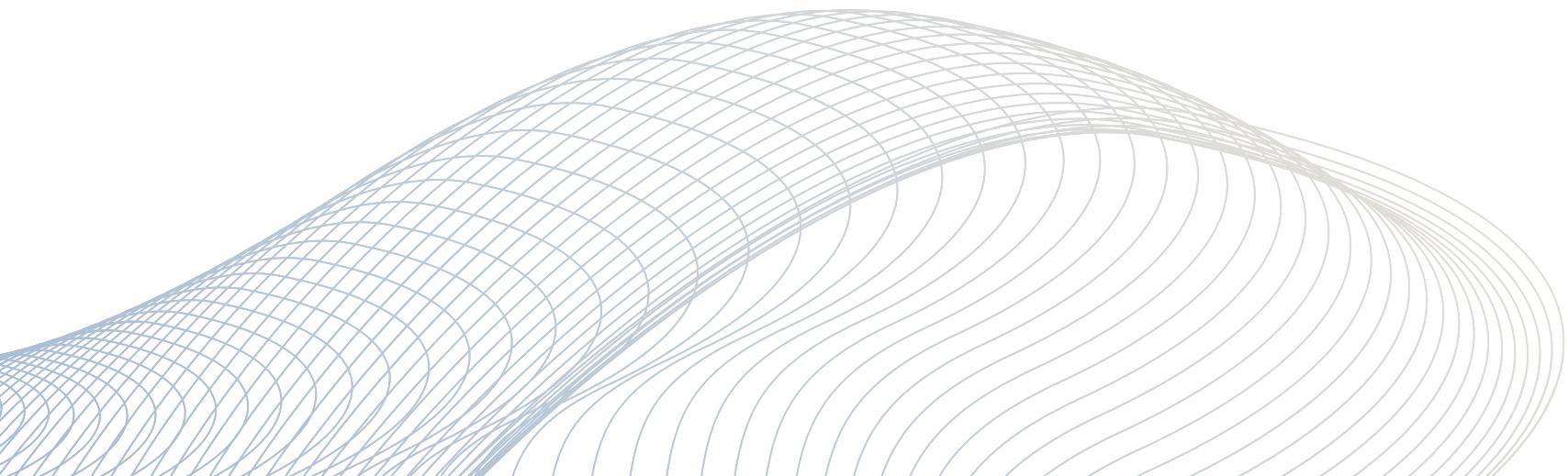


# SANTIAGO HOPKINS

## Engineering Portfolio

E: SANTIAGOHOPKINS@BERKELEY.EDU

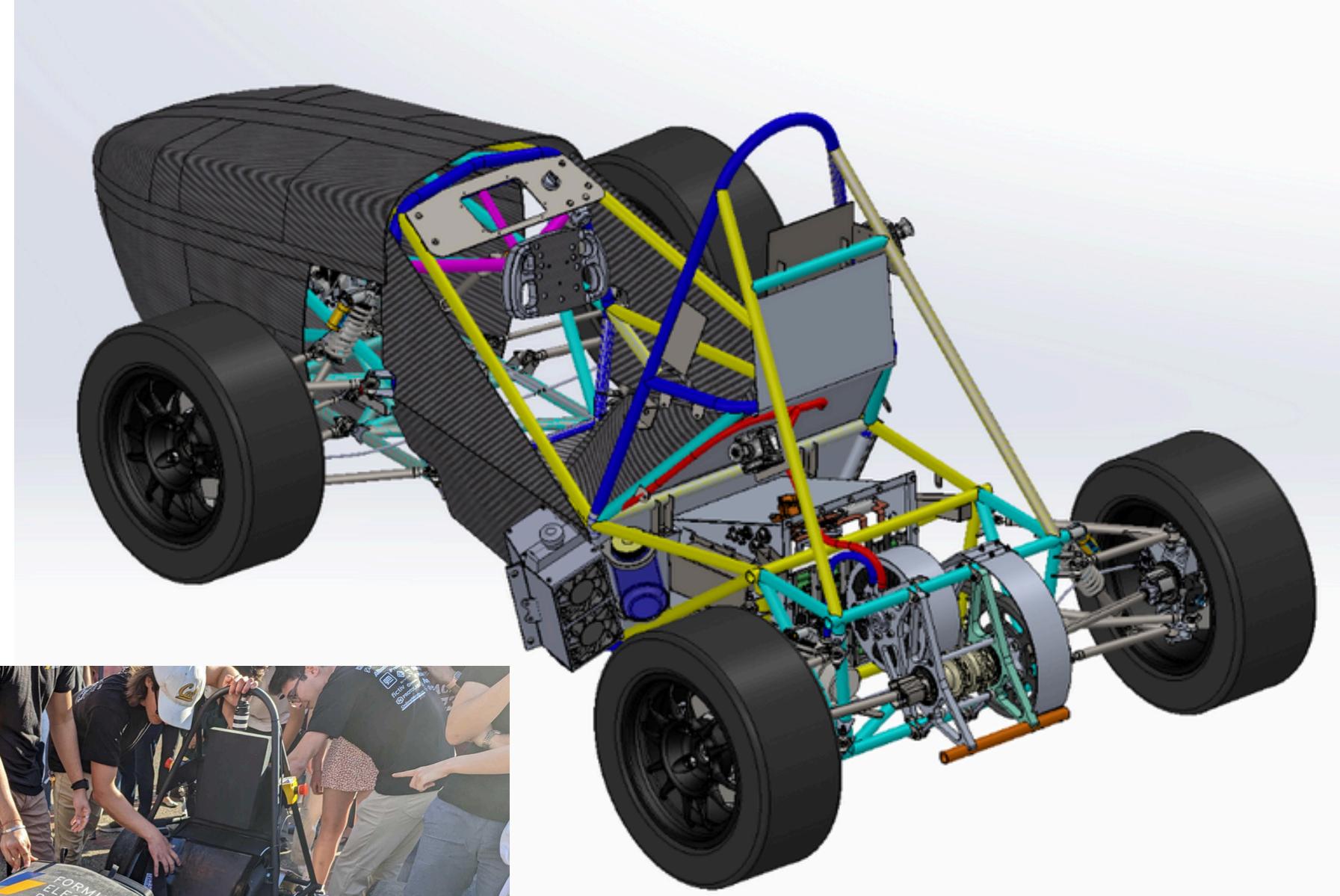
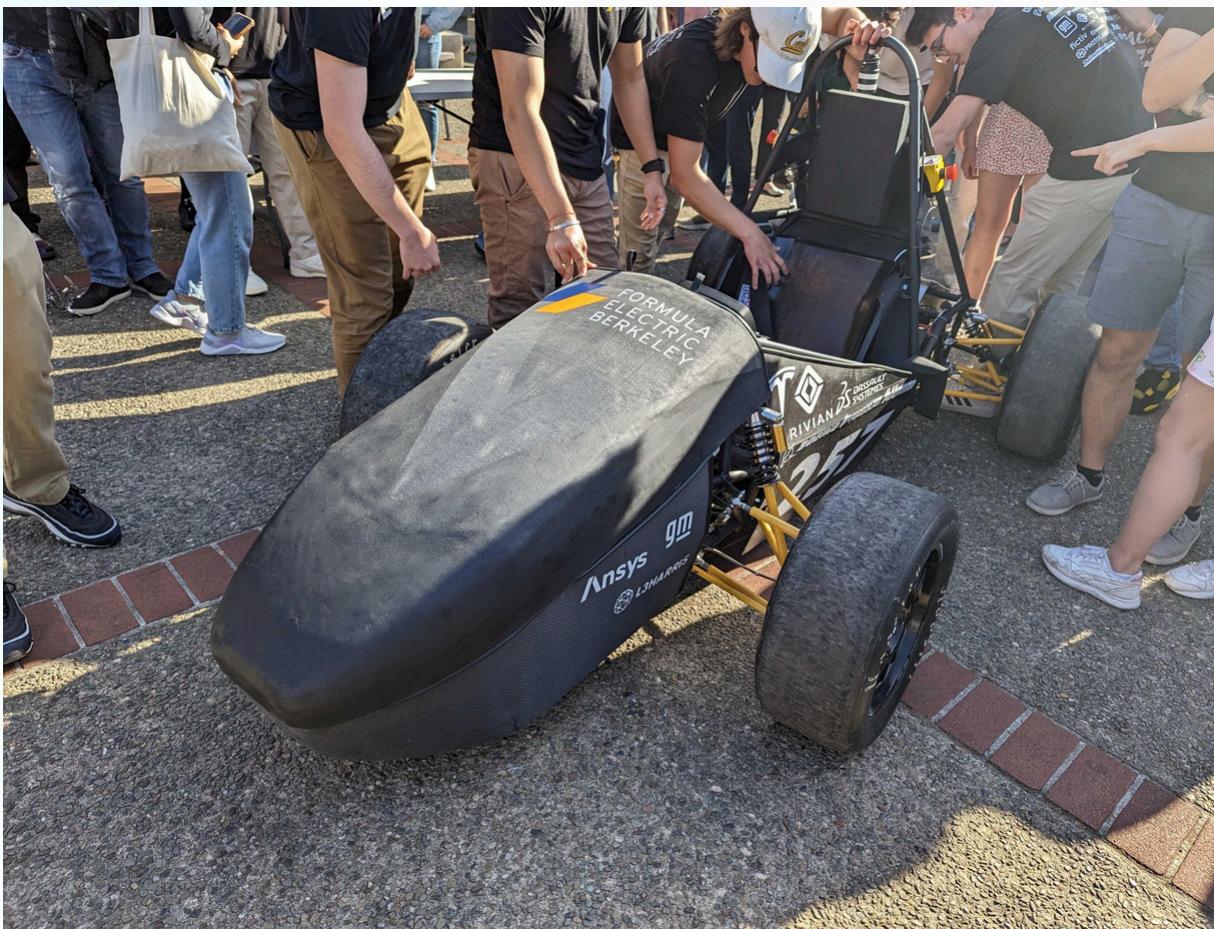
