

Kyle Mackenzie

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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