# Kyle Mackenzie

1mackenziekyle@gmail.com | 1mackenziekyle.github.io | github.com/1mackenziekyle | 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 |

## Relevant Experience

**Vehicle Dynamics Lead** June 2024 – Present

*UBC Formula Electric FSAE Design Team* *Vancouver, BC*

- Leading the design, requirements, and implementation of quad-motor torque vectoring drive algorithm.

**Reliability Test Engineer Co-op** May 2024 – Present

*Corvus Energy* *Richmond, BC*

- Analyzed failure modes for power-path connectors and developed a test plan to isolate for selected mode.
- Researched reliability testing, estimated parameters to calculate required cycles to emulate the product lifespan.
- Crimped, bolted, and torqued bolted voltatge pickup connections and thermocouples, and conected DAQ system, managing hundreds of cables in a clean manner.
- Wrote product certification test plans for vibrational test and thermal cycling test for a 9.5kWh battery module.
- Designed and tested plumbing system for validating product's liquid cooling system under vibrational stress.

**Battery Controls Systems Co-op** September 2023 – December 2023

*Corvus Energy*

- 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 data for 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.

**Drive Controls Firmware Member** Sep. 2022 – June 2024

*UBC Formula Electric FSAE Design Team* *Vancouver, BC*

- Researched vehicle control algorithms and designed a custom torque vectoring algorithm, improving handling and acceleration.
- 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.

**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.

## Technical Projects

**Uni-wheeled Robot Drive Controls** | *5-penrson Capstone project - MATLAB, Simulink* Sept. 2023 – Present

- Led the integration and troubleshooting of open-source BLDC motor driver boards.
- Developed a 100Hz PID controller to run on a Jetson Nano, which communicates with the motor drivers, to balance an inverted pendulum for upwards of 30 seconds.

**Autonomous Wheeled Robot** | *4 person project - C/C++, OnShape* May 2021 – Aug. 2021

- Designed the circuit boards and firmware on a small wheeled robot to autonomously navigate a course.
- Assembled, soldered, and tested custom PCBs for power distribution and control of two brushed DC motors.

## Education

**University of British Columbia** Vancouver, BC

*Engineering Physics* *Sep. 2020 - May 2026 (Expected Graduation Date)*