# Projects Portfolio

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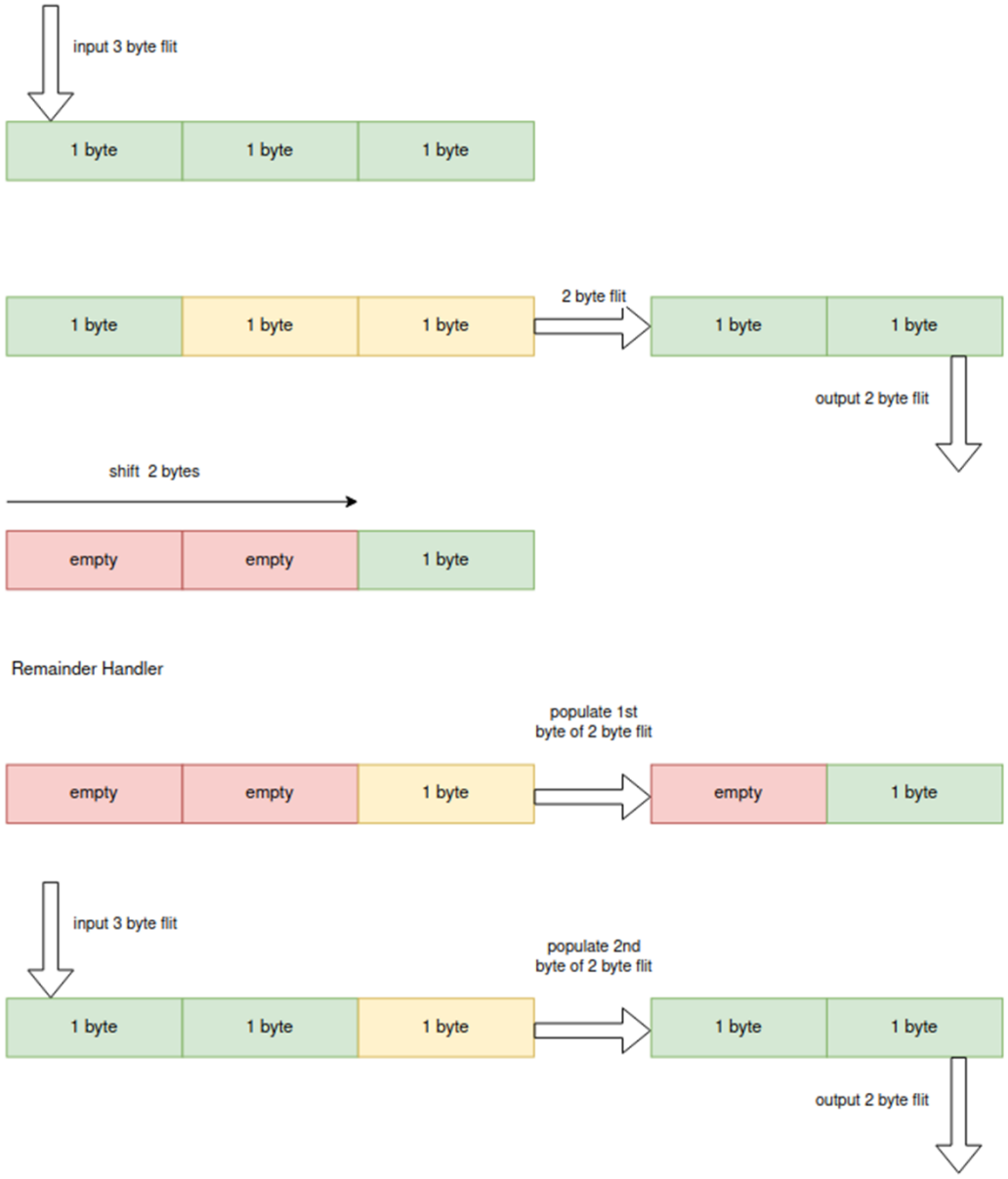
# AXI4-Stream Width Conversion Module

**Skills:** FPGA, C++, Vivado, Vivado HLS


- **Summary:** Designed a module to efficiently convert between various AXI4-Stream widths using as little resources as possible on the FPGA

- Iterated through multiple width conversion algorithms to find the most resource efficient solution
- Analyzed synthesized Vivado schematics to identify and resolve unintended areas of high resource usage resulting from high-level synthesis

