



PROJECT PORTFOLIO

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TABLE OF CONTENTS

01

Professional Race Experience

02

FSAE Solar Car Experience

03

ChassisSim Simulation Experience

04

Telemetry Analysis App

05

MATLAB Simulink Modeling

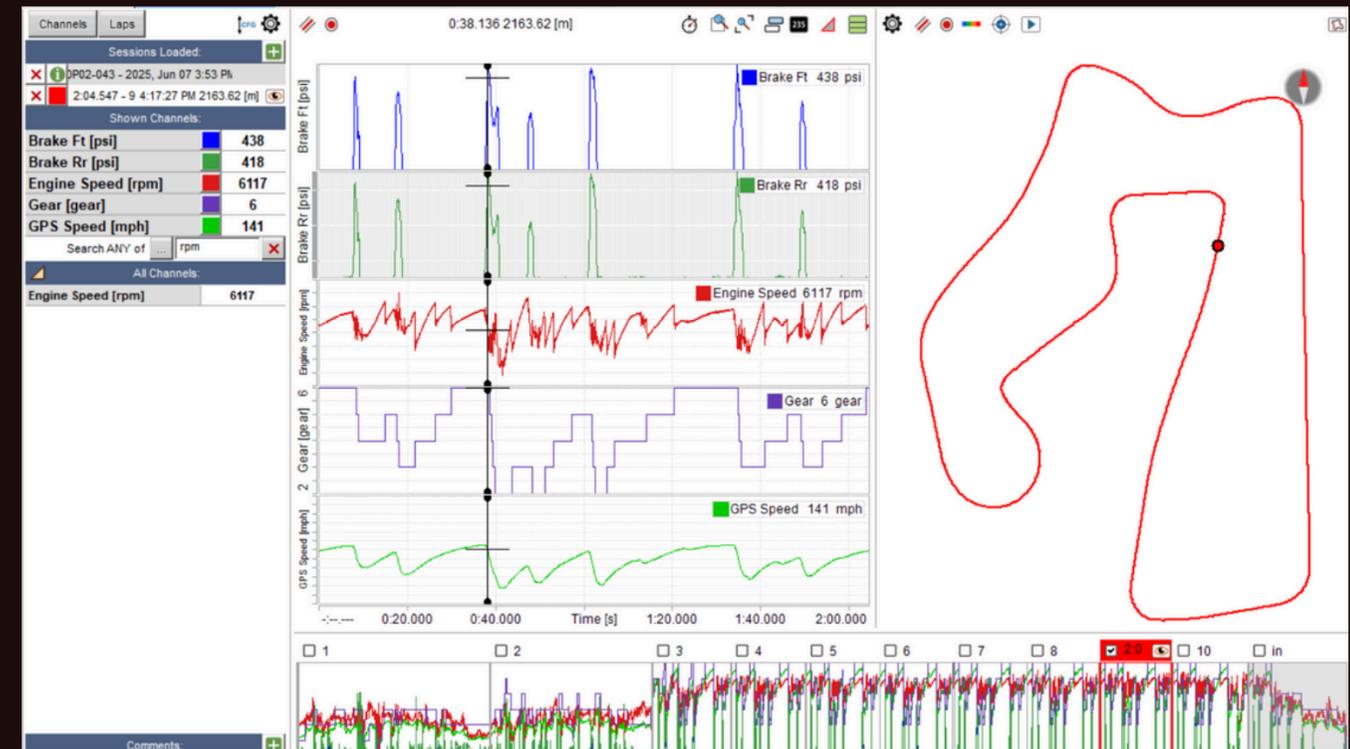
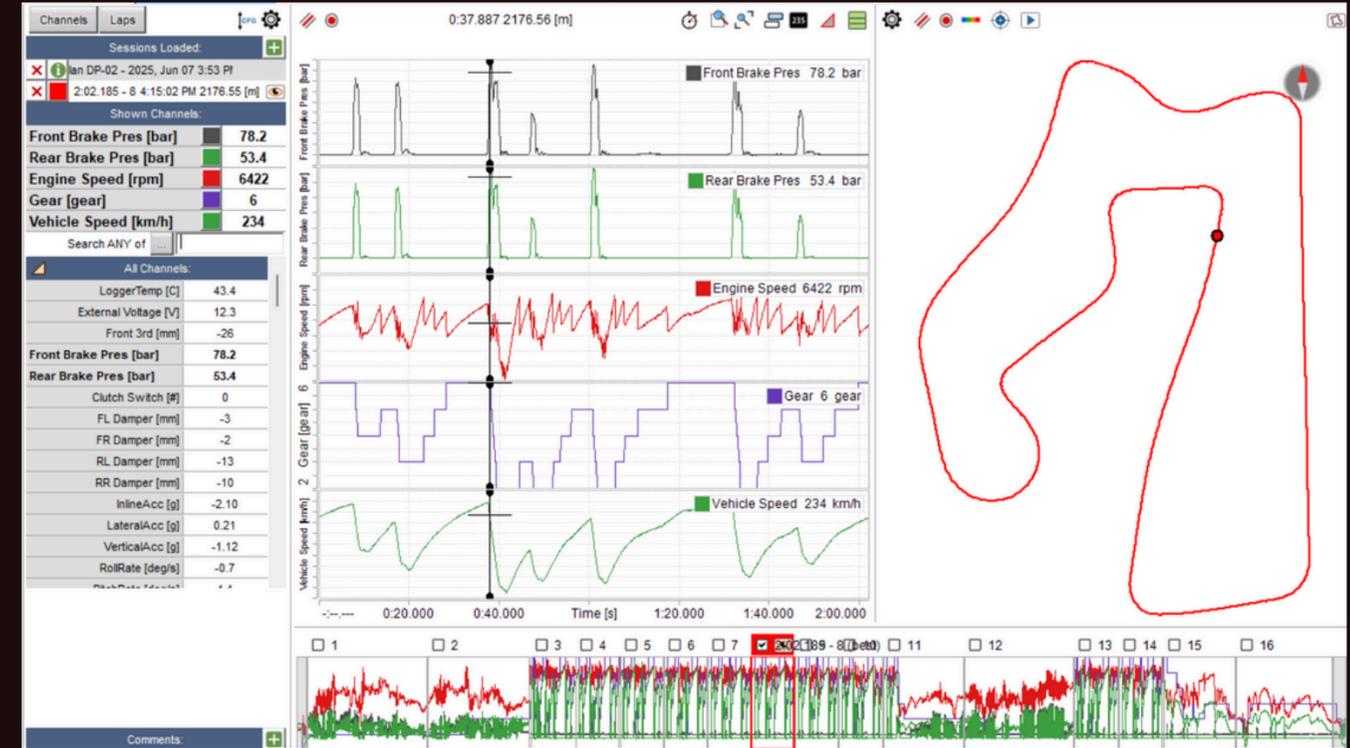