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October 2023

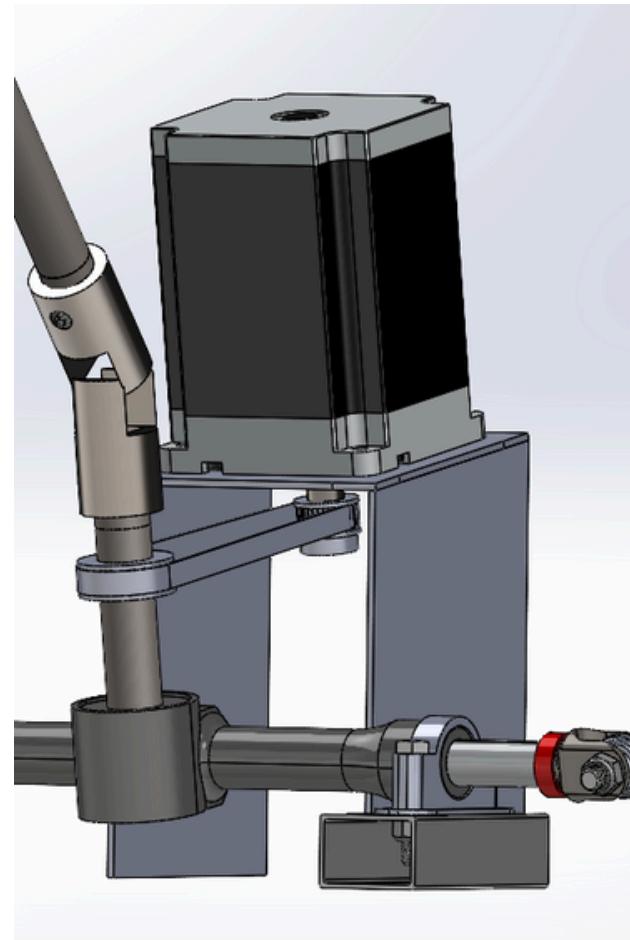
# FSAE ELECTRIC DRIVERLESS

- *Founding Member*  
Driverless Mechanical Design
- *Project Manager*  
Driverless Mechanical Design



