PORTFOLIO
2024 - 2025

MECHANICAL ENGINEER | SpaceX

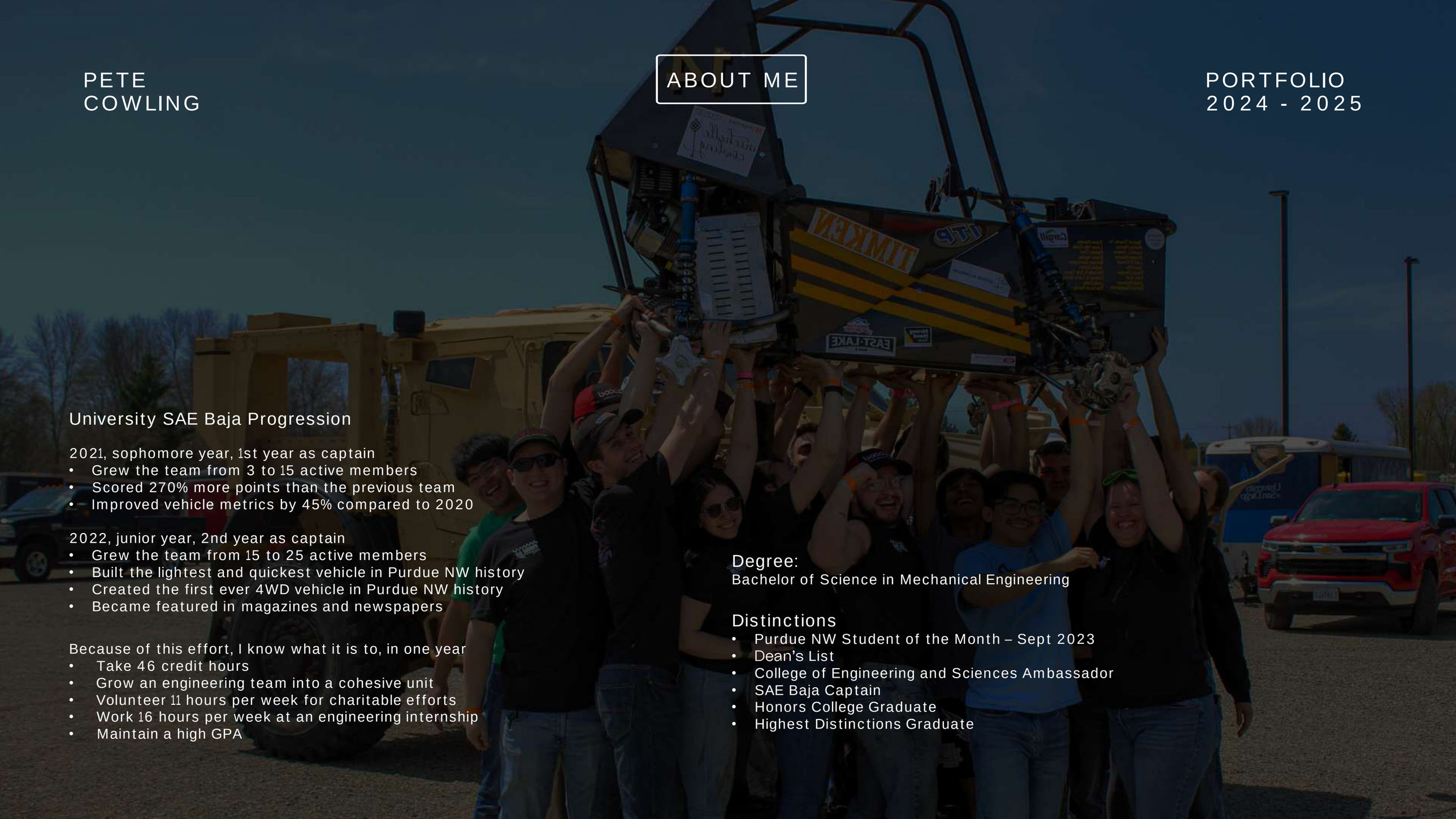
BASED IN
AUSTIN, TX

PETE COWLING

PETE
COWLING

ABOUT ME

PORTFOLIO
2024 - 2025



University SAE Baja Progression

2021, sophomore year, 1st year as captain
- Grew the team from 3 to 15 active members
- Scored 270% more points than the previous team
- Improved vehicle metrics by 45% compared to 2020