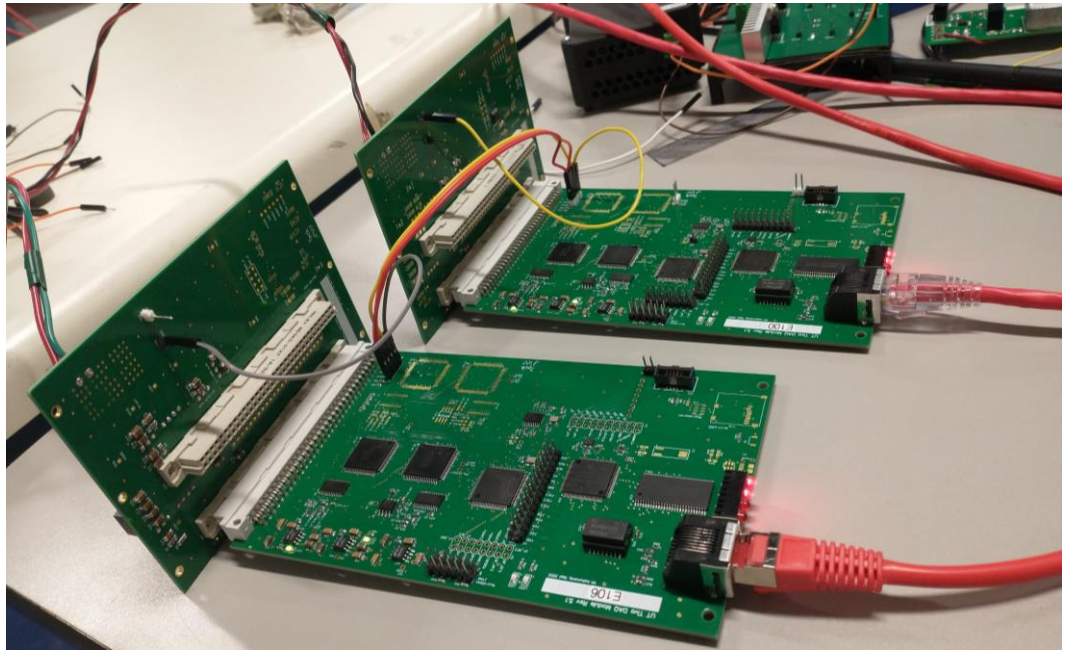



## Width Conversion Algorithm

- Implemented a bit-shifting technique to optimize resource utilization on FPGA
- Utilized template recursion to calculate remainder values (in-width/out-width != 0) at compile time
- Modified small code snippets in C++ to create more efficient high-level synthesis to reduce LUT usage
- Ask me about this during the interview!

# Custom FPGA Serial Communication

**Skills:** FPGA, System Verilog, Libero, Oscilloscope



- **Summary:** Wrote System Verilog code to synchronize acoustic anemometer sensor data for NASA

- Developed custom serial data transmission system to synchronize data from 3 dimensional ultrasound measurements
- Wrote comprehensive testbenches to debug issues involving data transmission
- Modified FPGA PLL to change data output frequency
- Used oscilloscope to test and debug output serial data

# 80V Power Module

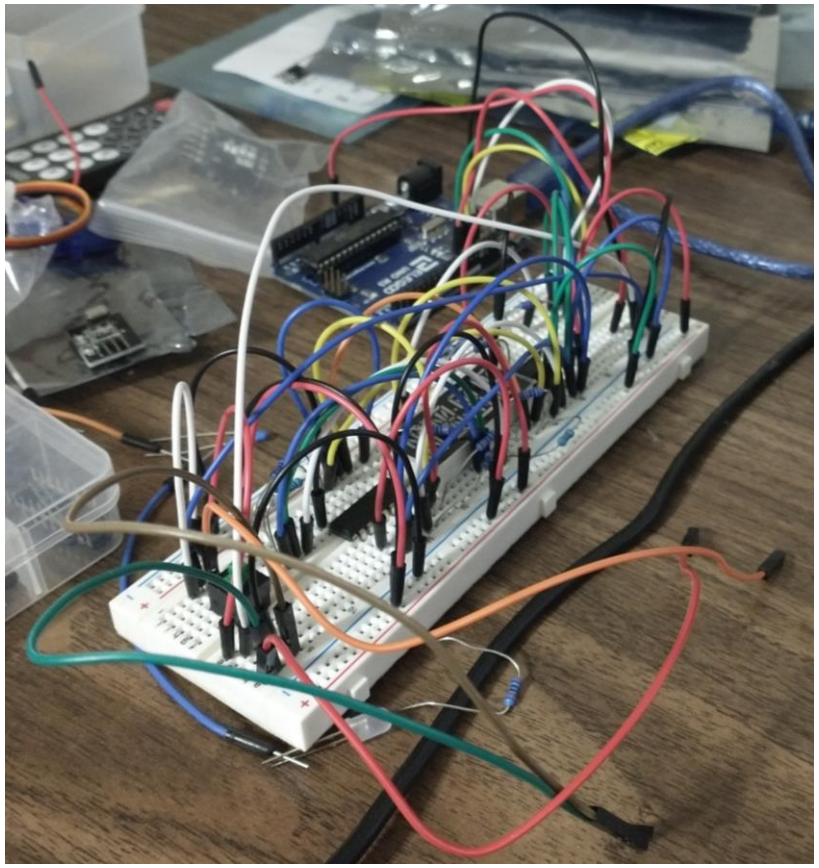
**Skills:** KiCAD, Fusion 360, Soldering, Voltmeter