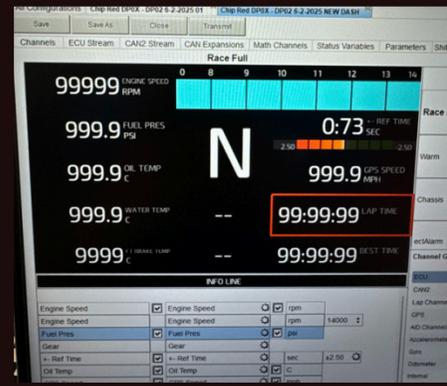
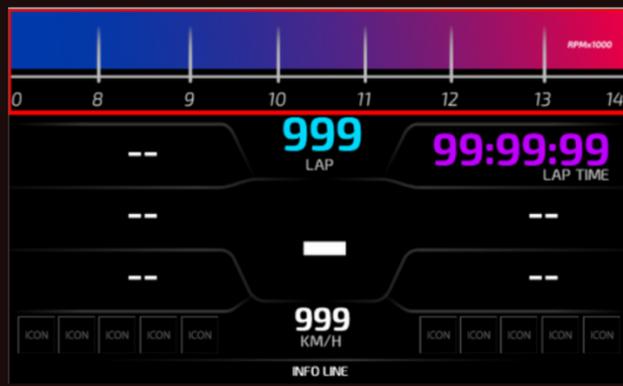


PROFESSIONAL RACE EXPERIENCE

Throughout my experience as a race data engineer, I have acquired varying levels of proficiency in the data logging brands pictured below, alongside being able to make data-driven decisions on car setup and driver advice.