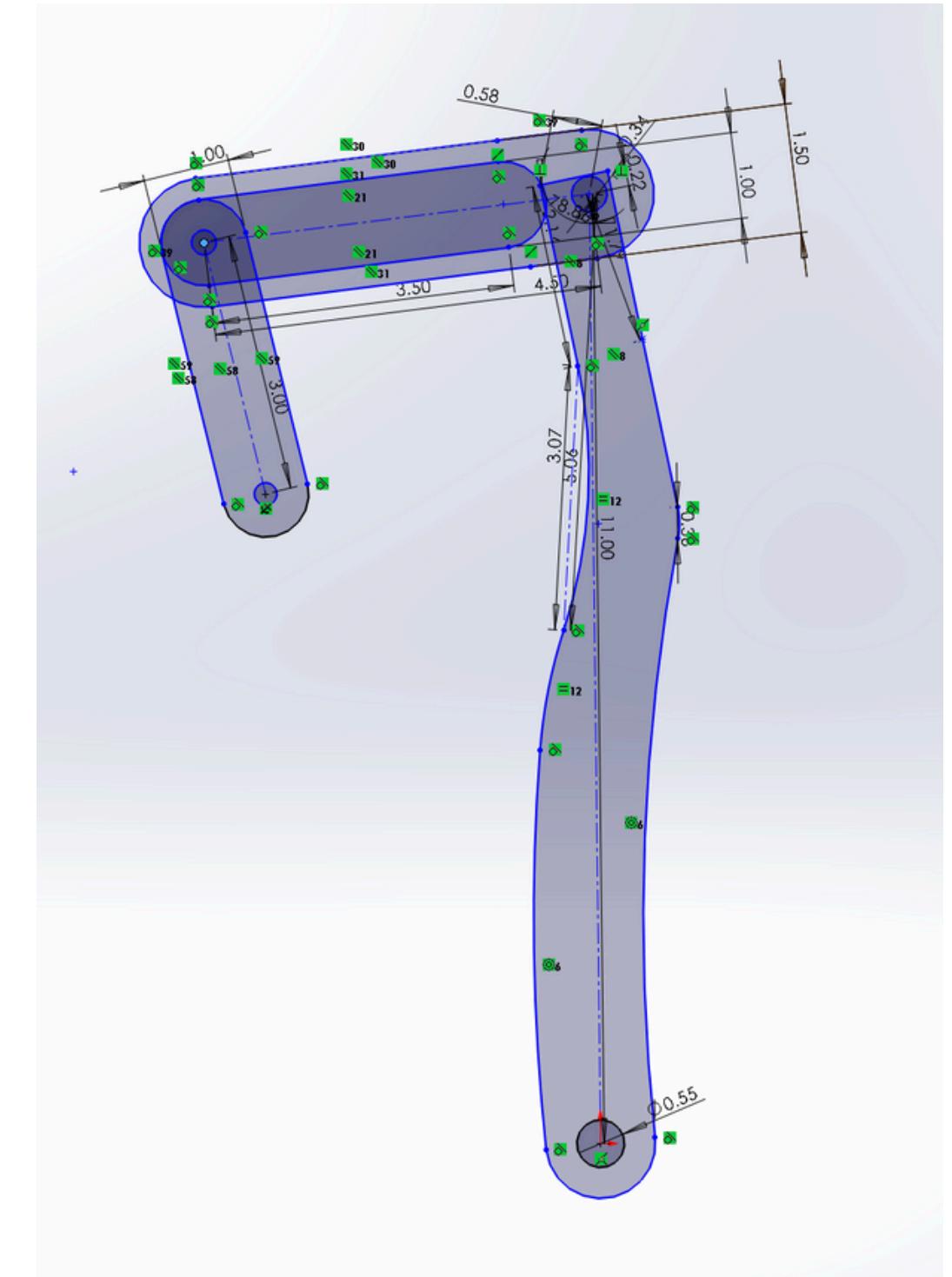
# Autonomous Steering System

- Actuated steering column using belt drive
- GT2 Belt
- 50t/33t Gears
  - Gear Ratio = 1.5
- Tensioning via slot mount
- Position tracking via absolute encoder
- Integrated lever switches to encode hard stops for steering system



# Autonomous Brake System

- Added Master Cylinder in parallel to actuate brake calipers.
  - Actuated Master Cylinder using Pneumatic actuator
  - Similar bore size with Adjustable Lever arm to provide mechanical advantage
  - Modular Design
  - Redundancy via two systems
  - Large FoS for added safety