- **Summary:** Created 80V power module PCB to test new anemometer design

- Researched components online through Digikey while optimizing cost for board
- Designed enclosure for PCB minimizing filament usage and accounting for heat flow


# Ultrasonic Measuring Tool 🔗

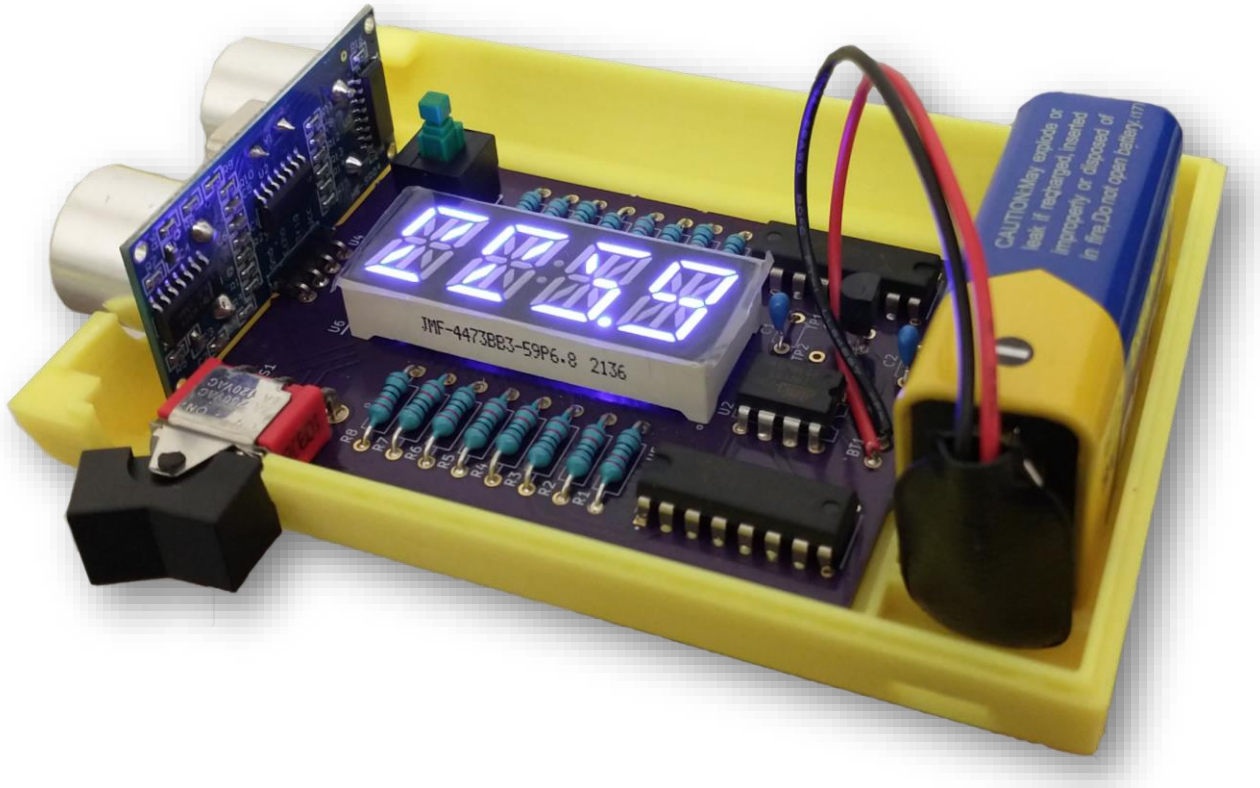
**Skills:** KiCAD, C++, Arduino, SOLIDWORKS, Soldering