01





PROFESSIONAL EXPERIENCE

Pictured above are the dashboards and logic I had designed for the drivers of Wolf Motorsports using the AiM RaceStudio3 dashboard and data logger manager.

Pictured to the right are data logs also taken from RaceStudio3. I was tasked with comparing the logs of our driver coach and one of our drivers to help him get to peak brake pressure more quickly when applying the brakes.

Pictured below are race logs taken from MoTeC i2 Standard, where we were focusing on tuning our Oreca FLM-09's traction control system.



02

FSAE SOLAR CAR EXPERIENCE

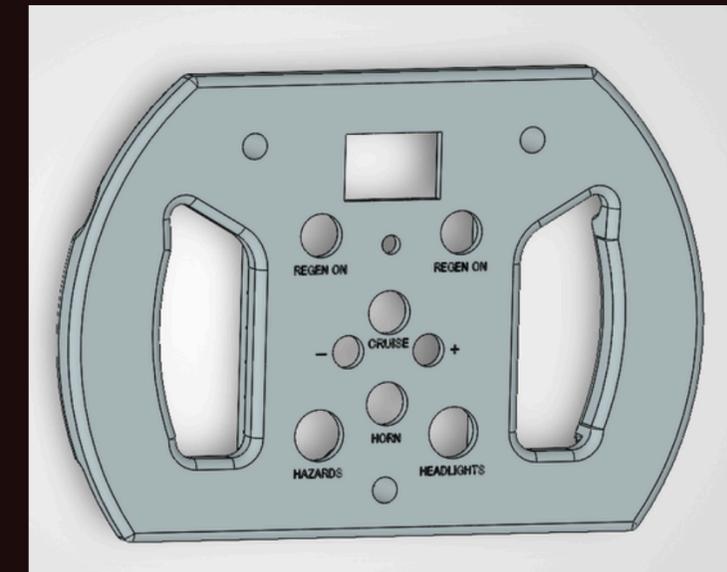
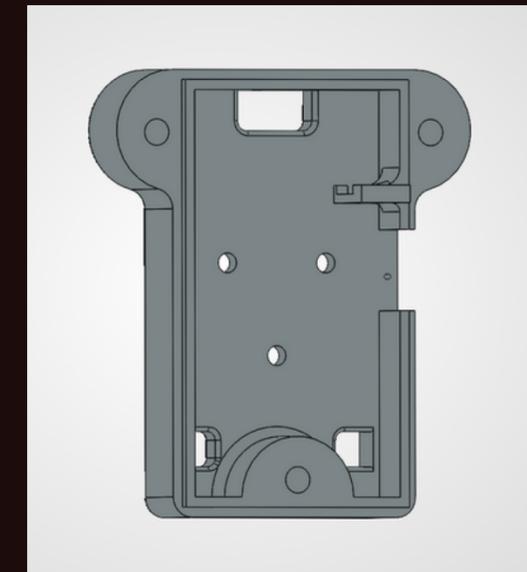
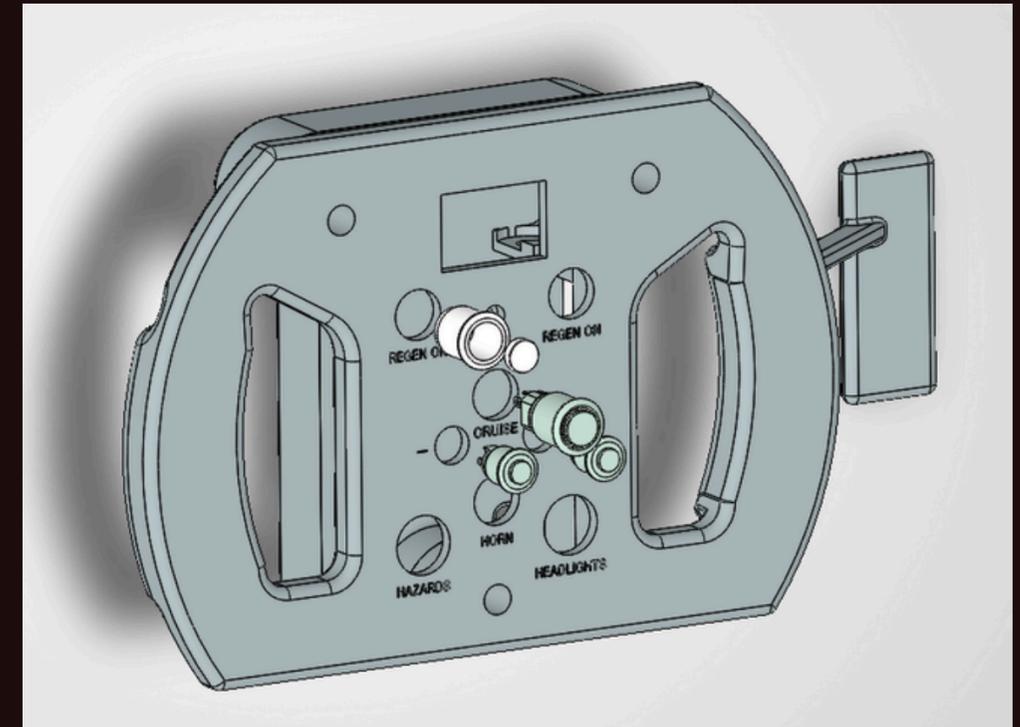
I was a member of the Badger Solar Racing team at the University of Wisconsin-Madison. I served in a multitude of roles, including Operations Director and Lead Driver, and helped our team design, build, and race a solar powered battery electric vehicle in the 2023 and 2024 Formula Sun Grand Prix.