## *Early Concept for Actuating Brake Pedal In Place of Extra Master Cylinder Approach*

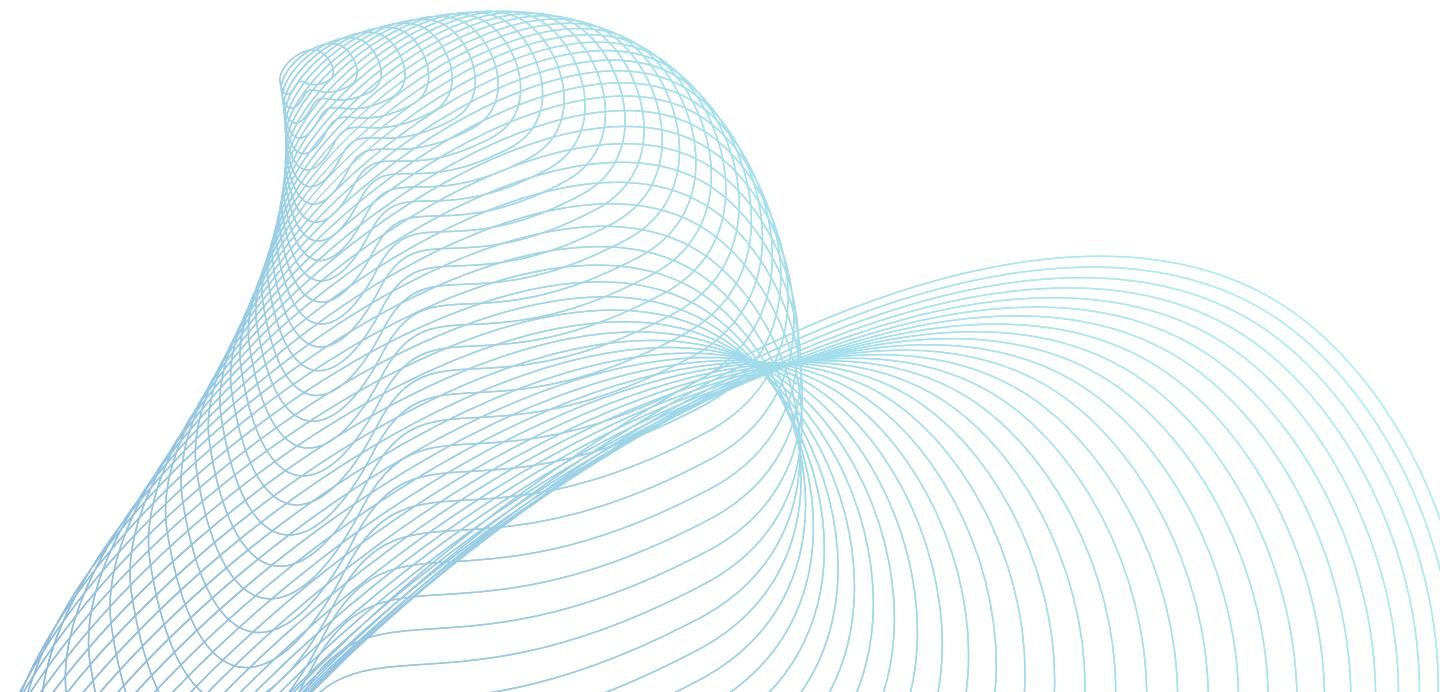