2022, junior year, 2nd year as captain
- Grew the team from 15 to 25 active members
- Built the lightest and quickest vehicle in Purdue NW history
- Created the first ever 4WD vehicle in Purdue NW history
- Became featured in magazines and newspapers

Because of this effort, I know what it is to, in one year
- Take 46 credit hours
- Grow an engineering team into a cohesive unit
- Volunteer 11 hours per week for charitable efforts
- Work 16 hours per week at an engineering internship
- Maintain a high GPA

Degree:
Bachelor of Science in Mechanical Engineering

Distinctions
- Purdue NW Student of the Month – Sept 2023
- Dean’s List
- College of Engineering and Sciences Ambassador
- SAE Baja Captain
- Honors College Graduate
- Highest Distinctions Graduate

PETE
COWLING

SPACEX

STARLINK

PORTFOLIO
2024 - 2025

MECHANICAL ENGINEER
STARLINK

May 2024 – Present

MECHANICAL ENGINEER

STARLINK

V4 Effort:

- Created automated flipping station for completed V4 user terminals that decreased maintenance from every 60k cycles to every 4M cycles

V4 Performance Effort:

- Mechanically designed the entire phased-array antenna stack for V4 Performance, Starlink's most rugged product
  - Performed tolerance analysis to reduce maximum antenna misalignment by 19.75% from V4 and avoid all enclosure interferences
  - Thermally analyzed for each layer to calculate misalignment from CTE mismatch and avoid buckling interferences
  - Created drawings for all parts using GD&T, and worked with vendors and in-house tooling to mass produce parts
- Designed a fully automated heat staking station for the antenna stack that is 10% cheaper and 25% less maintenance than the V4 station
- Designed a fully automated leak checking station that can detect any leaks in the product with practically no maintenance needed
- Currently designing more future products and stations that will provide cheap, fast, convenient internet to everyone!

Interested in learning how our stuff works? Here are some unofficial, but good, videos:

1. TSP #181 - Starlink Dish Phased Array Design, Architecture & RF In-depth Analysis
   - We have made many improvements since this dish, but the principles remain
2. How does Starlink Satellite Internet Work?

PETE
COWLING

PORTFOLIO
2024 - 2025

TESLA INTERN
NEW PRODUCT INTRODUCTION
DATA ENGINEERING

May 2023 – Dec 2023

TESLA

*NOTE: All photos, unless specified otherwise, are official Tesla images. Courtesy of Tesla, Inc.

TESLA INTERN
NEW PRODUCT INTRODUCTION

DATA ENGINEERING

Internal Fleet Repair App

The Internal Fleet Repair App I created allowed GFTX Tesla workers to submit maintenance tickets for their vehicles to be fixed while they were at work.
I created the Power App and data storage solution, and I am creating the dashboard and automated notifications. The app itself was built in under a week.

Here is a breakdown of what I have done with this Power App. I built and launched the application with no reported bugs.

- Collected user input for VIN, issue dropdown selection, pictures, and description that worked for different kinds of phones.
- Created repair module for repair techs to see all submitted issues in either a full or list view, search by VIN, and filter by already repaired
- Created module for managers to assign permissions to repair techs
- Created a SharePoint site with lists to store data
- Automated data flows to an Excel accessible by Tableau

Internal Tire Sale

There was over $1M in old inventory for wheels and tires. About 25% of the inventory was not in our inventory system and was untraceable, and about 50% was not located at our factory. I was tasked with

- Locating all the inventory
- Organizing the logistics of 7 trailers of inventory
- Storage of the inventory
- Managing the online selling systems for the sale

We sold about 85% of the inventory internally at a discount, recouping a significant amount of money.

