Jonah Lee – Project Portfolio

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Pictured: UBC Solar’s 3rd Generation Solar Car, ‘Brightside’

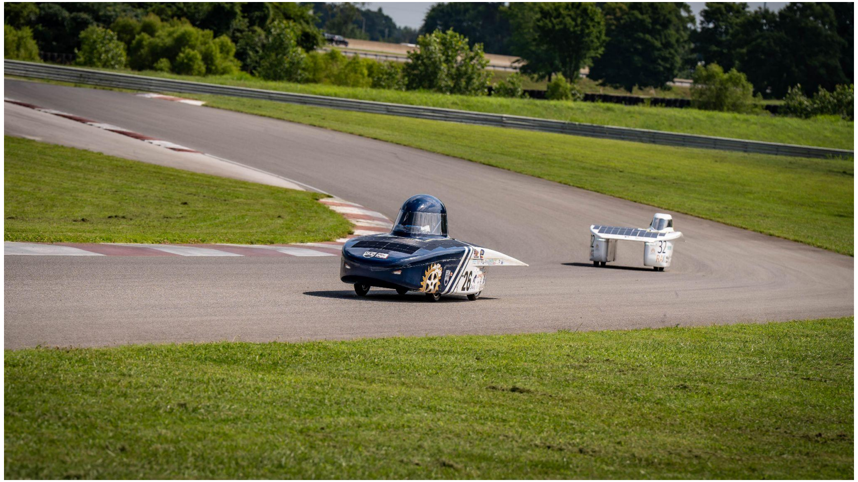
UBC Solar ‘Sunbeam’: Live data analysis pipeline

June 2025

To create a **live strategy dashboard** with actionable data visualizations, I **automated calculations** of power, battery state-of-charge, driving efficiency, track localization and more. Our data pipeline runs in real time using **radio telemetry** data from our Solar car’s sensors.