- **Summary:** Designed a PCB for measuring distance using ultrasound and then used SOLIDWORKS to create an enclosure for it

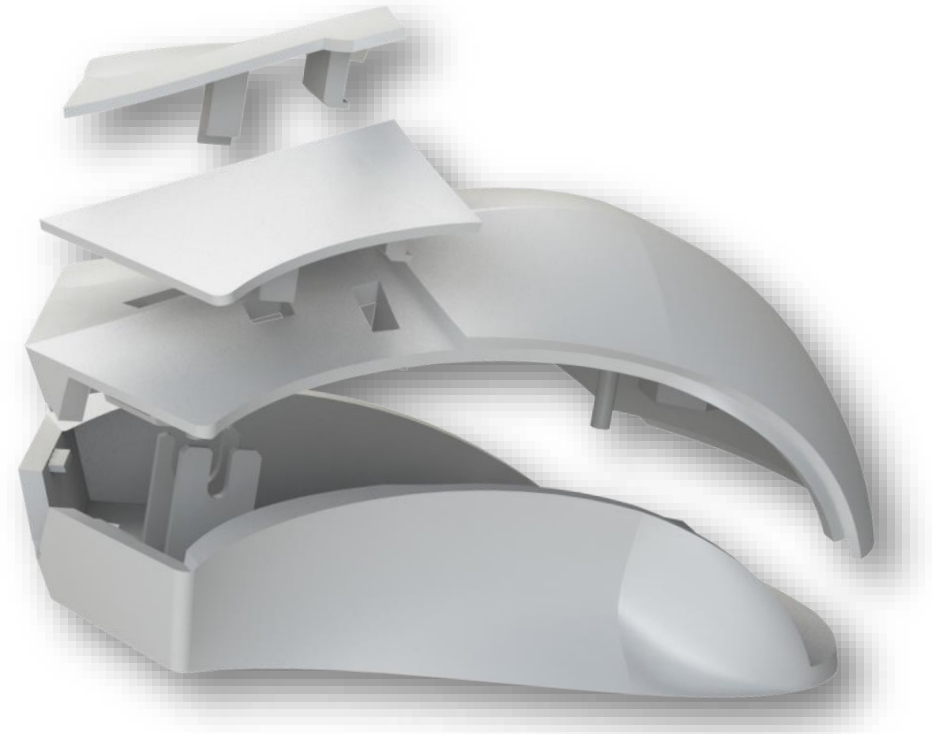
- Researched components online through Digikey and designed the PCB according to specifications
- Tested and debugged circuit design using breadboard
- Soldered components onto PCB

- Cut traces and soldered on physical wires to implement fix for PCB design
- Implemented pin change interrupts on ATtiny85 microcontroller so display would update while return pulse period was being measured
- Designed enclosure in SOLIDWORKS accounting for tolerances to create snap fit between top and bottom pieces