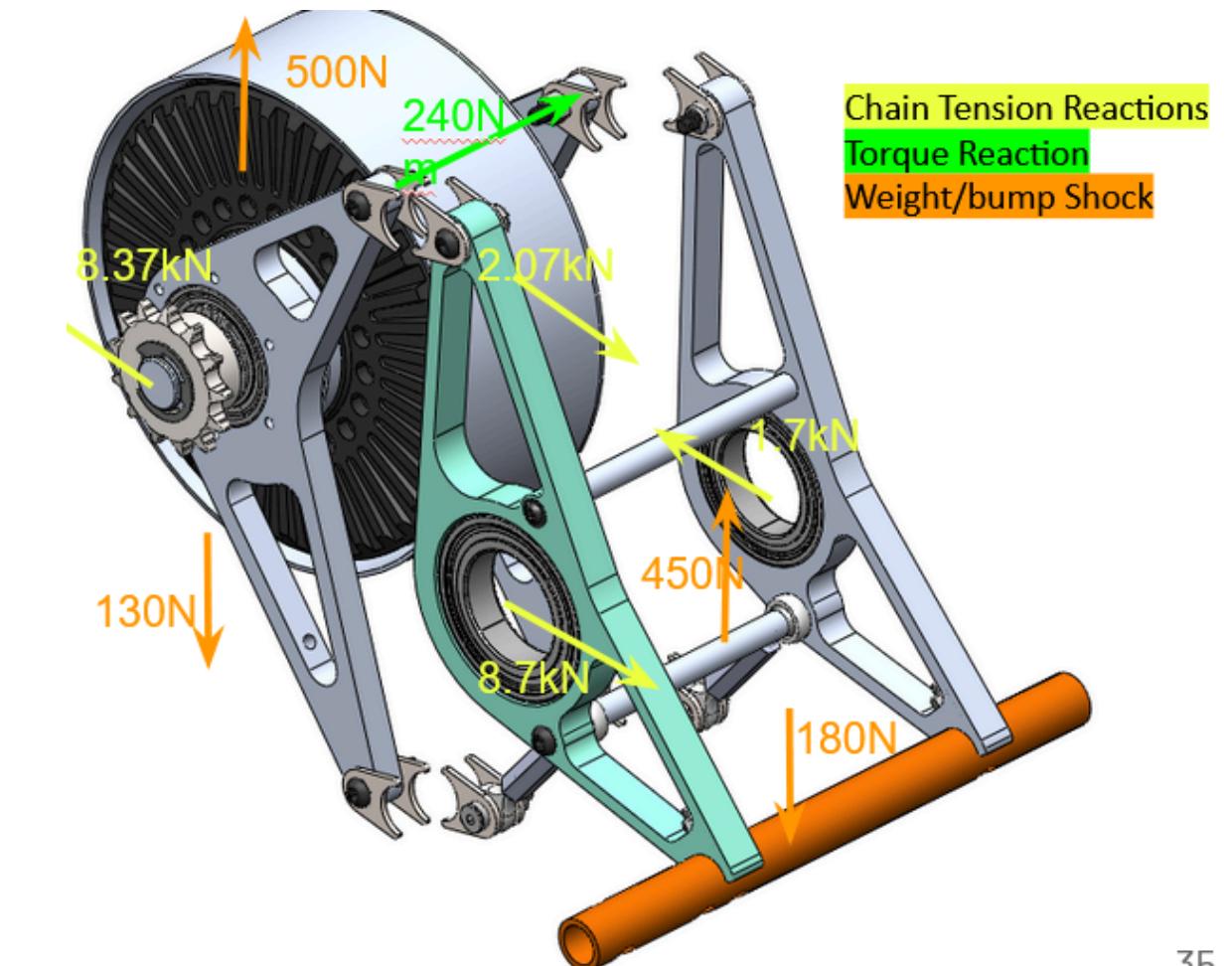
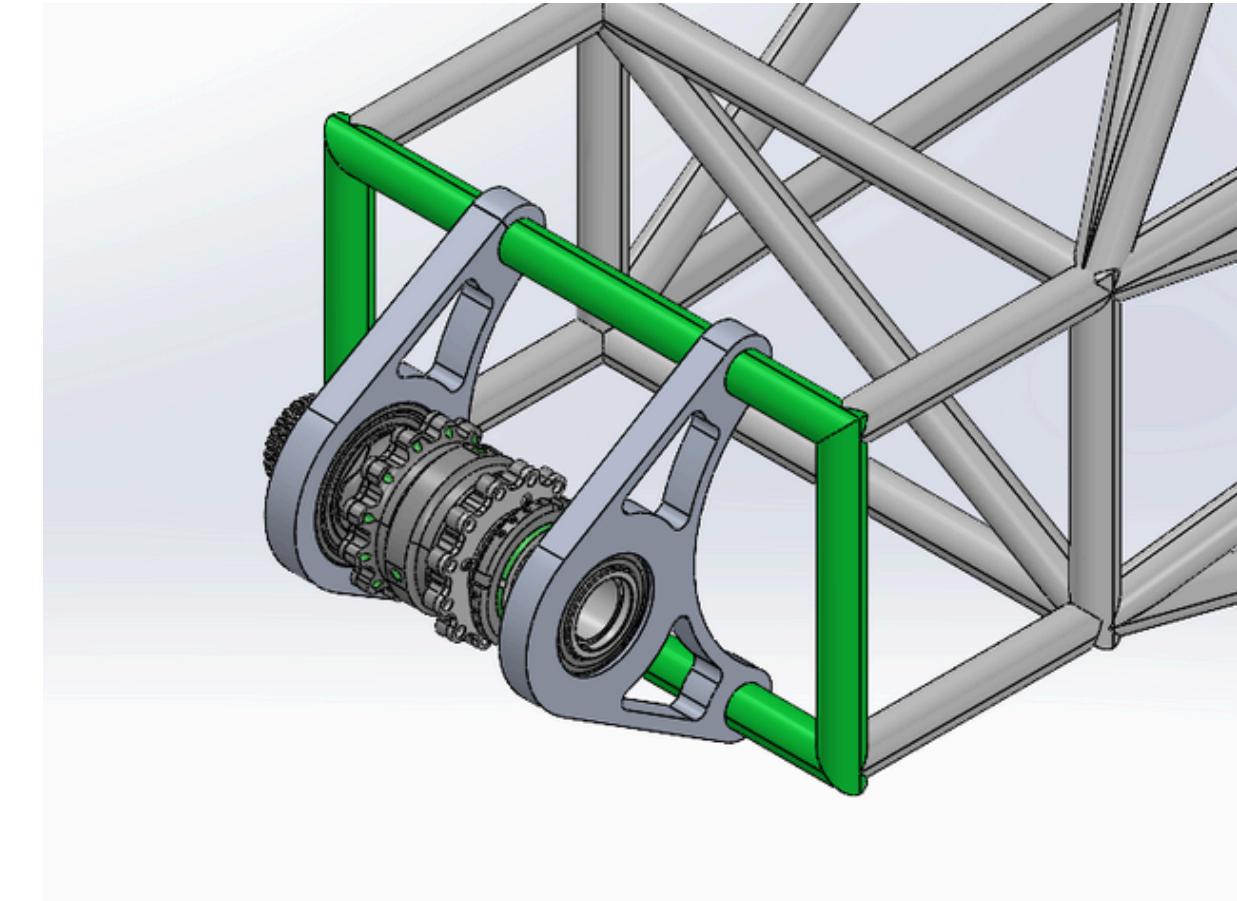
# LiDAR Mount