Github: github.com/UBC-Solar/sunbeam

UBC Solar | ‘Sunbeam’: Live data analysis pipeline

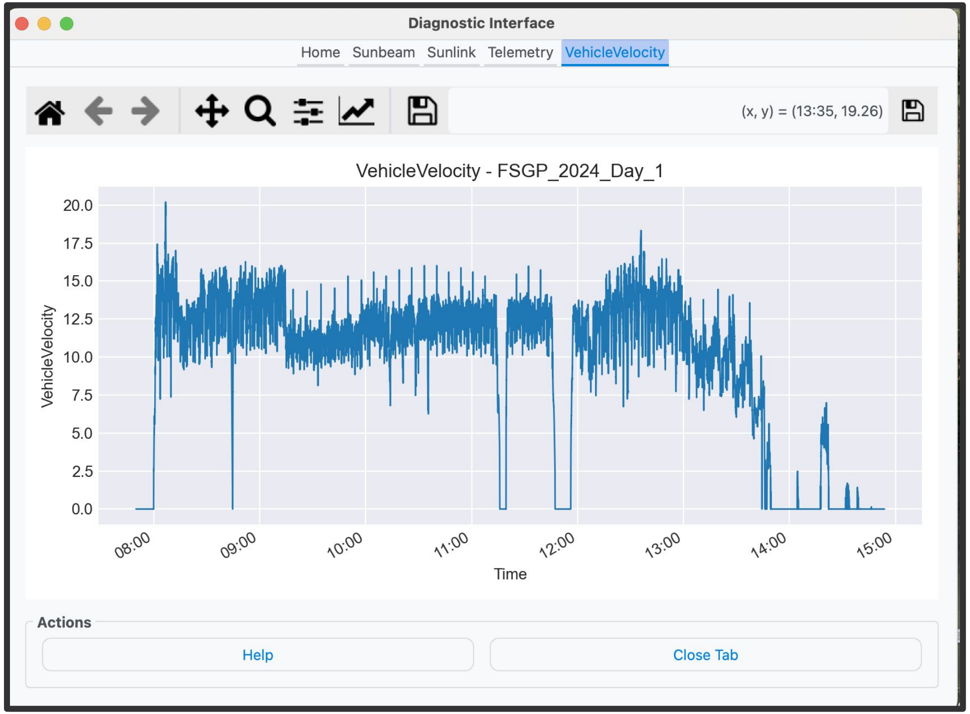


Our Solar Car, Brightside

1. Radio Telemetry

2. Sunbeam Data Pipeline

3. Live Visualization



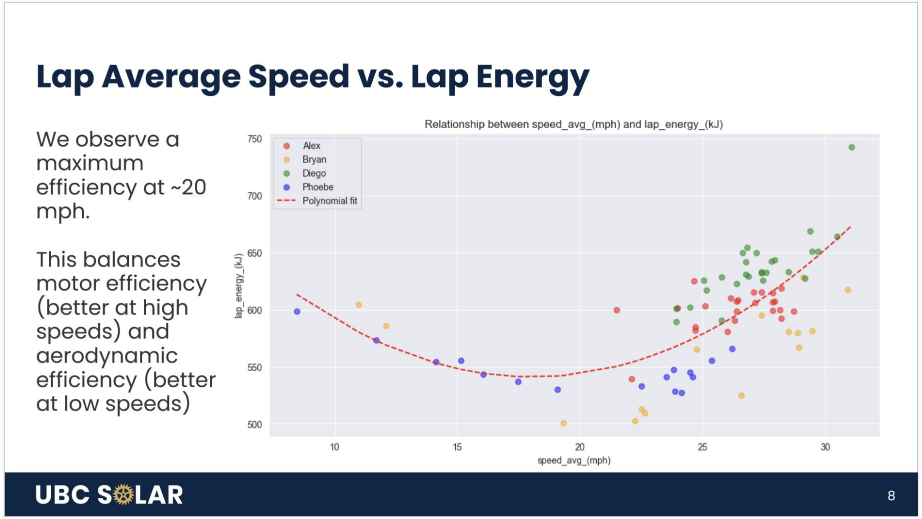
UBC Solar Efficiency Correlation Report

Nov. 2024

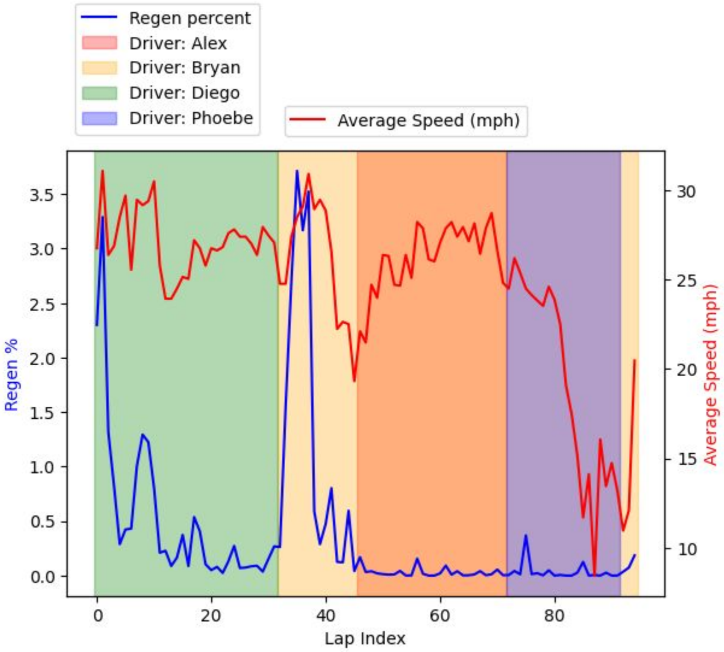
Using over **800 km** of telemetry data from our car's sensors, I synthesized results from our race at the **2024 Formula Sun Grand Prix and American Solar Challenge** to analyze which factors affect our car's performance.

We quantified how **speed**, **corner cutting**, **acceleration** and other factors impact our **energy efficiency**.

See the full report: [Github: UBC Solar Efficiency Correlation Report]()

