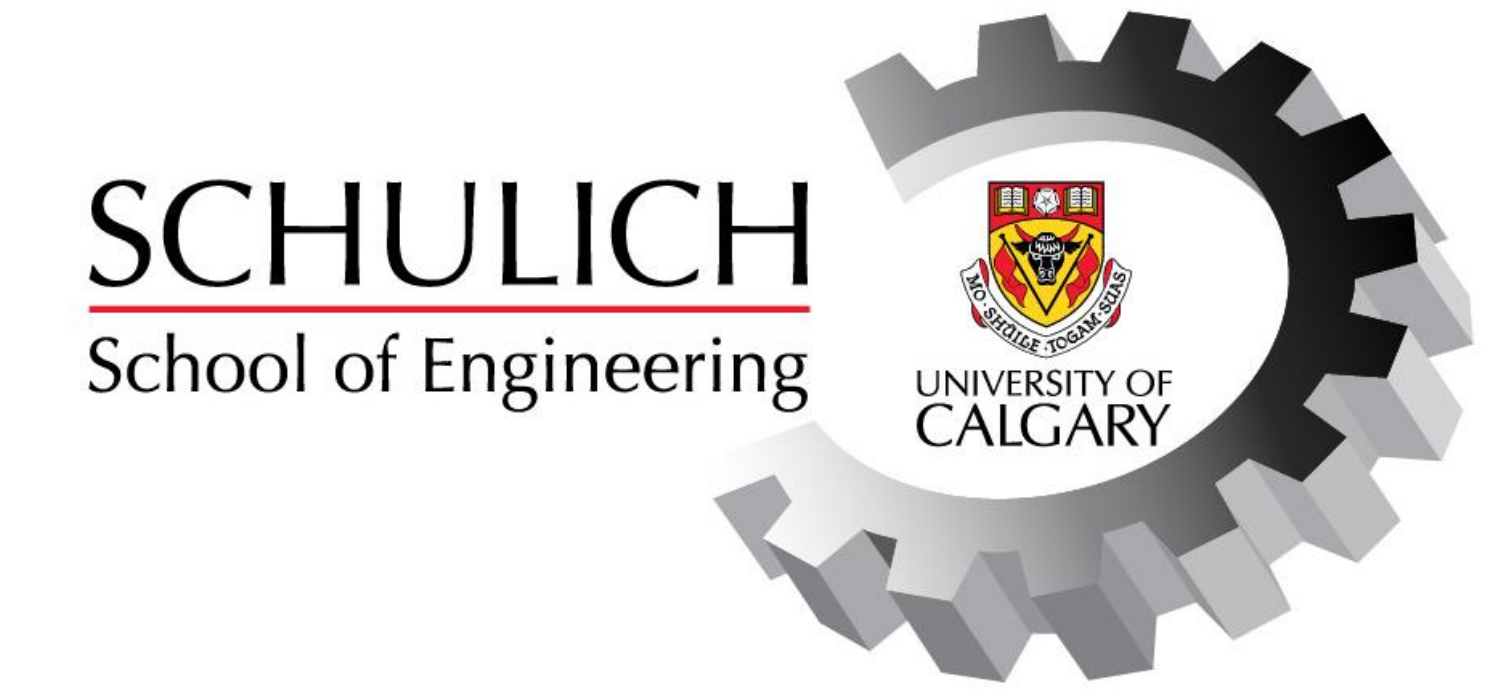
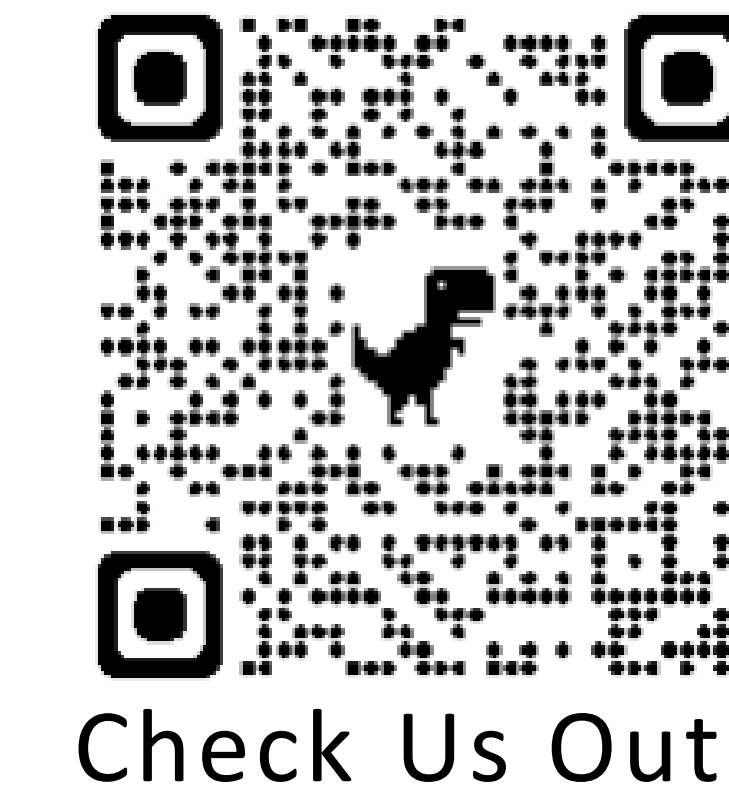
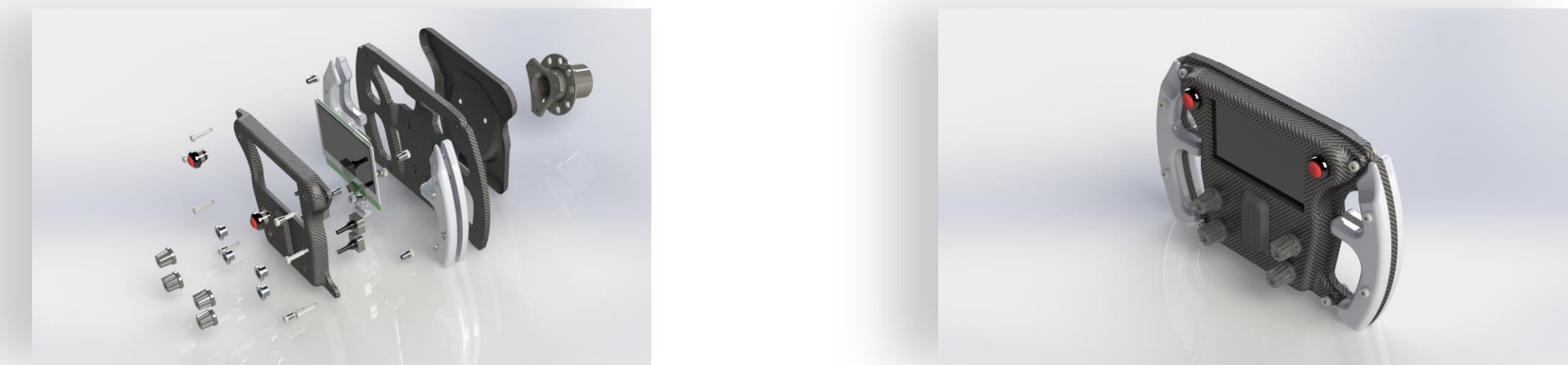