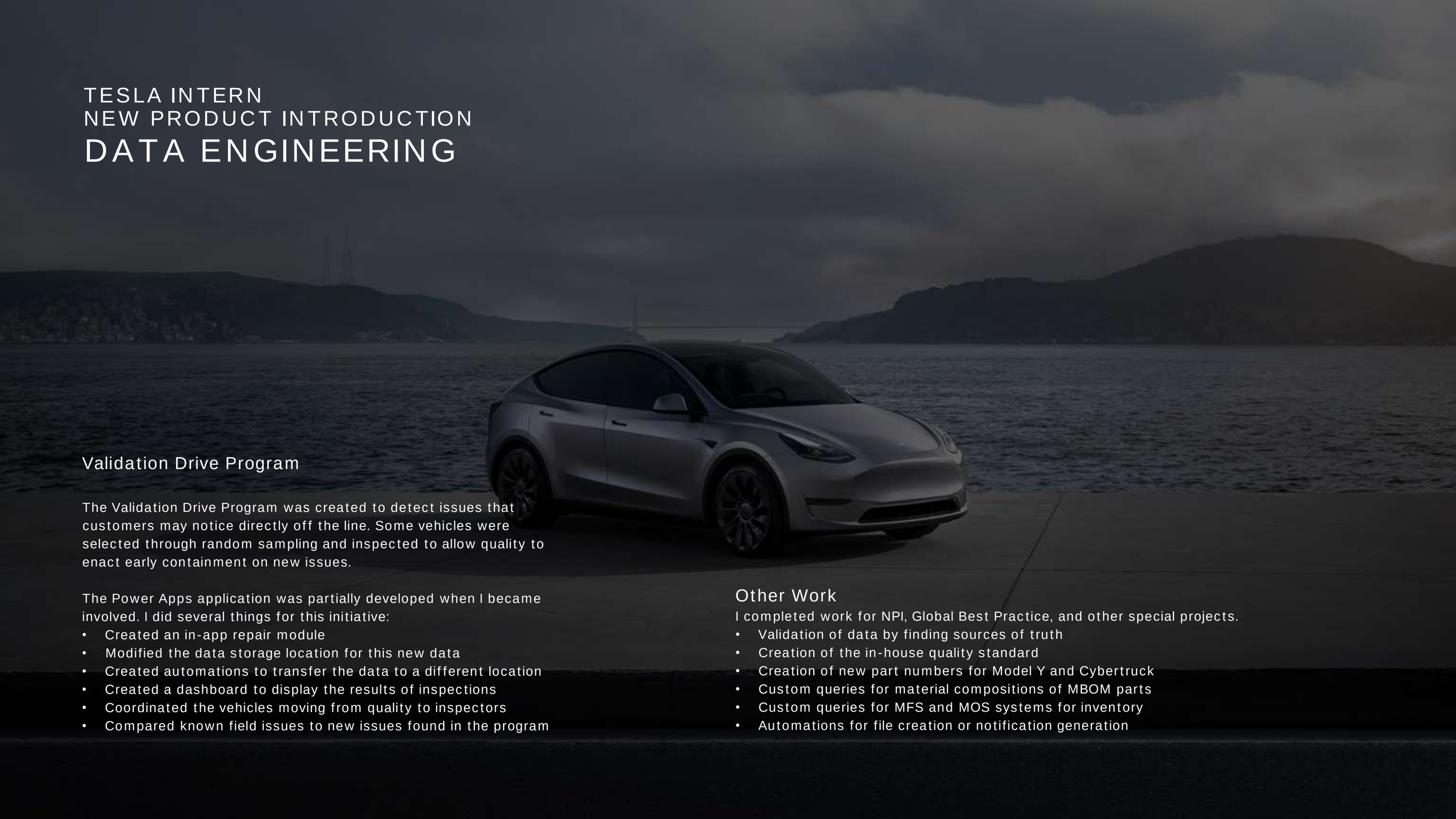
SQL Query Optimization

I have created one dashboard used weekly for management and refactored two dashboards used daily by all Model Y NPI Technical Project Managers. The refactoring consisted of optimizing MS-SQL queries. Here is what I did.