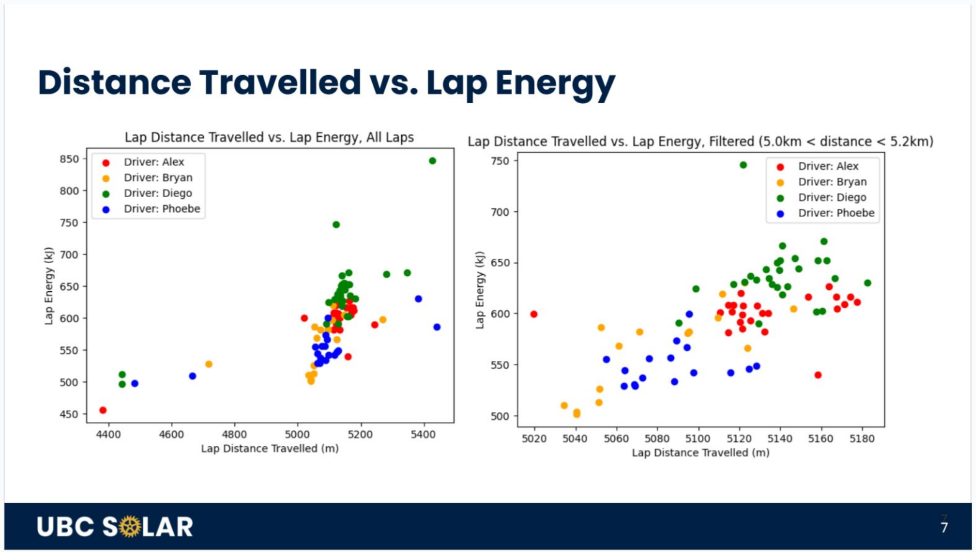


UBC Solar | Efficiency Correlation Report



Conclusion: Regenerative braking energy is minimal, but increased at higher speeds

Conclusion: Some laps were shorter due to better racing lines, resulting in increased efficiency



UBC Astronomy Kinetic Inductance Detector Signal Analysis

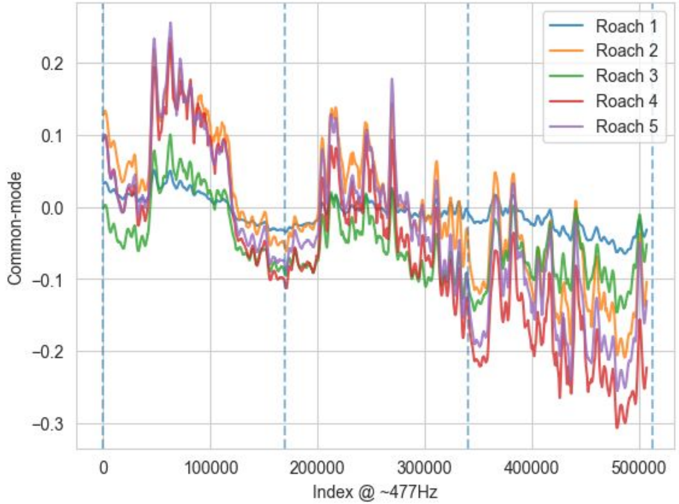
Feb. 2025

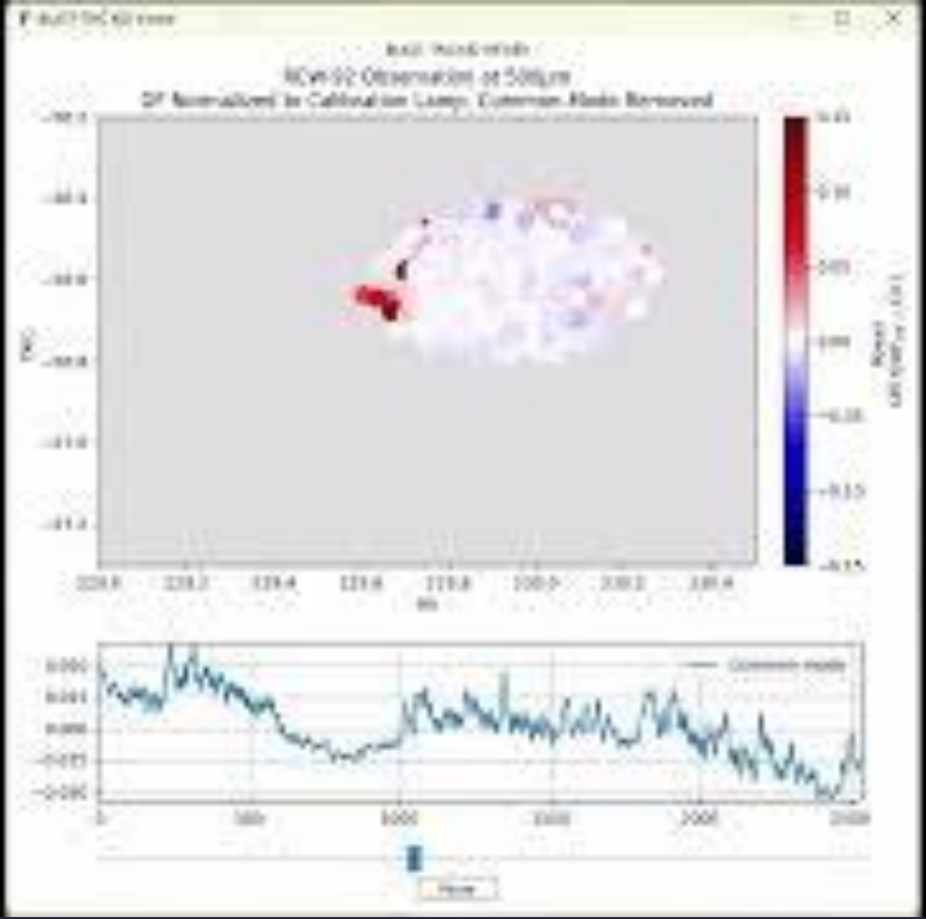
Kinetic Inductance Detectors (KIDs) are extremely sensitive detectors that are used in the **Fred Young Submillimeter Telescope** for detecting light. In this project, **I analyzed the signal behaviour** of this relatively new class of detectors to understand how to perform **'map-making'** from their data, i.e., how to produce images of the sky.