Re-Inventing the Wheel



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Problem
The current setup for the UCalgary Racing car has a basic bolted frame for the steering wheel and a separate dashboard display. This display provides critical data such as battery levels, pressure, and temperature readings. However, the current layout poses a multitude of issues. The dashboard displays position currently behind the steering wheel, meaning that the wheel obstructs the view of the display, limiting the usable space on the screen. This placement varies on its level of inconvenience depending on the driver's head position and height, potentially compromising driving performance and safety.

Results
The display is now unobstructed and easily readable by the driver being approximately 12cm closer. This allows for ease of use and improvement in performance. The wheel fits seamlessly into the car and displays all relevant information from the car's sensors indicating all the hardware and software components are interacting as intended.

Motivation
Motivated by the significant challenges faced by racing drivers due to the suboptimal ergonomics and functionality of the current UCalgary Racing car setup. The UCalgary Racing team was looking to incorporate an innovative solution to address these issues to ultimately improve race performance and overall placement.

Manufacturing
The wheel assembly and structure was completed by the main sponsor's 'Chassis & Controls' team. Many of the peripherals on the wheel such as the dials and buttons were designed by our team using one of our sponsor's software, SolidWorks. The overall design of the wheel complements the electronics done by our team to ultimately achieve the main goal of a more simple, safe, and reliable driver experience.



Solution
The primary objective of this project is to resolve these concerns through the development of an innovative steering wheel. This new design incorporates embedded controls and a state-of-the-art display that is strategically positioned for optimal visibility. This integration aims to simplify the vehicle's dashboard wiring, thereby reducing potential electrical faults and improving overall reliability.