- Designed and Fabricated LiDAR Mount
- Rule Compliant
- ~35° Range of Motion
- Rapid Prototyping via 3D Printing
- High Infill PLA
- Anti-Vibration
  - Sandwich Mounts -> Anti-Vibration Grommets
- Collected data rapidly and effectively for software pipeline training
- -> Aluminum carriage mounted via welded steel tabs.



# Differential Mount

- Drafted early concepts for Differential Mount
- Minimized weight, while retaining sturdiness via FEA and Topology Studies
- Features:
  - Turnbuckle Tensioning
  - Mounts to mounting tabs for easier manufacturing and adjustment



# WORLD SURF LEAGUE

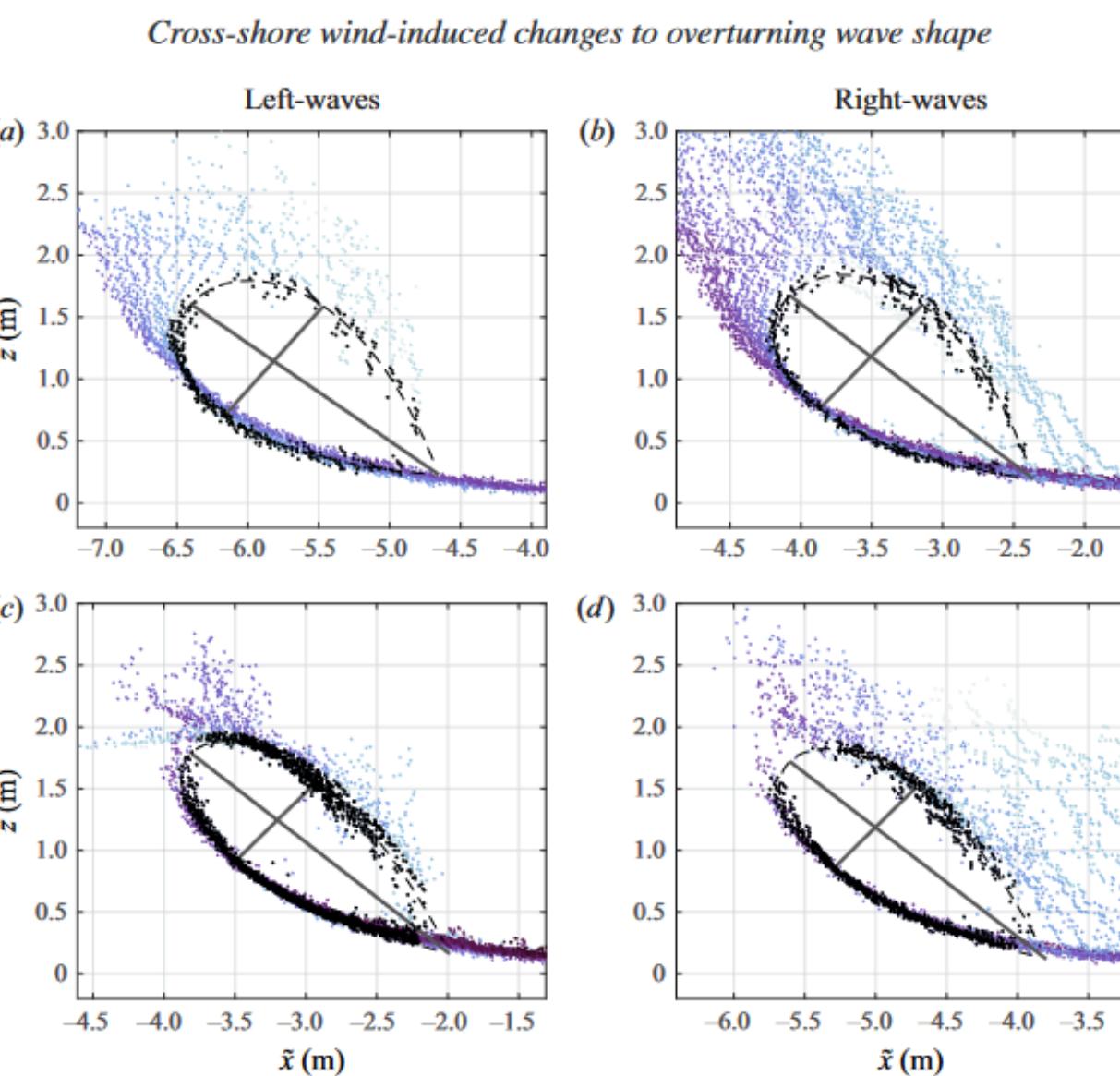
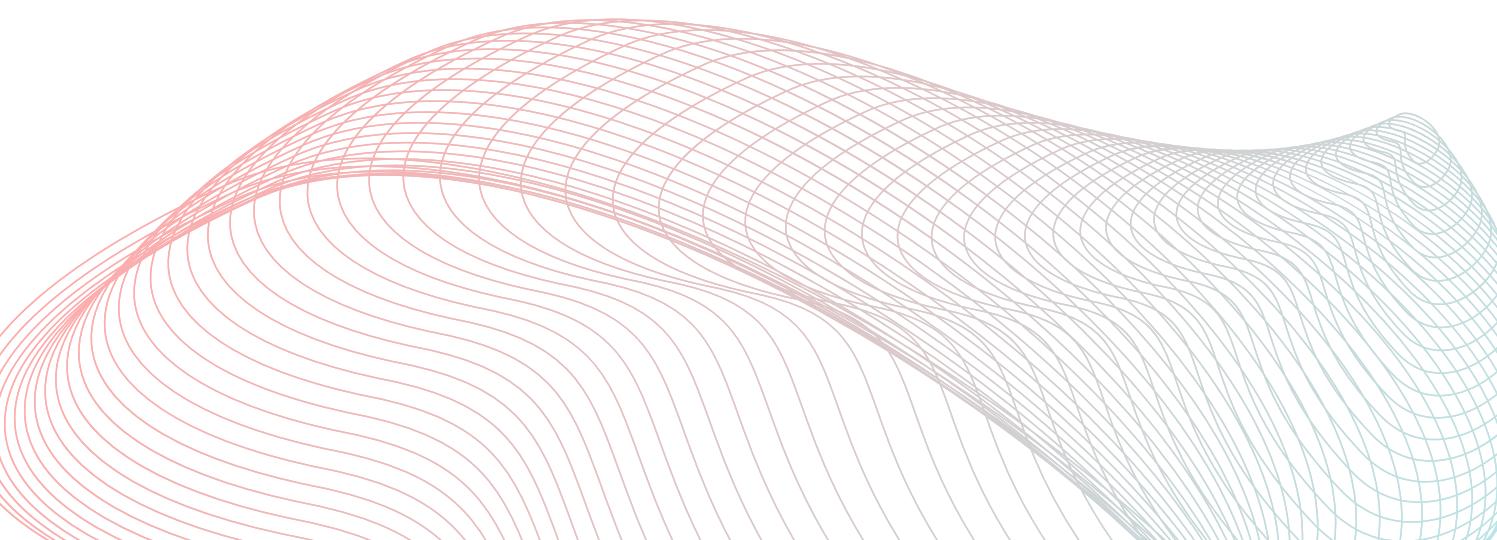
*Intern, Summer 2023*

Surf Ranch R&D (Wave Systems Engineering)



# Cross-Shore Wind-Induced Changes to Wave Shape

- In Conjunction, with Scripps and USC on a continuation of [this project](#).
- Recently, concluded that cross-shore winds does, in fact, affect wave shape
- Now, quantifying how winds affect wave shapes
- Added wind vectors to previous simulations



# CFD Prototyping and Validation

- Simulated wave shape after strip-light installation
- Quantified effects of strip lights on:
  - Barrel vortex ratio
  - Resultant force on ‘Wave-Side’ posts
  - Overall wave shape and ‘rideability’
- Designed experiment to validate or invalidate CFD results
  - Installed 20 boards to replicate strip-light installation
  - Surveyed surfers to determine affect on overall wave shape and ‘rideability’



**\*CFD Simulation and  
Results not pictured\***

# OTHER PROJECTS



# Predicting Bee Colony Success with ML

- Analyzed tabular data of environmental variables and several hours of audio files
- Compared 10 Classifier Models from the SciKitLearn Python Package
- Selected most accurate classification model
- Selected best features of the most accurate classification model via Lasso Regularization
- Achieved 85% accuracy on test data set