SOLAR CAR EXPERIENCE

Pictured to the right are the steering wheel and regen paddle assembly that I modeled in Siemens NX. I then printed these parts using different methods of additive manufacturing that we had available to us on our university campus.

Pictured below is the carbon fiber structure of our solar car, which I helped to assemble. Also pictured are pieces of the carbon aeroshell that I helped to manufacture using the knowledge I gained in the carbon composite manufacturing process, including the layup of both pre-impregnated and raw carbon fiber.



CHASSISSIM SIMULATION EXPERIENCE

With the skills I acquired during the ChassisSim Bootcamp provided by founder Danny Nowlan, I was able to create a fully correlated vehicle dynamics simulation model of my team's Ligier JSP320 LMP3 cars and the Road America race course.

03



CHASSISSIM EXPERIENCE



To create a data file of Road America, I used the iRacing motorsports simulation service to create a reference lap of geospatial coordinates, accelerations, and altitudes.



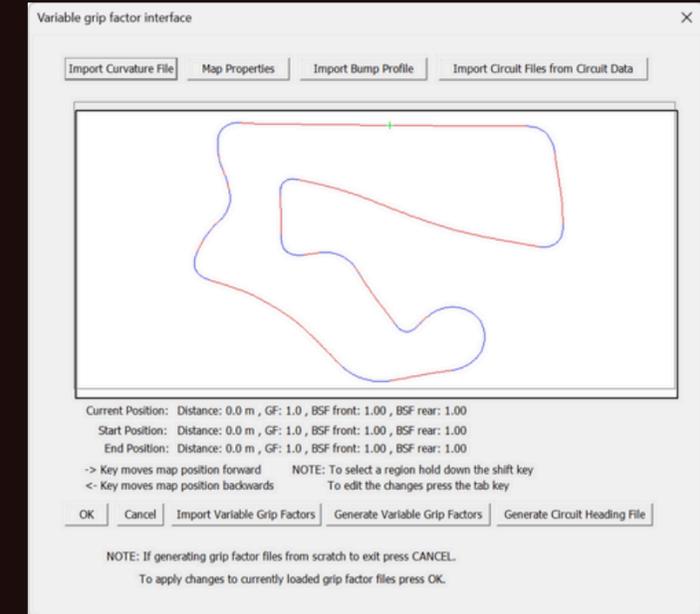
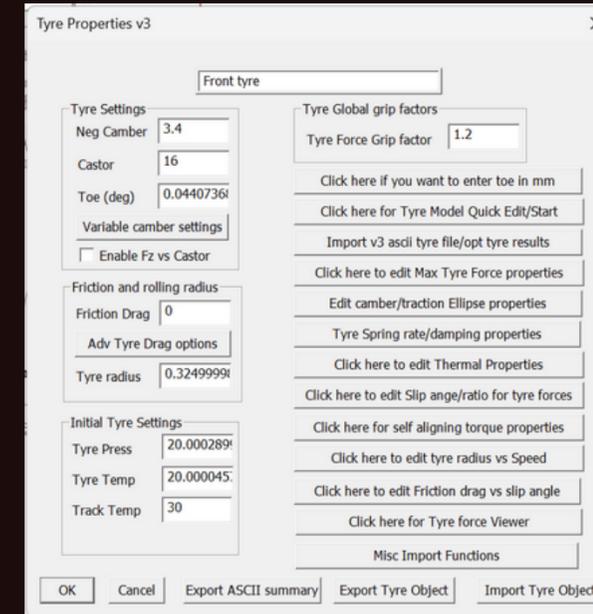
I then iterated through changes in dynamics coefficients to create a baseline using a reference lap and setup from iRacing, being careful to follow the documentation we kept on our LMP3 cars to maintain realism.



Once the baseline model was correlated, I then applied the last recorded set up of our car and ran the simulation to find the best possible lap time.



All models, documentation, and data logs can be found in a github repository under my X-26 race engineering project organization: <https://github.com/X-26-Race-Engineering/ChassisSim-Car-Models>



TELEMETRY ANALYSIS APP