- Optimized 13 queries
- Joined 43 different tables
- Improved query performance by 75% - 125%

TESLA INTERN
NEW PRODUCT INTRODUCTION

DATA ENGINEERING



Validation Drive Program

The Validation Drive Program was created to detect issues that customers may notice directly off the line. Some vehicles were selected through random sampling and inspected to allow quality to enact early containment on new issues.

The Power Apps application was partially developed when I became involved. I did several things for this initiative:

- Created an in-app repair module
- Modified the data storage location for this new data
- Created automations to transfer the data to a different location
- Created a dashboard to display the results of inspections
- Coordinated the vehicles moving from quality to inspectors
- Compared known field issues to new issues found in the program

Other Work

I completed work for NPI, Global Best Practice, and other special projects.

- Validation of data by finding sources of truth
- Creation of the in-house quality standard
- Creation of new part numbers for Model Y and Cybertruck
- Custom queries for material compositions of MBOM parts
- Custom queries for MFS and MOS systems for inventory
- Automations for file creation or notification generation

PETE
COWLING

WORK EXPERIENCE

PORTFOLIO
2024 - 2025

orbital
ENGINEERING, INC.®

ORBITAL ENGINEERING INTERN
PROCESS AND STRUCTURE
MECHANICAL ENGINEERING

June 2021 – April 2023

*NOTE: All photos are stock images. Orbital is dedicated to protecting sensitive information.

ORBITAL ENGINEERING
PROCESS AND STRUCTURE
ENGINEERING INTERN

Bid and Proposal Developer

At Orbital Engineering we engineered a solution was reduced by 4,400% from the initial proposed bid from a competitor. The project was for US Steel to decrease fish fatality from intake water. For this, I

- Developed bids, requests for proposals, proposals, and presentations
- Designed piping routes through the facility using hundreds of drawings
- Evaluated vendor equipment
- Suggested screen geometry improvements that ultimately lowered the cost by the full amount, although this was already suggested outside my knowledge.

I also designed a cable tray bridge for Shell, and I made a bid for a Cargill HVAC project.

BEFESA Palmerton Facility

BP Whiting Facility

Maintenance and Equipment Replacement

BP and Linde are customers who often hire us to engineer equipment replacements and system upgrades. These can require us to relocate an entire substation on site, which is the case with Shell in Michigan City, and nearly all our customers will require little to no downtime. For example,

- I developed drawings for BP to replace combustion chambers
- Designed to retire and install thousands of miles of gas piping with NiSource in Kokomo, IN

3D Scanning and Processing

I travel to sites before our engineers begin to design to gather millions of data points for them to see existing structures and better design structures and processes, as well as inspect for safety. This opportunity has exposed me to large industries and production plants and their inner workings by

- Scanning Befesa's zinc recycling plant in Palmerton, PA
- Scanning the Mondelēz/Nabisco production lines in Chicago, IL
- Scanning the Cargill facility north of Hammond, IN