# COMPUTER MOUSE SHELL 🔗

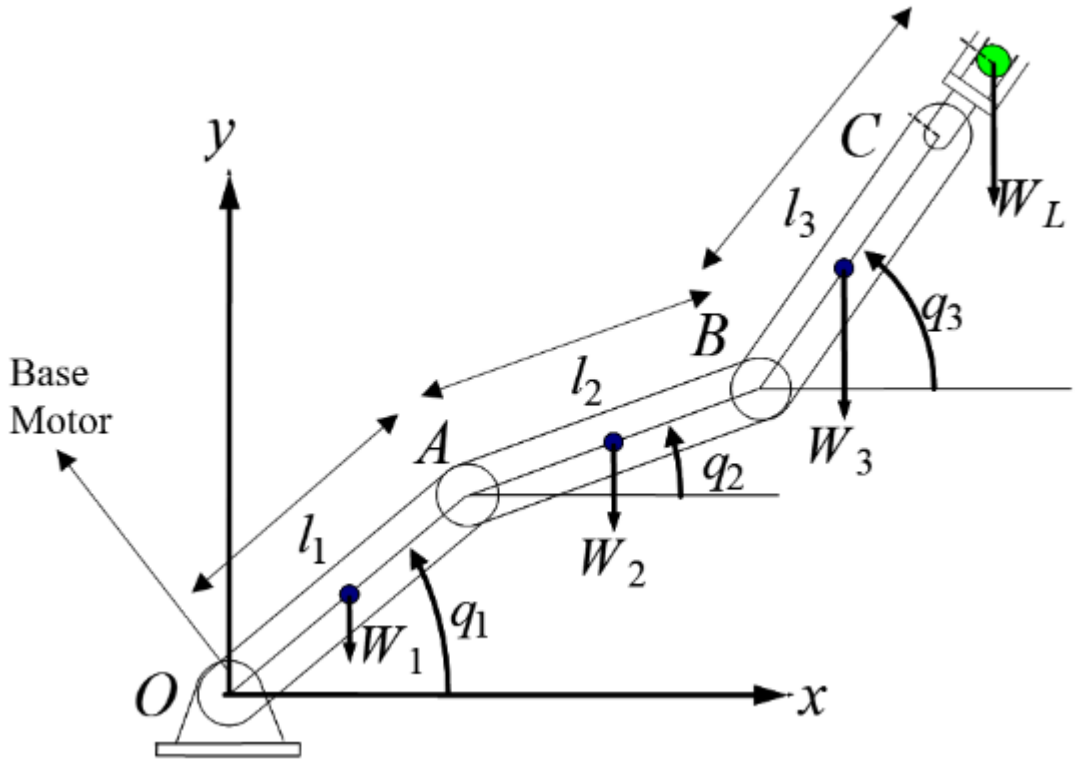
**Skills:** SOLIDWORKS, GD&T, Cura



- **Summary:** Designed a mouse shell in SOLIDWORKS to encase unused computer mouse circuit board
- Learned surfacing tools in SOLIDWORKS to create sleek design
- Enclosure precisely measured to fit circuit board, mouse keys and expose scroll wheel
- Performed iterative design process to perfect ergonomic feel of mouse