In my personal time, I have applied my motorsports knowledge and background in software to create a live telemetry analysis app to give iRacing teams and users the upper hand in real time strategy calls and driver coaching. The app is called the X-26 iSpotter.

04



TELEMETRY ANALYSIS APP

GAINING THE STRATEGY EDGE

The telemetry app provides a unique insight into all competitors that users face on the track, alongside the user's own performance. The F1 inspired "circle of doom" gives users a visual of everyone on the track, and includes a predicted position post pitstop. KPIs like fuel consumption, predicted lap times, and mini-sector times are all actively updated and calculated.

FULL STACK DEVELOPMENT

This app is powered by the iRacing telemetry API, IRSDK. I used a python wrapper of the IRSDK to power a backend that allows users to watch their own telemetry alongside the position and pace of their competitors. This data is then sent via a websocket to an HTML/JavaScript frontend dashboard. Data packets are sent at 60hz, the maximum speed that the IRSDK API can pull data from iRacing.



The code is available at: <https://github.com/X-26-Race-Engineering/X-26-iSpotter/tree/main>

MATLAB SIMULINK MODELING

I have also applied my post-graduate learnings of MATLAB and differential equations to create and simulate a motorsports derived traction control system for an electric racing car.

05



MATLAB SIMULINK MODELING

Using publicly available articles and regulatory documents, I am currently building a Simulink model of a hypothetical traction control system for a single speed electric racing vehicle, resembling the specifications of a Gen 3 FIA Formula E car.

In the top right you will see a torque mapping of the hypothetical motor, created using a torque curve of a Gen 1 car which was scaled to meet the peak torque created by the Gen 3 motor. The top left and bottom images are of the hypothetical traction control module.