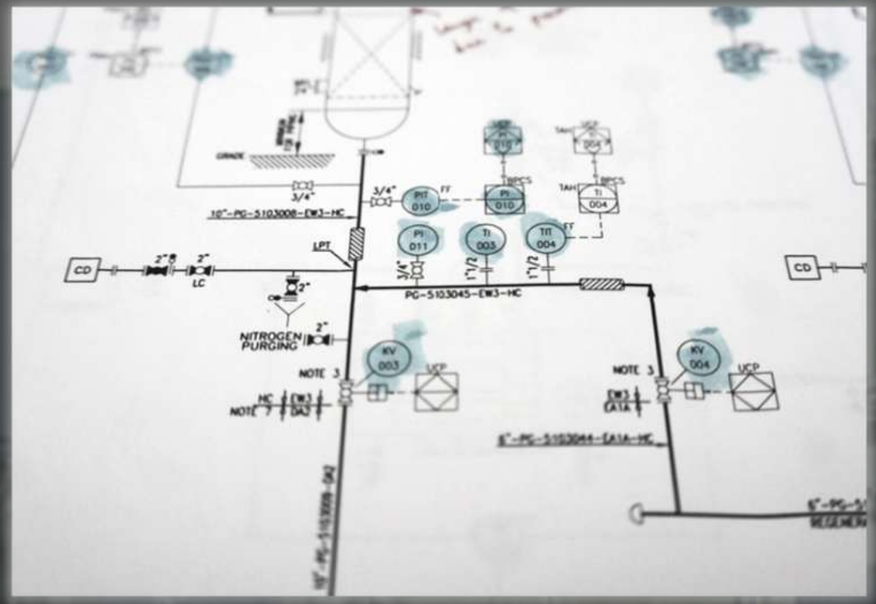
This work totaled trillions of data points in processing.

ORBITAL ENGINEERING INTERN
PROCESS AND STRUCTURE

MECH ENGINEERING

Piping and Instrumentation Diagrams (P&IDs)

I developed processing systems in companies such as Linde, Cargill, and BP. These developments may encompass entire processes to ramp up production, such as Cargill trying to double production of corn syrup within a few months, or by replacing existing machinery, such as Linde (Praxair) replacing parts of a 3-stage compressor for argon production.

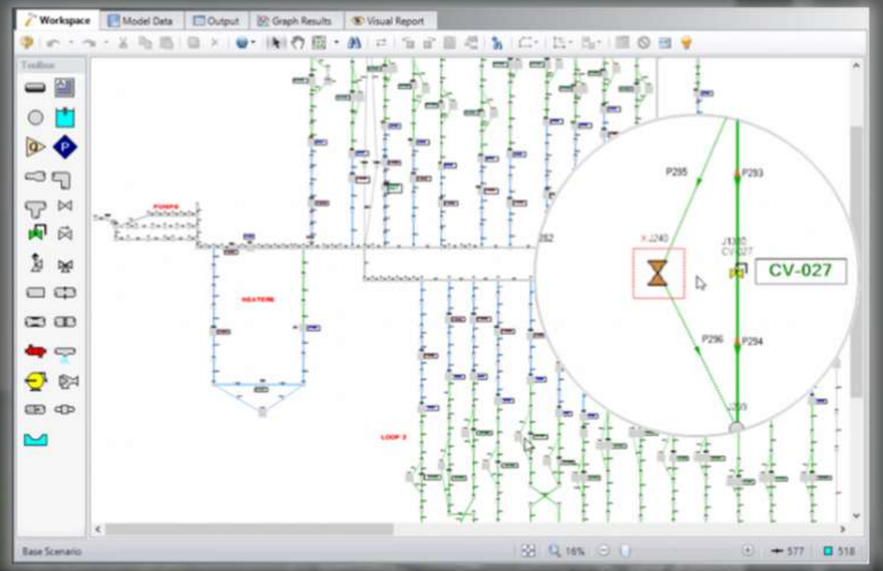


Piping and Instrumentation Diagram (P&ID)

Dynamic Fluid Analysis

Fathom AFT is a software to analyze fluid processes based off a few input variables relating to pipe diameter and material, bend radius of elbows, and properties of the fluid found on the Safety Data Sheet (SDS). I have

- Modeled tens of thousands of feet of piping
- Created many scenarios for the layouts
- Sized pumps and detected pressure at different junctions
- Simulated external temperature and freezing point of the fluid
- Determined insulation effectivity
- Evaluated heat tracing



Fathom AFT Model

Schematic Wiring Diagram (SWDs)

I worked with Orbital to appropriate sensors that have signals sent to a processing unit. These control units often control valves that increase or decrease flow, change which storage tank is being used, or inform operators of quality.

