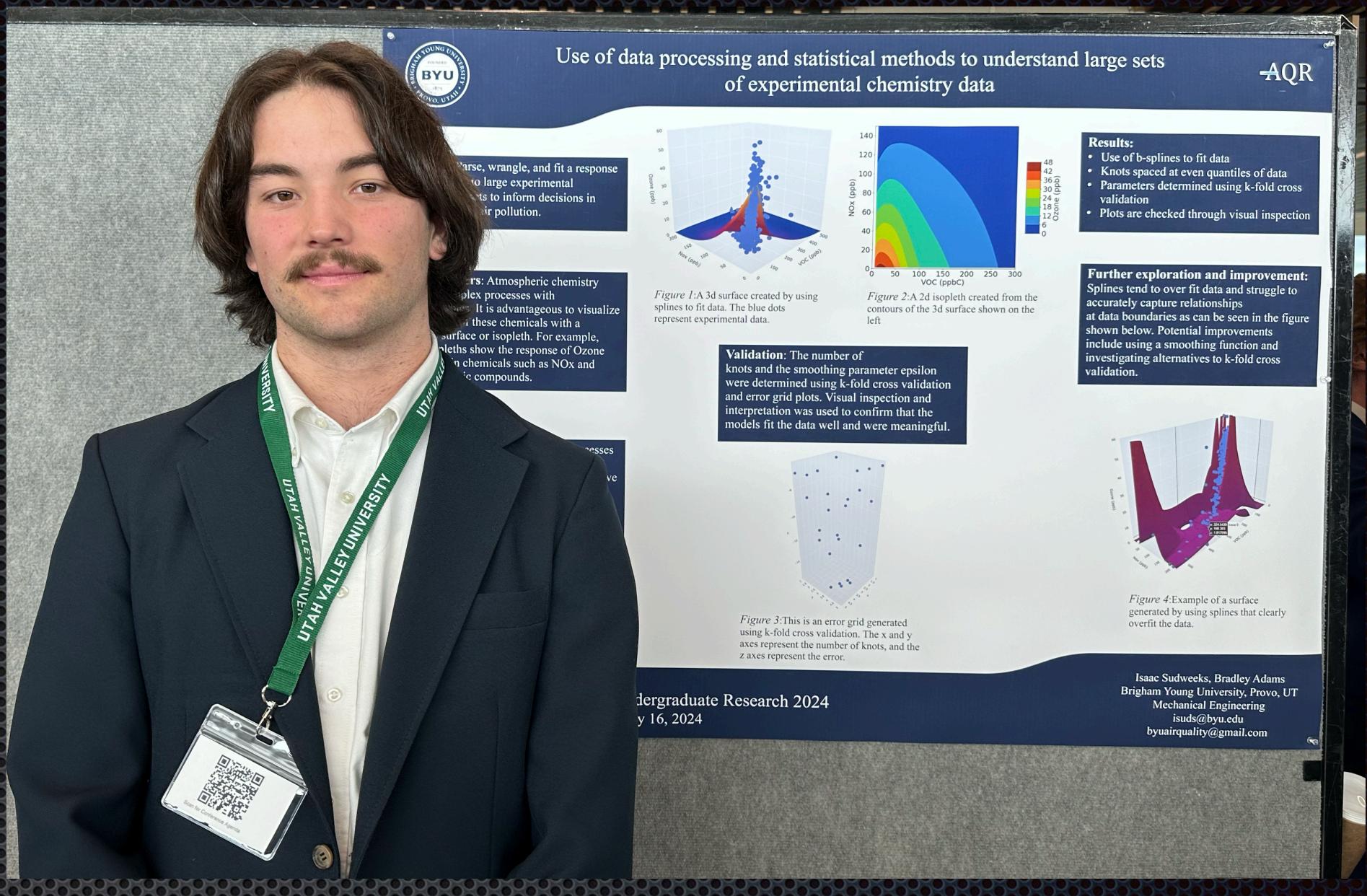
Chemistry Testing Box

- Designed, built, and validated a chemistry testing rig to measure concentrations of compounds in the atmosphere continuously.
- Developed a GUI, so technicians can actively monitor sensor readouts.
- Gained experience with various power converters, air sensors, DAC systems, LCDs, and solenoid actuation.



Isopleths (pending publication)

- Designed and developed an approach using data science, statistics, and machine learning to build 3 dimensional visualizations of experimental chemistry data.
- Visualization aided in analyzing the effects of different pollutants on ozone formation.