I intend to make the code public once the tire dynamics and battery use/motor controller modules are finished.

```
function [opt, diff] = fcn(raw, Tire_Stiffness, Tire_Shape, Peak_Tire_Friction, CG_Dist_PCT, Target_Slip)

%hankook iON slicks tire params (estimated)
stiffness = Tire_Stiffness; %Default 10
shape = Tire_Shape; %Default 1.9
friction_coeff = Peak_Tire_Friction; %Default 1.7
curvature = 0;

%Controller target and drivetrain vars
lambda_target = Target_Slip; %Default 0.11
gear_ratio = 6;

%Distance from front (percentages)
cg_dist = CG_Dist_PCT; %Default 0.5

%Normal force (downforce will be added in V2)
normal_force_body = 840 * 9.81;
normal_force_wheels = 7.5 * 2 * 9.81;
body_force_rear_static = (normal_force_body * (1-cg_dist)) + normal_force_wheels;

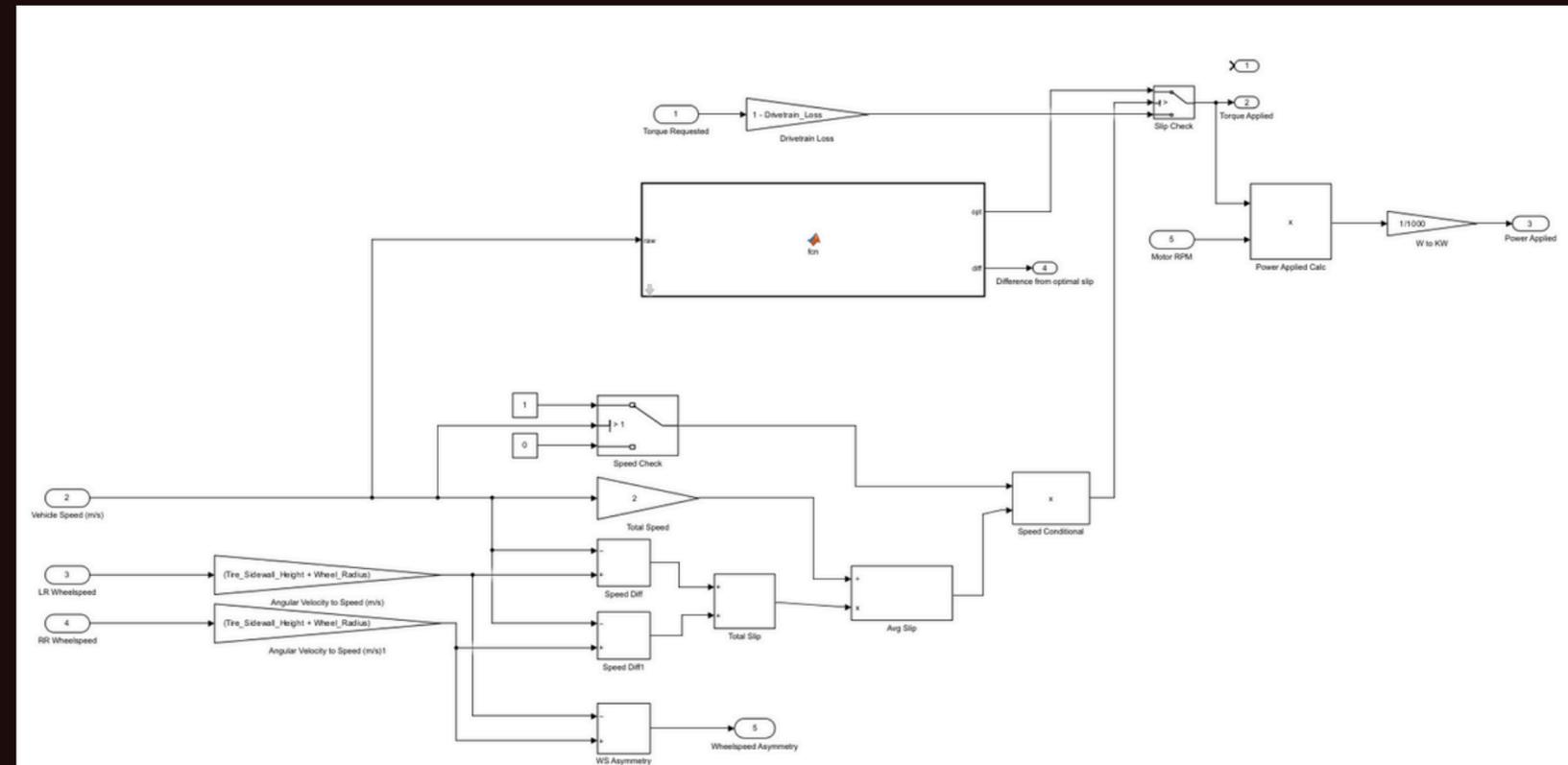
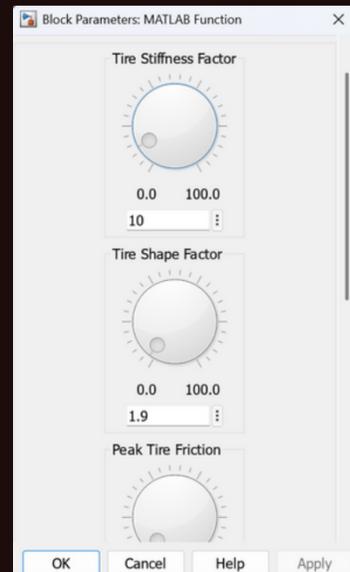
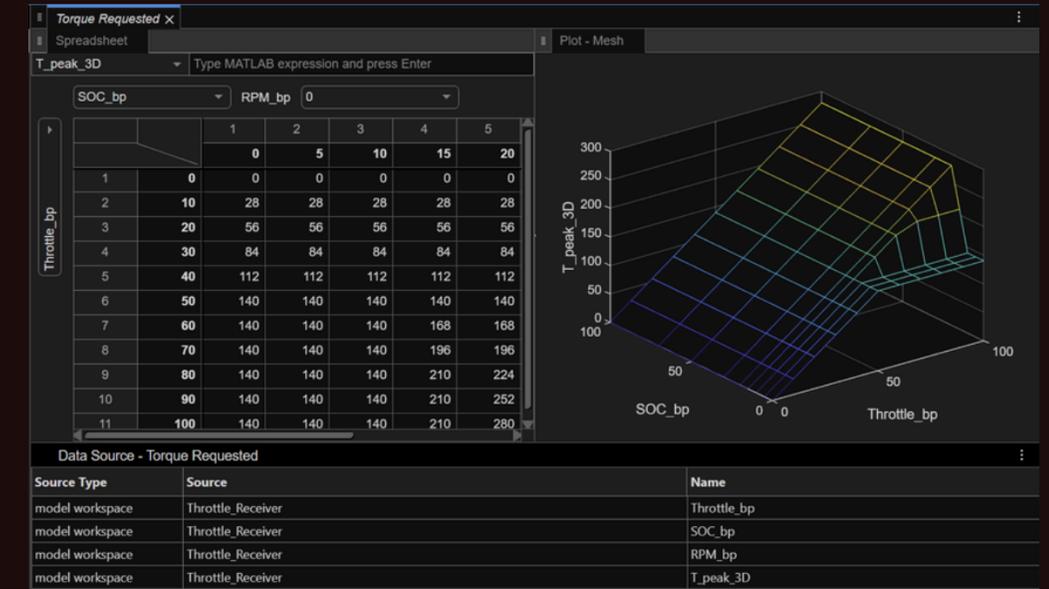
F_Nw = body_force_rear_static / 2;

mu_opt = friction_coeff * sin(shape * atan(stiffness * lambda_target));

opt_wheel = mu_opt * F_Nw;

opt = opt_wheel / gear_ratio;

diff = raw - opt;
```





THANK YOU

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