PETE
COWLING

MECHANICAL ENGINEERING
STUDENT/ SAE BAJA CAPTAIN

PORTFOLIO
2024 - 2025

NOTABLE PROJECTS

SAE BAJA RACING
PURDUE NW UNIVERSITY

TEAM PRESIDENT AND CAPTAIN

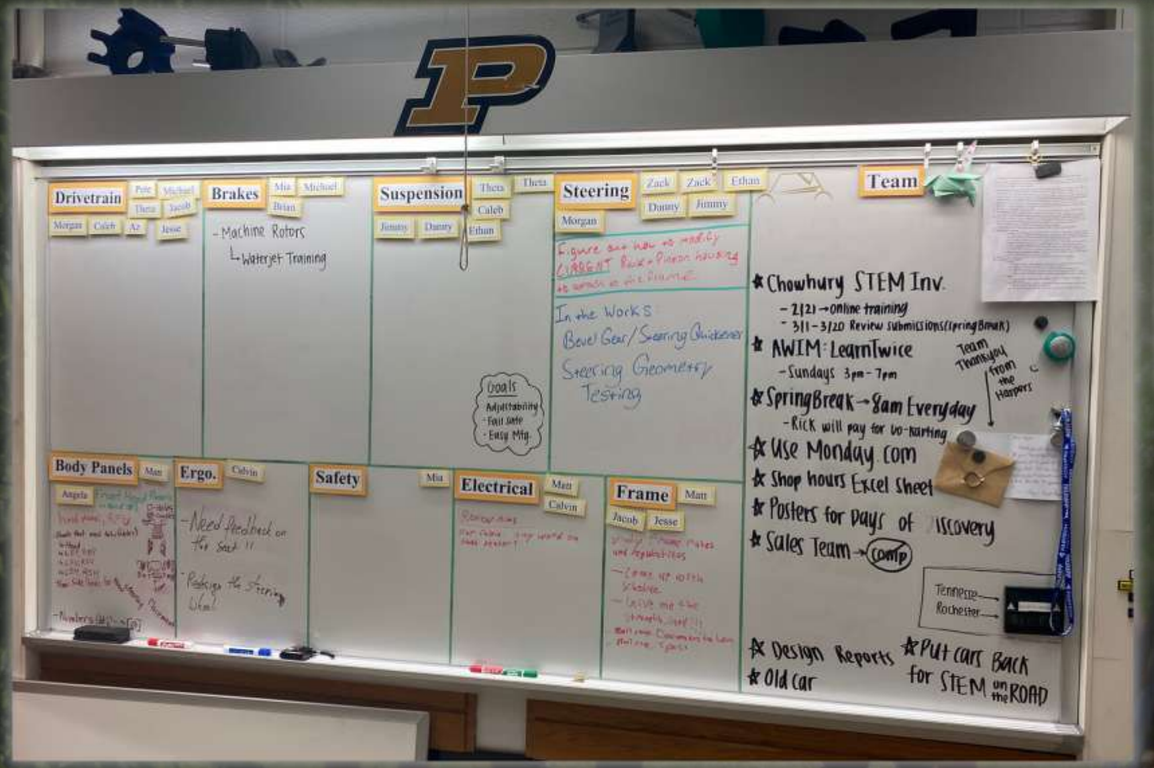
Integration

Initial Goals

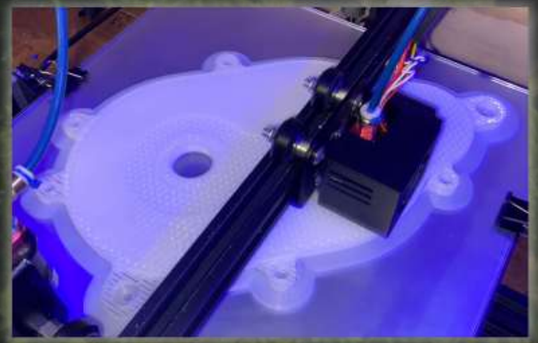
- I want to divide the vehicle into collaborative subsystems to avoid physical interferences.
- I want to use CAD and 3D prototypes to ensure our vehicle meets our design goals and that assembly and disassembly is painless.