School Projects

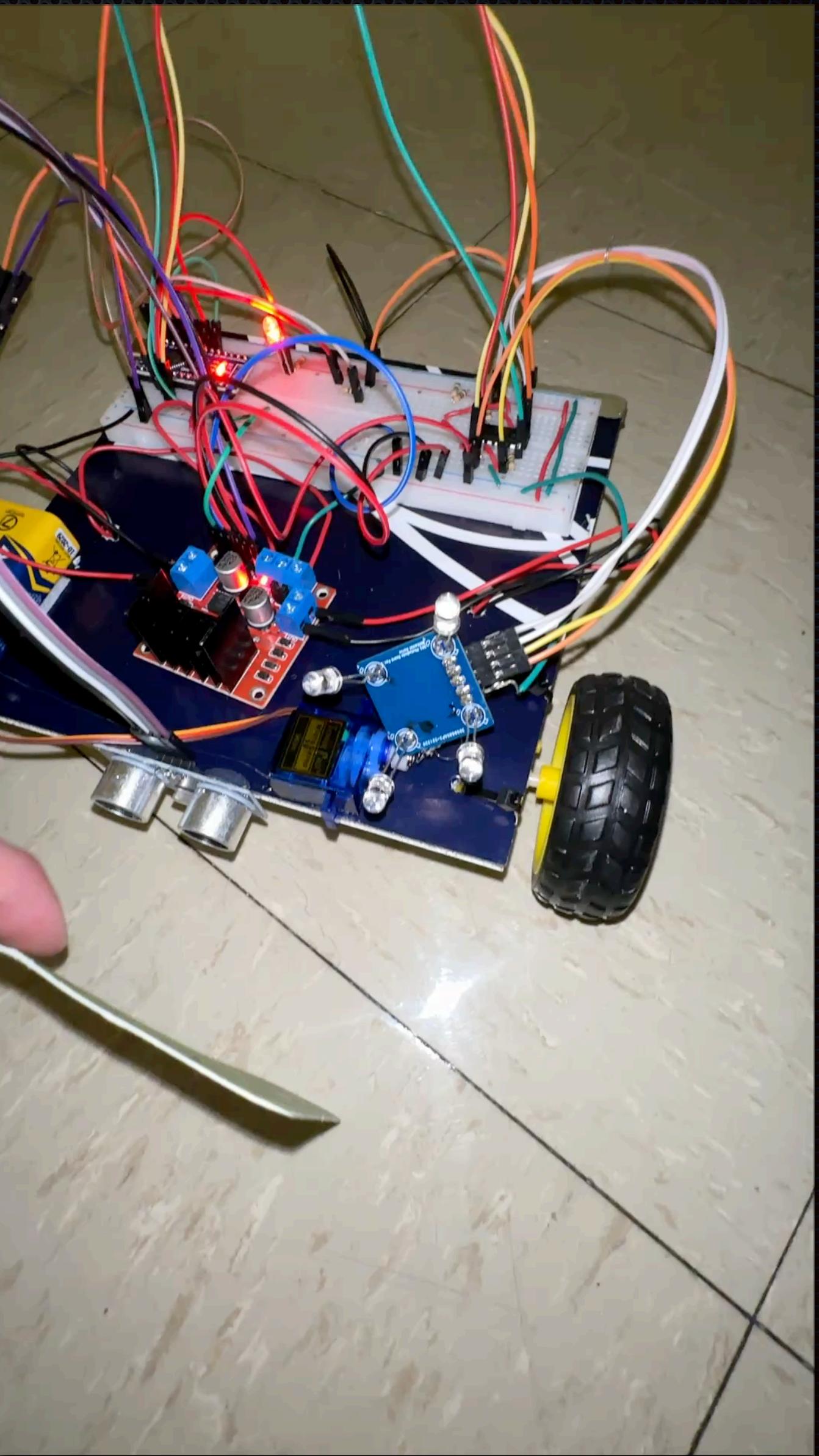
Mini Mars Rover Robot

- Designed, built, and validated an autonomous robot that performed various tasks using input from sensors and advanced control algorithms such as PID control.
- Learned principles of embedded design and gained experience using electronic components such as PIC24, IR sensors, Stepper motors, Servos, QRD sensors, Operations Amplifiers, and Buck Converters



