

# Kyle Mackenzie

[1mackenziekyle@gmail.com](mailto:1mackenziekyle@gmail.com) | [1mackenziekyle.github.io](https://1mackenziekyle.github.io) | [github.com/1mackenziekyle](https://github.com/1mackenziekyle) | [linkedin.com/in/kdmackenzie](https://linkedin.com/in/kdmackenzie)

## TECHNICAL SKILLS

**Software:** FreeRTOS, STM32 Firmware, Operating Systems, Python (numpy, pandas, scipy, tensorflow)

**Modelling & Controls:** Laplace-domain physical system modelling, Simulink, Vehicle Dynamics, BLDC motor controls

**Tools/Environments:** CAN, MODBUS, RS-485, Git, Docker, Linux, Bash scripting, Data wrangling & automation

## RELEVANT EXPERIENCE

### BMS Firmware Engineer Co-op

May 2025 – Aug. 2025

*Moment Energy*

- Implemented and debugged Sunspec Modbus API on an ESP32-based battery pack controller, including RS-485 communication troubleshooting.
- Overhauled fault-logging architecture in BMS firmware: Reconfigured non-volatile storage of system faults, fault severity levels, and CAN message handling for multi-frame fault strings. Designed, developed, tested, and merged.
- Added a clang format C-style formatting tool to the Texas Instruments IDE, standardizing code style and removing the need for code-style comments on pull requests, thereby speeding up the development cycle.
- Developed a CAN tool to emulate the behavior of another circuit board, greatly reducing the testing workflow time for pull requests.

### Vehicle Dynamics & Controls Developer & Team Lead

Sept. 2022 – Dec. 2024

*UBC Formula Electric FSAE Design Team*

- Led the research & design of quad-motor torque vectoring drive algorithm, utilizing state-of-the-art sensor fusion, cornering response design, and four-wheel slip control.
- Built a physics-based dynamics model of the car in MATLAB Simulink, to evaluate stability and performance of the controller, and allow year-wide testing, instead of simply during Summer months, improving prototype cycle.

### Reliability Test Engineer Co-op

May 2024 – Aug. 2024

*Corvus Energy*

- Developed a certification-level test plan to isolate a single failure mode for power-path connectors.
- Crimped, bolted, and torqued bolted voltage pickup connections.
- Performed an analysis on test data to numerically characterize the reliability of busbar components, providing the company with concrete data supporting the lifespan reliability of our product.

### Battery Controls Systems Co-op

Sept. 2023 – Dec. 2023

*Corvus Energy*

- Developed a thermal model in Simulink of the precharge circuit of a 1MWh energy storage system.
- Developed coulomb-counting algorithm and automated test scripts to validate SOC algorithm and track cell health.
- Developed a PCB to emulate temperature sensors to extend test coverage for a battery cell test bench.

## TECHNICAL PROJECTS

### OS161 Operating Systems Kernel Development ([link](#)) | C

Sept. 2024 – Dec. 2024

- Implemented high-level synchronization primitives such as locks, condition variables, and semaphores, which were later used to implement thread-safe system calls, a file system, and virtual memory.
- Designed and implemented a thread-safe file system architecture to support file-related syscalls.
- Implemented a virtual memory system that manages a page table to keep track of the state of RAM pages, and a TLB to cache page table entries. Additionally implemented swap-space support.

### Capstone Project: Uni-wheeled Robot Drive Controls ([link](#)) | Python

Sept. 2023 – Present

- Won the 2025 Eng Phys Project Fair Eric Roenitz Award for Ingenuity, one of three awards granted to capstone projects.
- Led chassis design to incorporate mechanical design principles, focusing on modularity and rapid (dis)assembly to accelerate the prototype cycle.
- Brought up the software system on a Jetson Nano to facilitate the development of LQR, MPC, and RL controllers.

### Machine Learning Self-Driving & Character Recognition ([link](#)) | Python

Jan. 2023 – Apr. 2023

- Developed a novel SAIL (Selective Aggregation for Imitation Learning) method to improve dataset efficiency for imitation learning, selectively adding only informative training samples to enhance model performance.

## EDUCATION

### Engineering Physics

Sept. 2020 - May 2026

*University of British Columbia*