Result

- I divided our members into eight engineering teams, with each member being on one or two teams to reduce member downtime and increase integration efficiency. These teams had a specific set of goals to accomplish for the vehicle. Examples of these teams were the drivetrain team, suspension team, brakes team, etc.
- All parts to be fabricated on a CNC, such as our gearbox, were developed in CAD and 3D printed to scale to visually inspect assembly. This was cost effective, and no adjustments had to be made for assembly or disassembly.



2022 Physical Task Workspace for all Vehicle Systems



3D Prototype of the 2022 Gearbox Cover

CNC'd 2022 Gearbox Cover Mid Fabrication

Arizona 2022 Competition

Management

Initial Goals

- I want to grow the team to 20 active members over the course of two semesters and separate those members into engineering teams that help them accomplish their career goals.
- I want to raise at least $20k to fund traveling to two competitions and purchase the materials for the vehicle.

Results

- I grew the team from 3 to 17 members within two semesters. Of the 11 members who tried to get an internship or lab assistant position, 10 were successful with the Baja SAE experience on their resume.
- Our team raised $26k in cash to travel to all three SAE sanctioned competitions in the 2022 season. We were able to bring 17 members to at least one competition.

SAE BAJA RACING
PURDUE NW UNIVERSITY

DRIVETRAIN LEAD

Initial Goals
- Build a 4WD vehicle with as little rotational inertia as possible.

Result
- Built the first 4WD vehicle in Purdue NW history.
- Built the lightest and quickest Baja vehicle in Purdue NW history.

Rear Axles

Initial Goal
- Integrate the rear axle with the suspension to delete a suspension component and reduce mass.

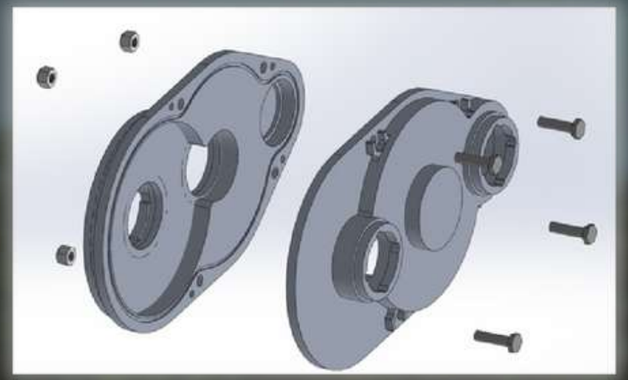
Result
- Created an integrated rear axle using 6061T6 aluminum that weighed 85% less than CV axles
- Deleted a suspension a-arm, reducing manufacturing, time, cost, and weight

Driveshaft and Differential

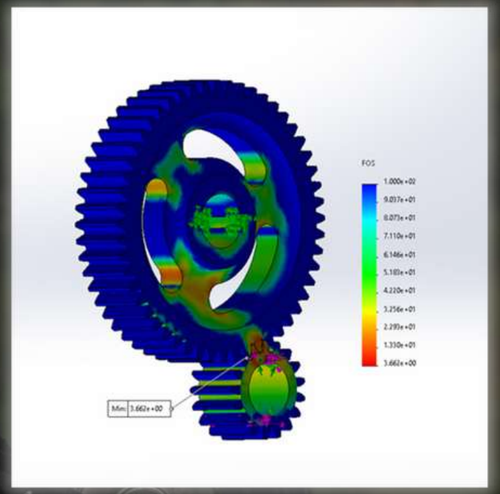
Initial Goal
- Use an appropriate limited slip differential and driveshaft with low rotational inertia.

Result
- Located an over-running LSD, electronically controlled using an electromagnetic clutch to preserve rotational inertia
- Created a carbon fiber driveshaft for light weight

2022 Gearbox



2023 Gearbox Model



2022 Gear Reduction FEA

2023 Rear Drivetrain

Gearbox

Initial Goals
- Create a minimalist, cool gearbox with an integrated rear caliper mount.