# LEAST TORQUE CALCULATOR

**Skills:** C++, Cosine Law, Vectors



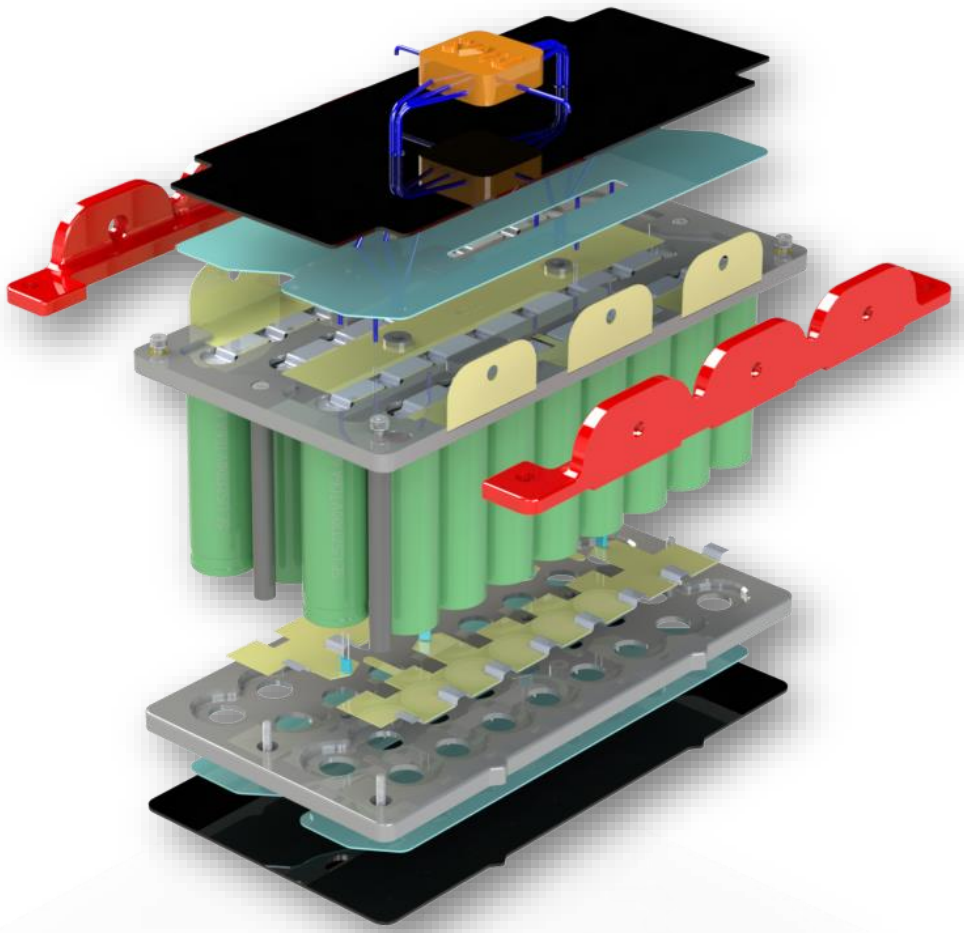

- **Summary:** Designed and programmed a C++ script to find the combination of 3 links that produce the least torque in 3 positions

- Utilized Cosine Law to find the length of the first 2 links
- Implemented link collision detection to detect if links are intersecting
- For a detailed look check out this report!

| | Gripper Location | Link 3 Orientation |
|---|---|---|
| Position 1 | x = 0.75m, y = 0.1m | $q_3$ = -60° w.r.t the x-axis |
| Position 2 | x = 0.5m, y = 0.5m | $q_3$ = 0° w.r.t the x-axis |
| Position 3 | x = 0.2m, y = 0.6m | $q_3$ = 45° w.r.t the x-axis |