Presentation Slides: Common-Mode Comparison, KID Viewer

Source: https://github.com/jonahjlee/map_making_blasttng_jl

Time-domain average signals from various detector arrays (AKA 'Roaches')





YouTube: Kinetic Inductance Detector Signal Visualizer (made with Python/Tkinter)

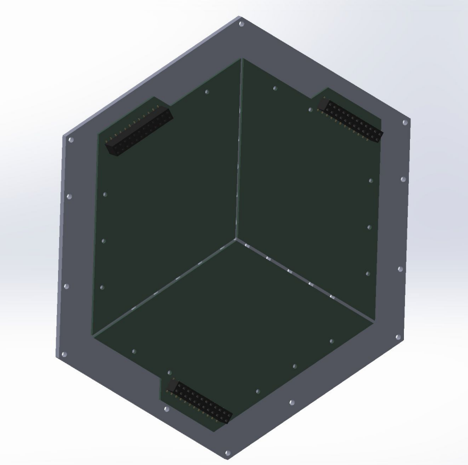
UBC Astronomy Detector LED Mapping Circuit Board Design

Feb. 2025

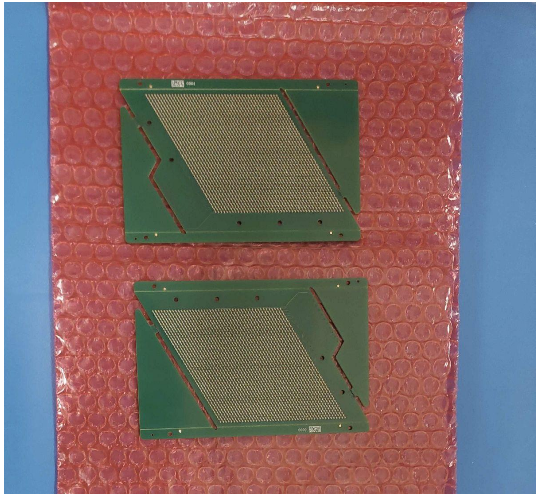
Due to the manufacturing process of a Kinetic Inductance Detector array, a **'mapping' calibration step** must be performed, to map the physical location of each detector to its resonant frequency. I designed the hardware for this stage on Canada's 850GHz instrument, which includes two components:

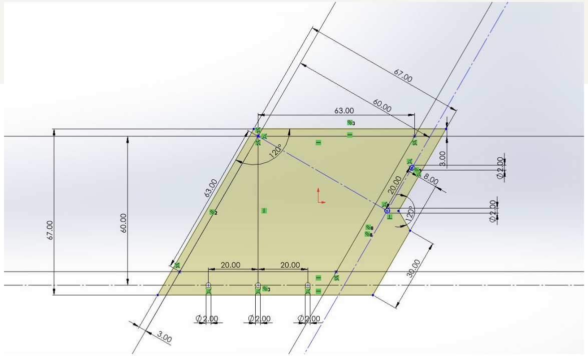
1. An **LED matrix Printed Circuit Board** (PCB) with over 5000 densely packed LEDs, designed to operate at cryogenic temperatures
2. An **aluminium collimator** used to focus the light from each LED onto a single detector

Presentation Slides (long!): [850GHz LED Array]
Source code / CAD: [Github: CCAT 850Ghz LED Mapping]



