



# Kyle Mackenzie

[1mackenziekyle.github.io](https://1mackenziekyle.github.io) | [github.com/1mackenziekyle](https://github.com/1mackenziekyle) | [linkedin.com/in/kyle-mackenzie-url](https://linkedin.com/in/kyle-mackenzie-url)

## TECHNICAL SKILLS

Software	Controls	Electrical	Mechanical
Python, C/C++	State Estimation	Altium	CAD Design
UART, SPI, I2C, CAN	Motor Controls	Fourier Analysis	Lathe & Mill
OS Fundamentals	Thermal Modelling	PCB Assembly	Waterjet & Laser Cutting

## EDUCATION

### University of British Columbia

Engineering Physics

Vancouver, BC

Sep. 2020 - May 2025 (Expected Graduation Date)

## RELEVANT EXPERIENCE

### Lead Drive Controls Firmware Developer

Sep. 2022 – Present

UBC Formula Electric FSAE Design Team

Vancouver, BC

- Researched vehicle control algorithms and designed a custom torque vectoring motor control algorithm, increasing cornering speed and decreasing lap times by 10%.
- Implemented torque vectoring algorithm in C code on an STM32 microcontroller, communicating with inverters and other boards over a CAN Bus.
- Developed a Python API for non-software developers to easily interface with the team's STM32 controllers over UART to facilitate testing of circuit boards.

### Battery Controls Systems Co-op

September 2023 – December 2023

Corvus Energy

Richmond, BC

- Developed a thermal model in Simulink of the precharge circuit of a 1MWh energy storage system.
- Validated UKF (Unscented Kalman Filter) used in SOC (State of Charge) estimation algorithm.
- Collected battery cell cycling test data and led SIL (software in the loop) testing of SOC algorithm.
- Developed coulomb-counting algorithm to validate SOC algorithm and track SOH (state of health) of cells.
- Wrote automated test scripts in Python for the HIL (hardware in the loop) BMS test bench.
- Developed a PCB to emulate temperature sensors to extend test coverage for a battery cell test bench.

### Research Assistant

May 2023 – Aug. 2023

Cognitive Neuroscience of Schizophrenia Lab, BC Children's Hospital

Vancouver, BC

- Optimized a MATLAB implementation of CPCA, a regressive dimension-reduction algorithm, to handle GB of brain fMRI data, measuring brain activation and classifying functional brain networks.
- Developed MATLAB report generation script to display and analyze results of algorithm.

### Full-Stack Developer Co-op

Jan. 2022 – Apr. 2022

ICBC

Vancouver, BC

- Developed web form data entry automation scripts, saving the company 10h / month.
- Developed prototype for automation of web form data entry using python-based libraries alternatively to the previously used internal tool, proving development time could be reduced by 50%.

## TECHNICAL PROJECTS

### Uni-wheeled Robot Drive Controls | 5-person Capstone project - MATLAB, Simulink

Sept. 2023 – Present

- Derived equations of motion using Lagrangian mechanics to model the dynamics of a uni-wheeled robot.
- Developed 3D simulation environment to facilitate SIL (software in the loop) testing of control algorithms.

### Autonomous Wheeled Robot | 4 person project - C/C++, OnShape

May 2021 – Aug. 2021

- Led CAD design of a wheeled DC-motor-drive robot using OnShape.
- Designed, assembled, and soldered H-Bridge PCBs for bi-directional control of brushed DC motors.
- Wrote motor driver firmware in C and deployed on an STM32 Blue Pill controller for all sensor reading and motor actuation on robot.