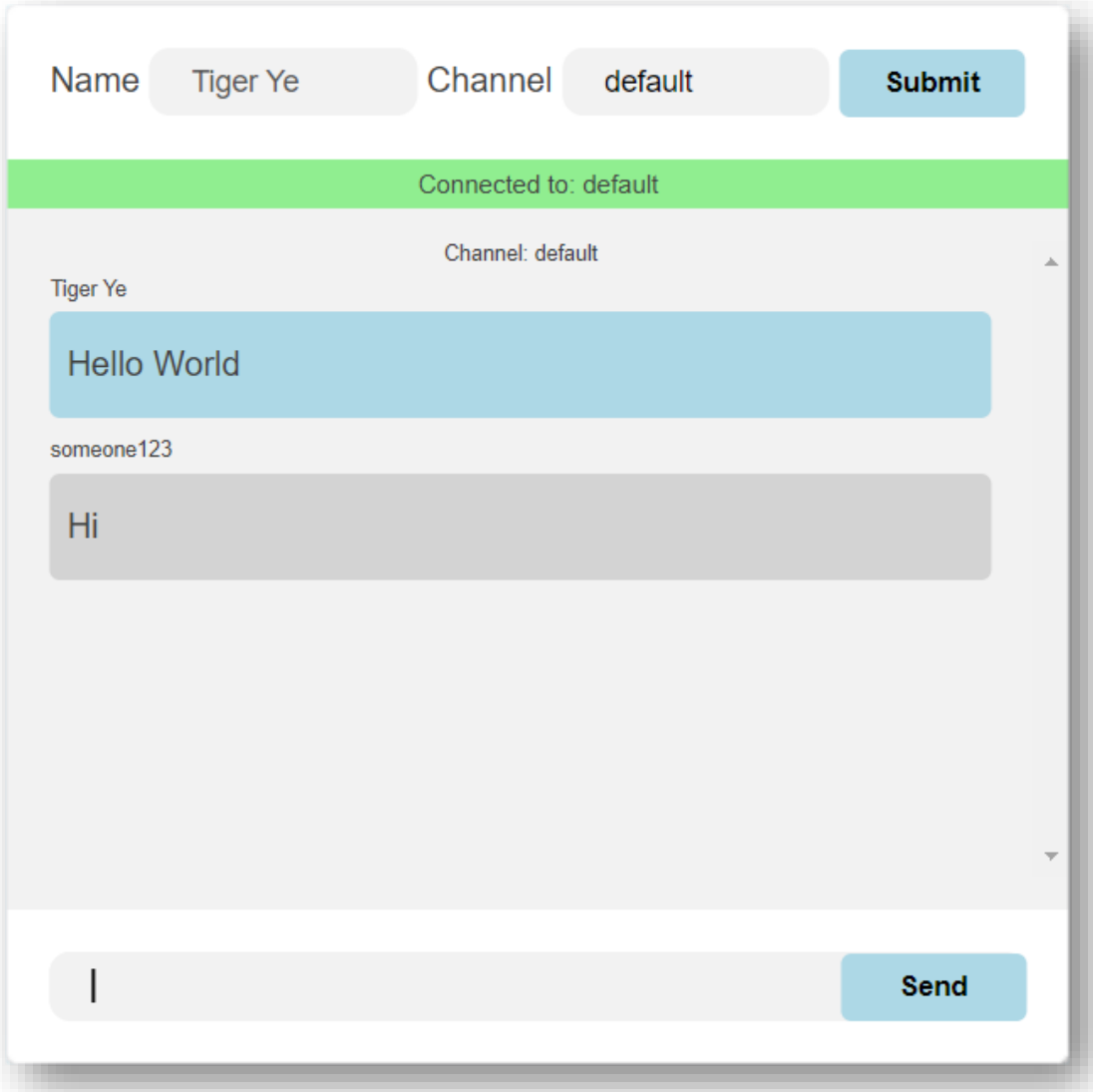
# BATTERY MODULE

**Skills:** SOLIDWORKS, GD&T, Spot Welding, Electrical Insulation



- **Summary:** Designed a 4s8p battery module for Midnight Sun solar car team using 21700 sized lithium-ion cells

- Analyzed and calculated ideal busbar area and connection force using Holm Contact Resistance Model
- Included wires using 3D sketch to model connections and account for spacing needed
- Added fish paper and acetal plates for electrical insulation




# CHAT APP 🔗

**Skills:** Node.js, jQuery, JavaScript, CSS, HTML, Ably Realtime API, Heroku, Express.js

- **Summary:** Programmed an online chatroom application using Ably Realtime API and was hosted on Heroku servers *they removed free hosting :(

- Utilized Express.js for backend JavaScript code
- Applied jQuery to add HTML message components to chat

# FRC 2019/2020 ROBOT

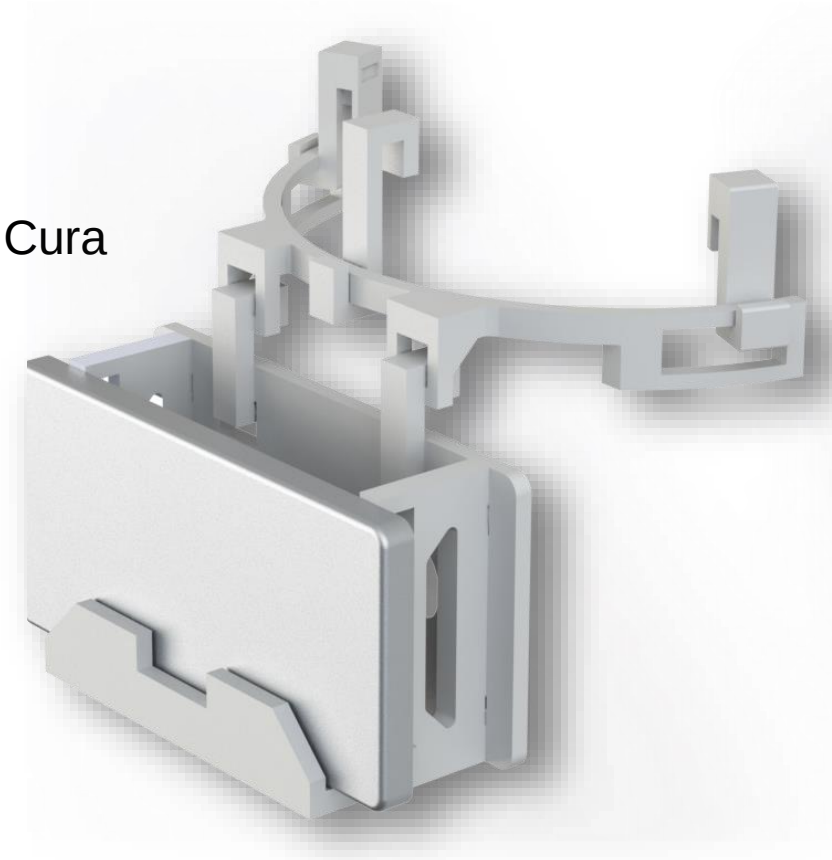
**Skills:** Fusion 360, Drill Press, Filing, Milling, Band Saw, Hand Drill, Riveting, Communication, Leadership

- **Summary:** Led the design and construction of Team 1246's 2020 FRC robot

- Static stress simulations performed in Fusion 360 to ensure climb mechanism could support robot weight
- Integrated parts from McMaster-Carr into design of robot
- Directed workflow and communicated with other leads in a fast-paced work environment