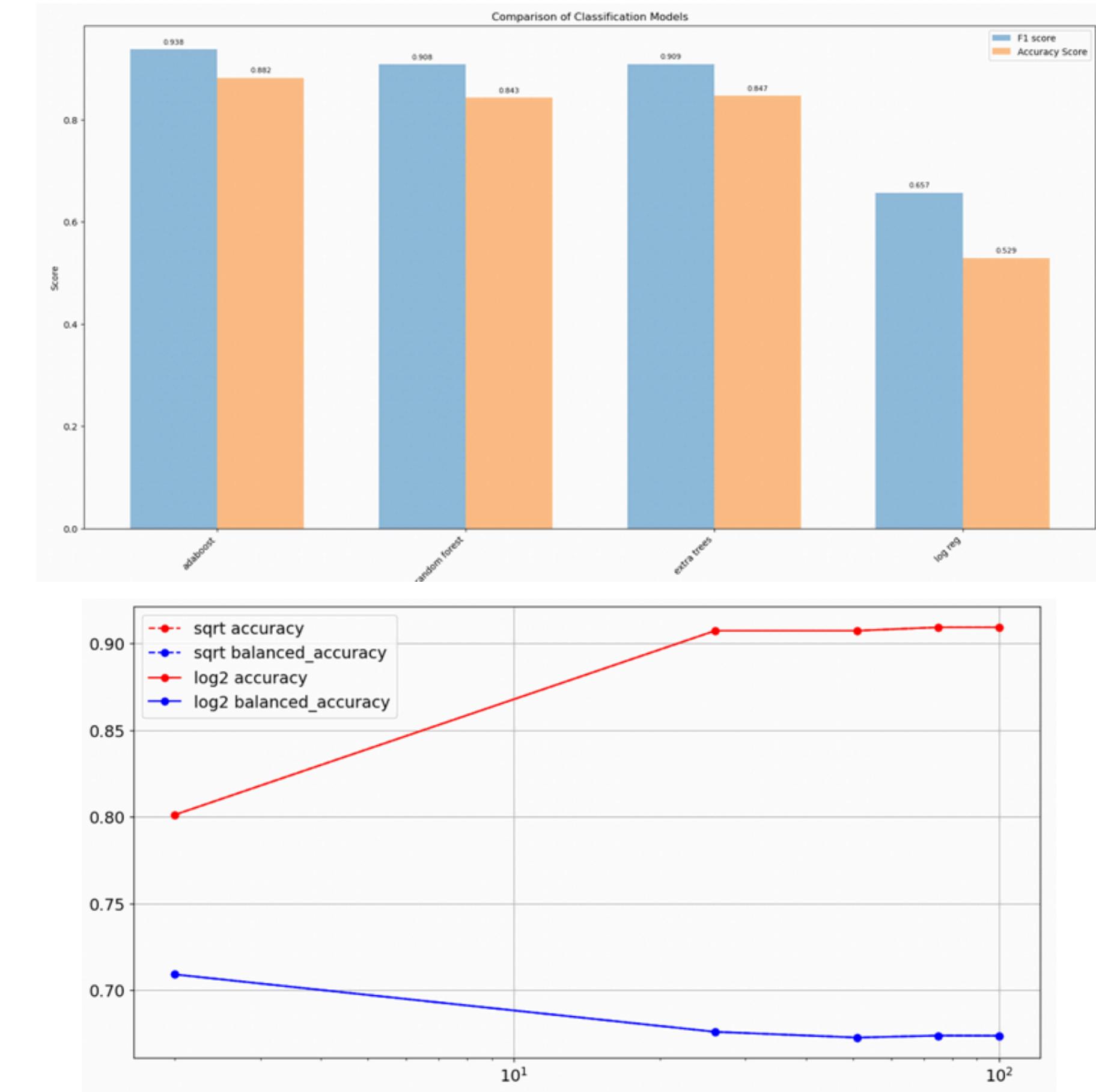
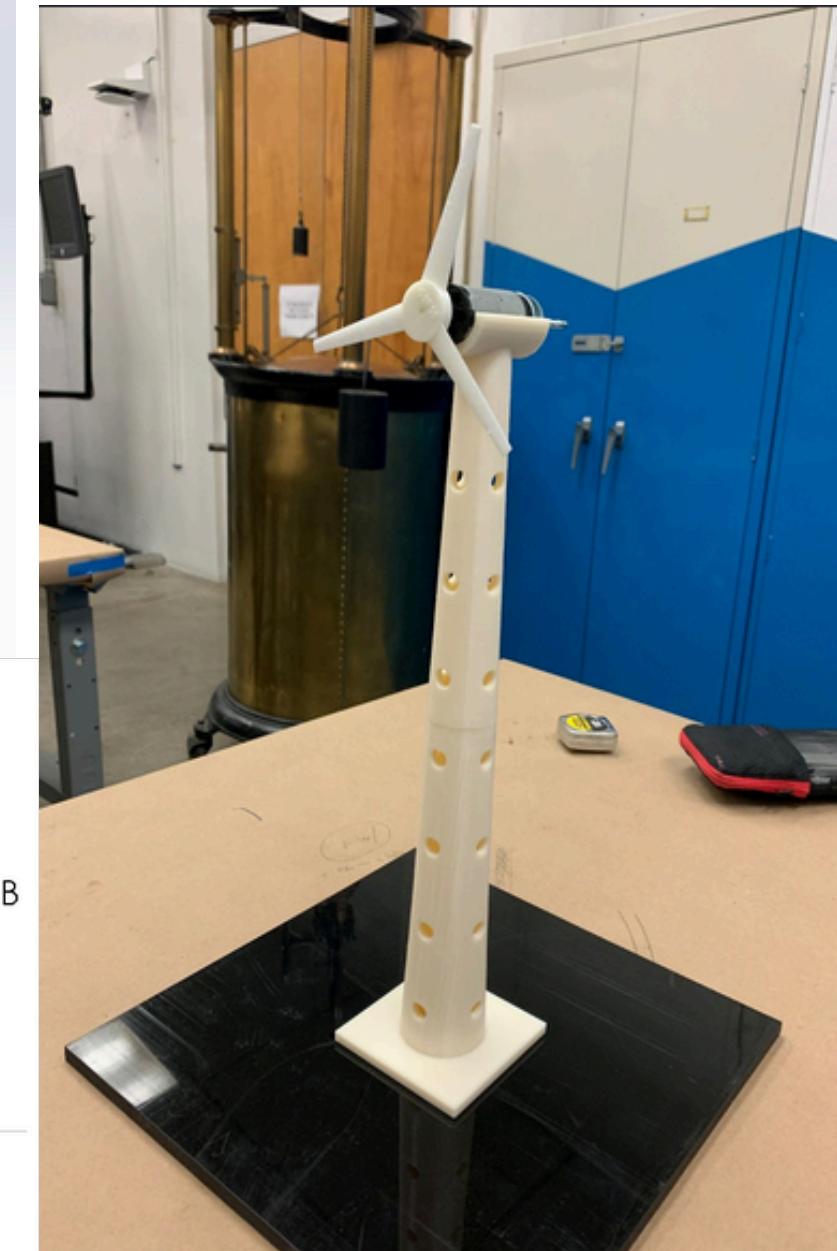
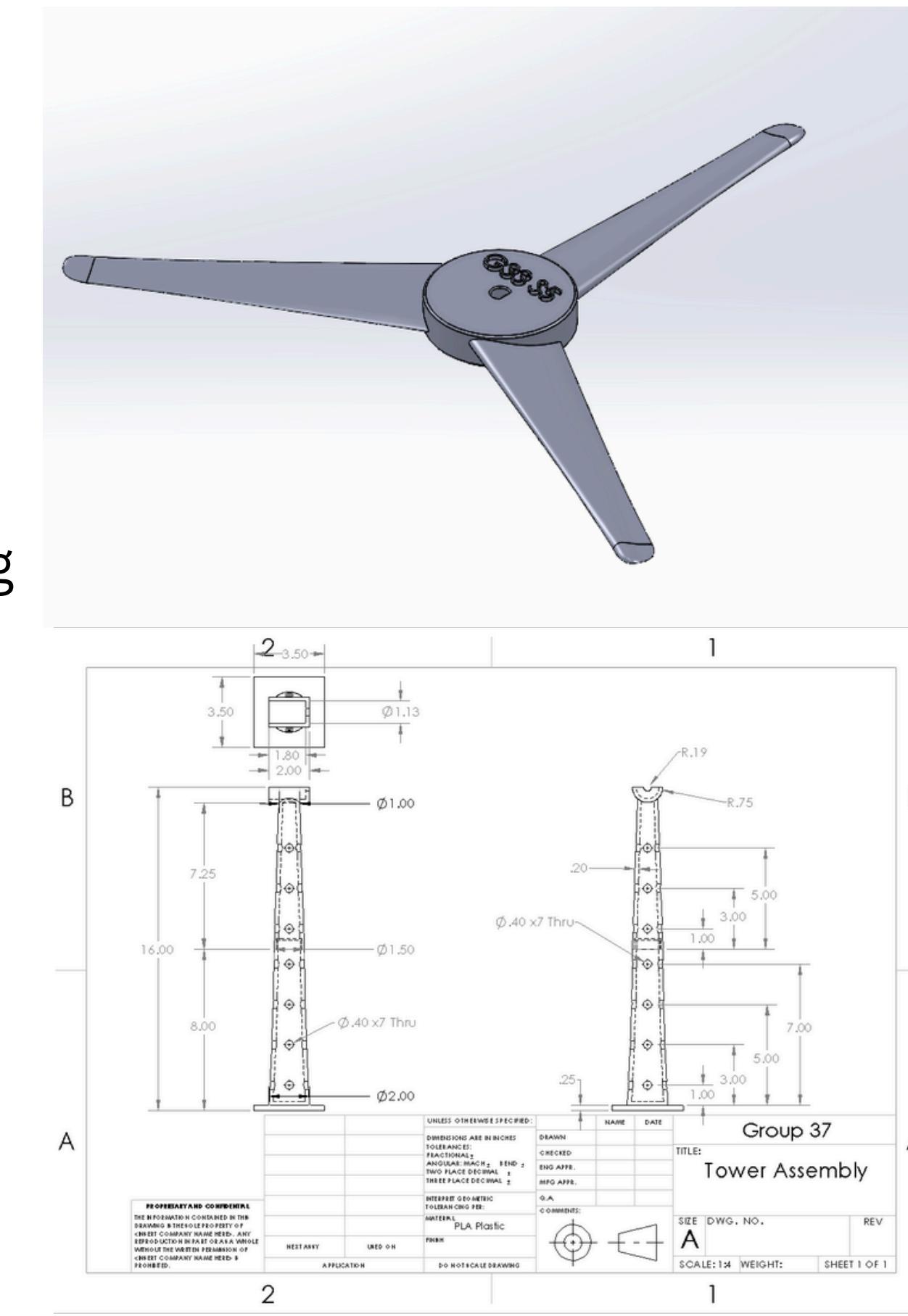
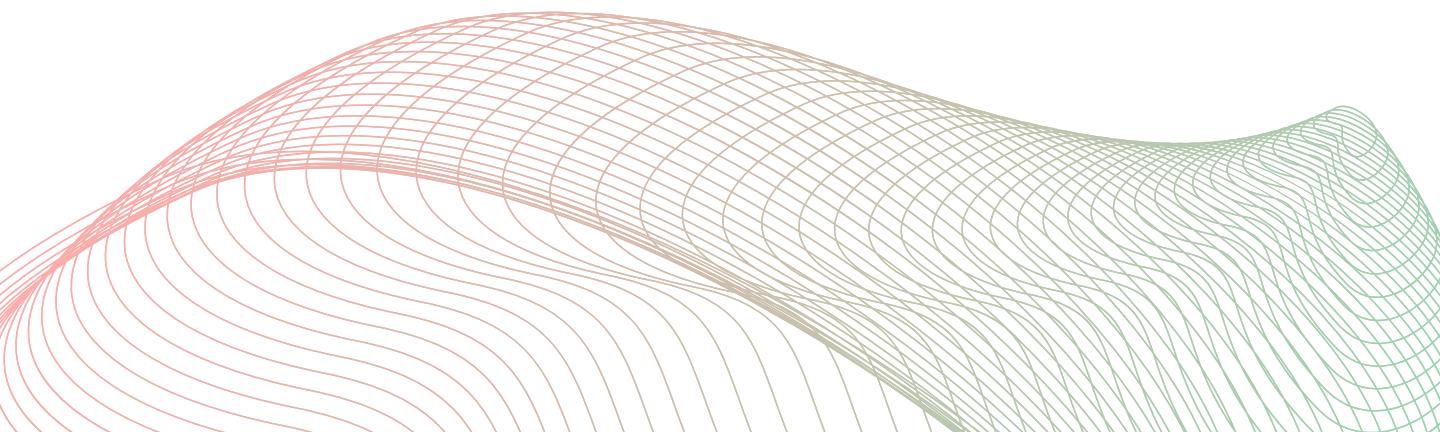


Figure 4: Extra Trees Classifier Accuracies

# Wind Turbine

- Led Airfoil Design
- Airfoil Parameters:
  - AoA = 14°
  - AoT = 12°
  - 3 Blades
- Two part tower design for 3D printing
  - Optimized for Stiffness using FEA
  - Holes to stay under weight maximum



# Combat Robot

- 3lb Spinner Robot for Intra-School Competition
- Composite Body
  - Aluminum 6061 covered HDPE
- Steel Spinner
- Belt Drive