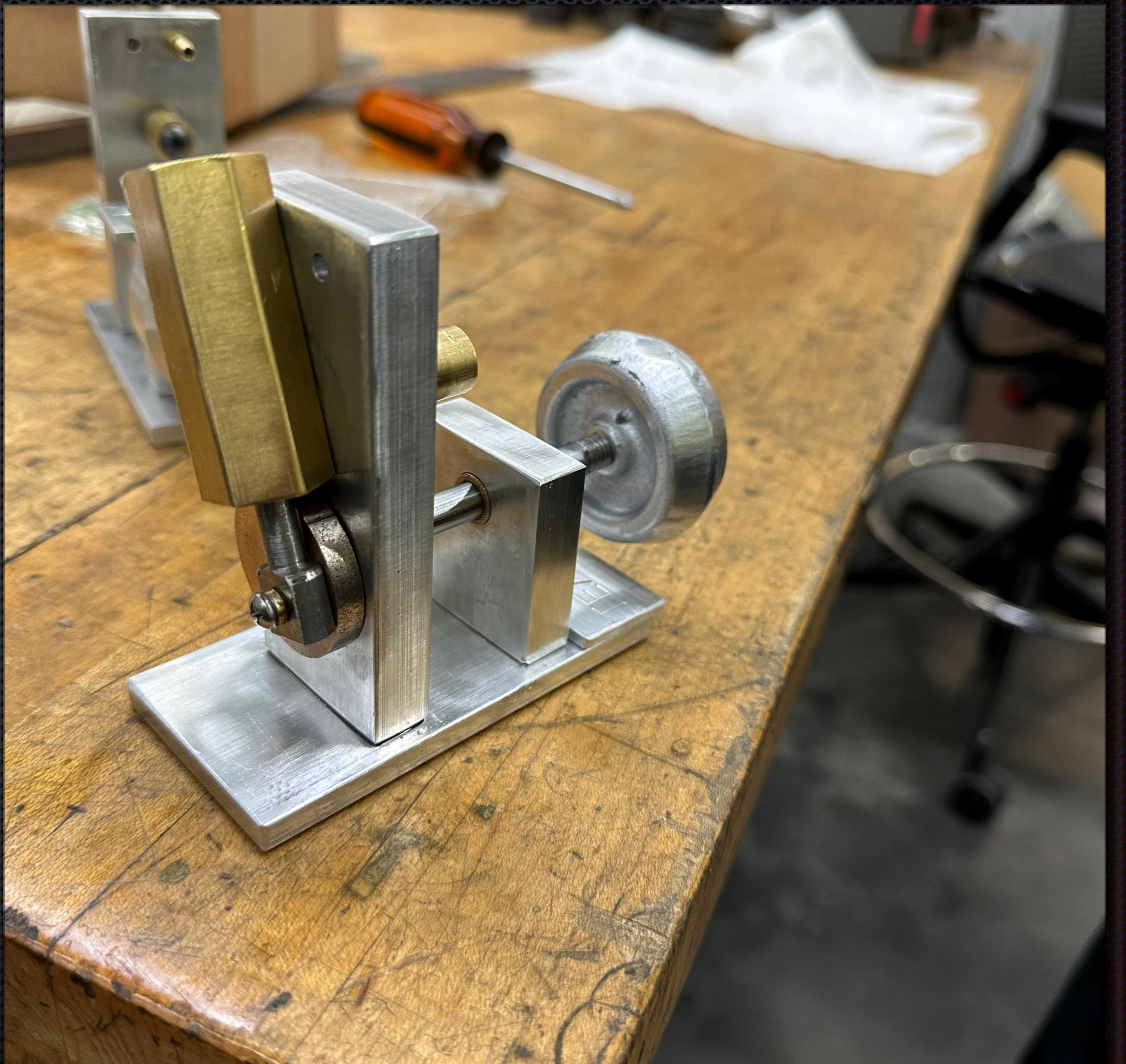
Light Following Robot

- Designed and built an autonomous robot that avoided objects and followed a light source.
- Gained experience using operational amplifiers, photodiodes, LEDs, motor drivers, motors, servos, filtering circuits, and Arduino.