Sponsors and Advisor
Sponsoring Company
• UCalgary Racing

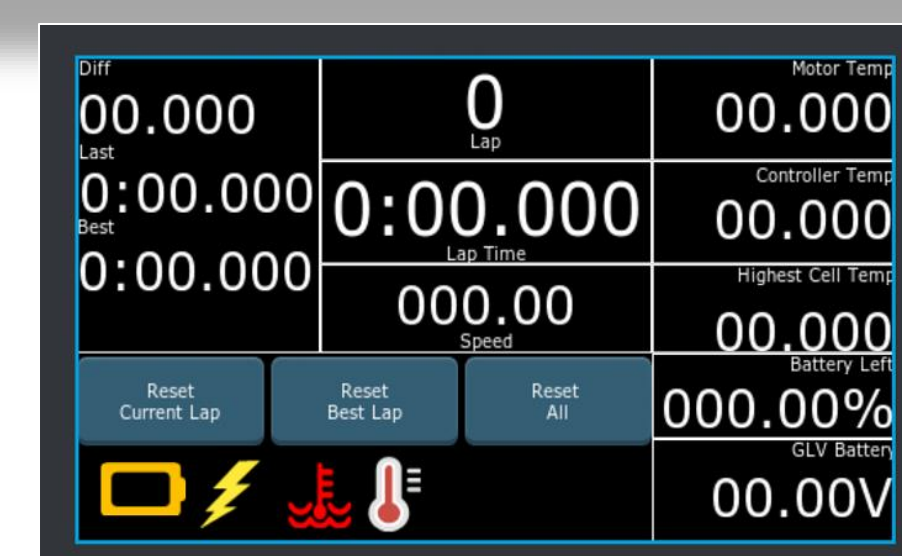
Sponsor Representative
• Phillip Mrljic

Academic Advisor
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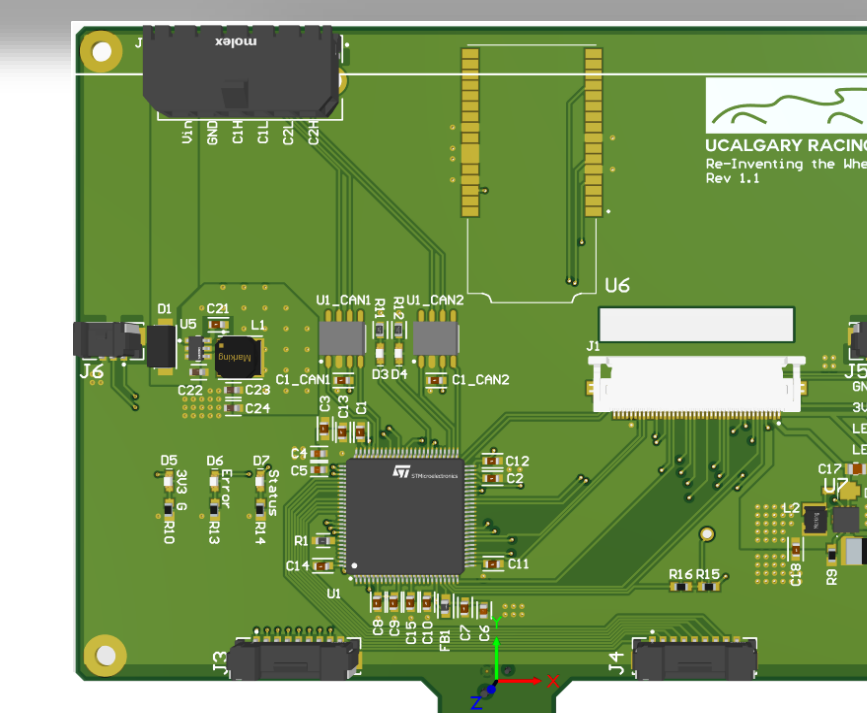
Teaching Assistant
• Elham Sadeghabadi

Additional Sponsors
• Altium Designer
• SOLIDWORKS

Software
The two main software applications used were STMCubeIDE and TouchGFX. The STMCubeIDE is used to program the MCU with the CAN FD channels and allow for communication with the sensors between the car and the main PCB. The data is then sent to the appropriate data field in the TouchGFX graphical user interface (GUI) and displayed on the screen for the driver.



Hardware
The main hardware objectives for the project was to create a printed circuit board (PCB) that can power the display and the microcontroller (MCU). The power supply for the car is 14V and we had to step it down to 3.3V to power the MCU and other passive components. The other purpose of the PCB that we created was to power the backlight display which required 26V and 40mA. Additional functionalities of the board include CAN FD channels, analog inputs, general purpose input-output and analog to digital converters.



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