Result
- Created a very cool gearbox design which weighed less than 7.5 lbs.
- The left side case served to work for an inboard brake mount.

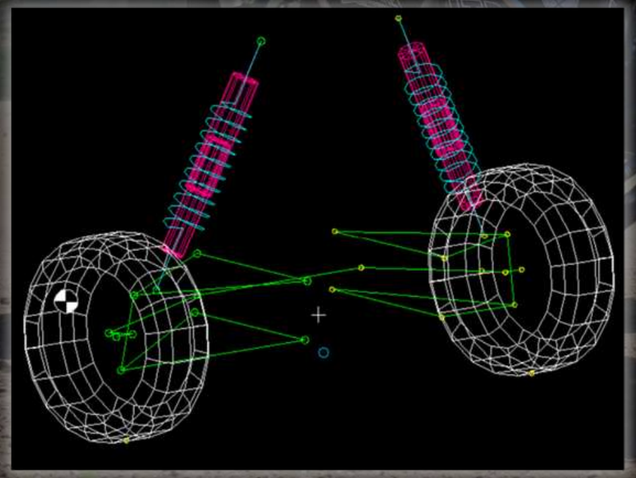
SAE BAJA RACING
PURDUE NW UNIVERSITY

OTHER CONTRIBUTIONS

Suspension

Dynamic Analysis Efforts

- Analyzed the dynamics suspension movement through travel for both the front and rear suspension to maximize contact with the ground and avoid affecting the drivetrain and steering systems.
- Organized 3D analysis efforts to achieve the desired static angles and angle changes through travel while fitting within the track width constraints for the steering system.



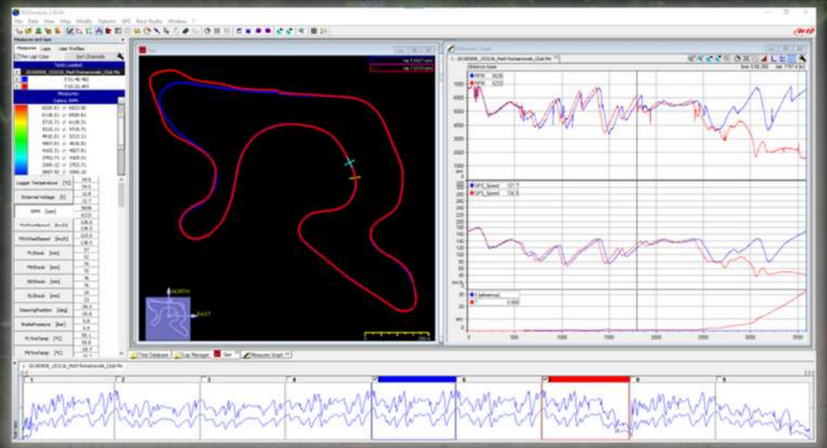
Lotus Suspension Model

Red: Old Steering Rack Location
Green: New Steering Rack Location

Steering

Rack Location Adjustment

- The most competitive turning radii at competition are between 6 and 8 feet. I moved the rack position up by just over 4 inches which improved the steering radius from 14.5 feet to 7.5 feet overnight.



AIM System Data Collection Sample

Electrical

Data Acquisition

- Gathered data using and AIM system for our drivetrain performance. This records our engine RPM, vehicle speed at each instant, and the track GPS route we took. More optional modules are included for heat and engine analysis that we are expanding to use for the 2023 season.
- I found that our vehicle was too heavy to compete for acceleration and top speed. The load of our vehicle brought down our maximum engine RPM by nearly 600 RPM.

LET'S WORK
TOGETHER

CONTACTS

PORTFOLIO
2024 - 2025

PETE COWLING

petecowling.com

linkedin.com/in/pete-cowling

COWLINGPETE@GMAIL.COM

(219) 789-2812