UBC Astronomy | LED Mapping Circuit Board Design





Check out my slides for lots more detail: [Google Slides | 850GHz LED Array]

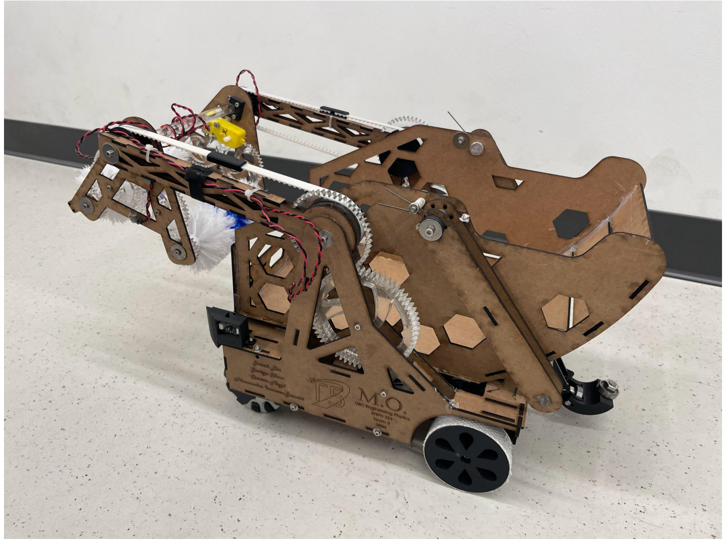
Engineering Physics Autonomous Robot Competition

Summer 2025

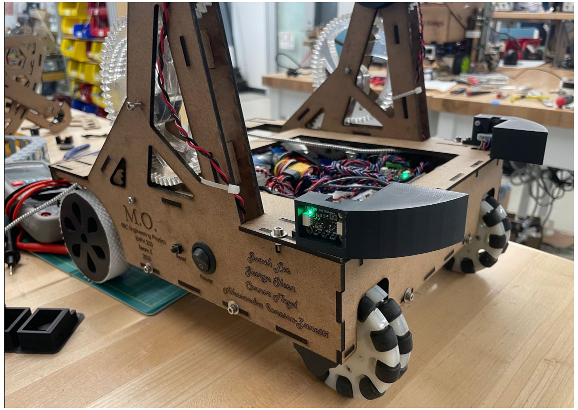
On a team of four, I built and developed an **autonomous robot** designed to search for ‘pets’ on a preset course and return them safely to the starting point.

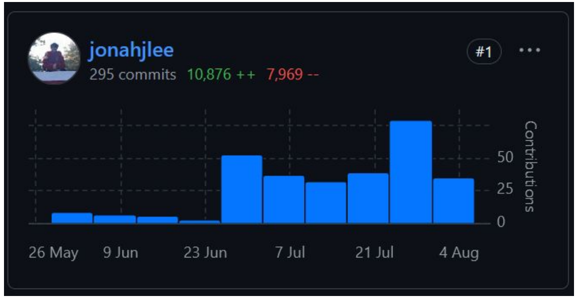
I focused on the **firmware** for our autonomous robot “MO”, developing complex routines in **FreeRTOS** and designing behaviour to work with a variety of **sensors and actuators**.

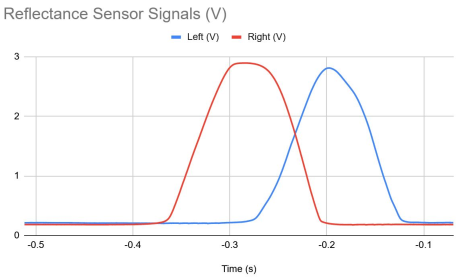
See our source code: [ENPH 253 Firmware | Github]

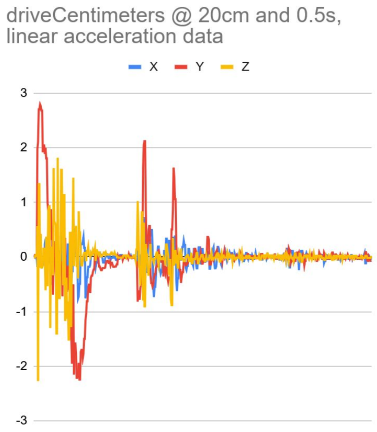


Engineering Physics | Robot Competition









We're on the news!
https://vancouver.citynews.ca/2025/08/07/vancouver-ubc-robots-engineering-physics/