Pipsqueak Engine

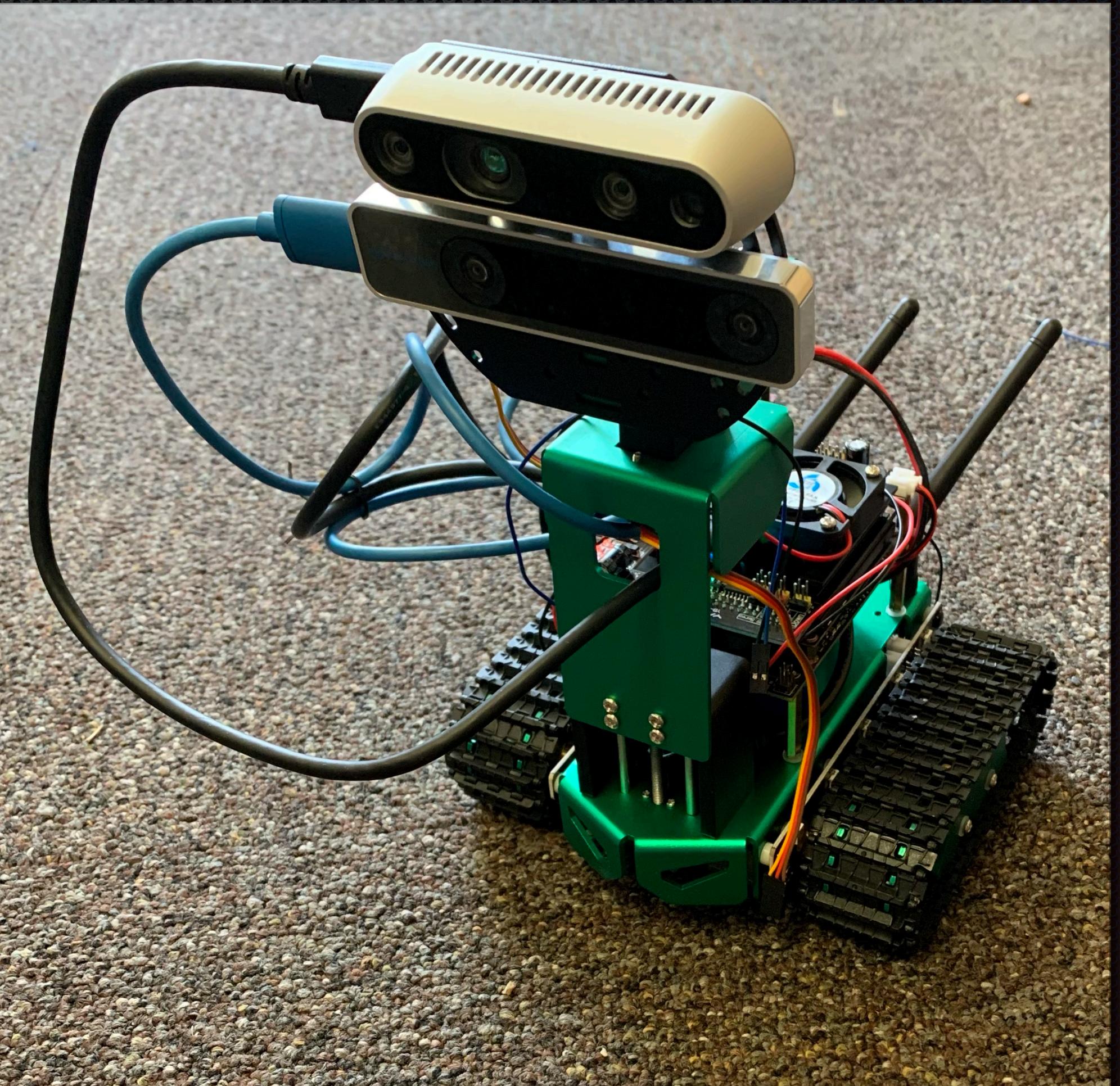
- Designed and built a small air-driven engine using a variety of manufacturing processes including milling, lathing, casting, powder metallurgy, and 3D printing
- Optimized the design for manufacturing processes



Personal Projects

SLAM Robot

- Developed an autonomous robot that could navigate any environment employing a basic SLAM algorithm.
- Gained hands-on experience using Nvidia's Jetson Nano, intel real sense cameras, and robot operating system (ROS). Learned basic principles of localization and robot design and deployment.



Wave Machine

- Completed initial design work and validation of a proof of concept for a portable device to create a surfable river wave.
- Presented the work to 20 peers who validated my application of fluid mechanics principles.
- In the process of creating a full-sized model for testing.