# VR HEADSET 🔗

**Skills:** SOLIDWORKS, GD&T, Measuring Dimensions, Iterative Design, Cura

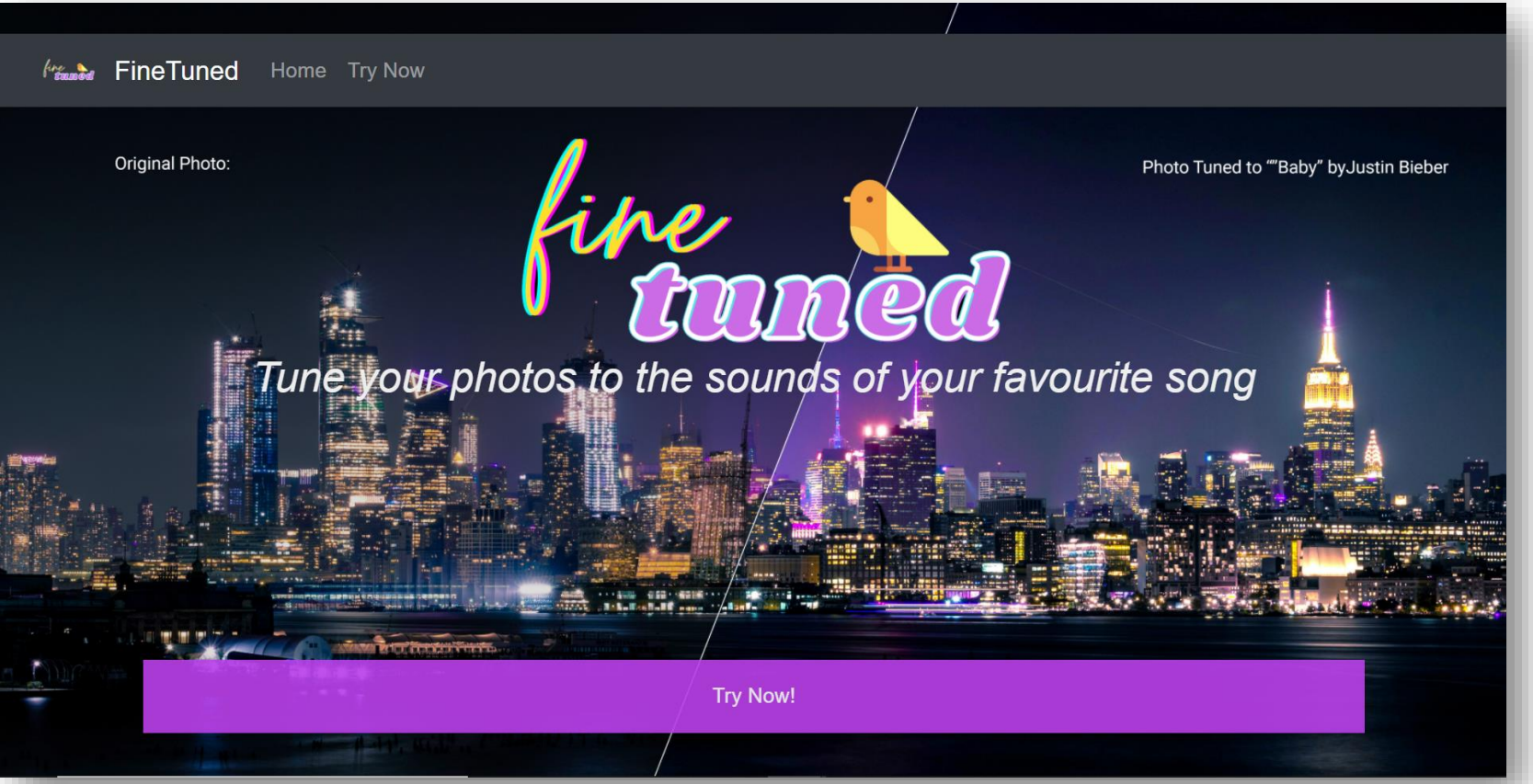


- **Summary:** Designed modular VR headset for phone in SOLIDWORKS

- Incorporated phone, lens, and headpiece into VR headset design
- Accounted for tolerances for easy assembly
- Tested and optimized lens placement for optimal 3D effect

# FINETUNED

**Skills:** Python, PIL Library, Spotify API, Flask




- **Summary:** Designed a webpage that edits photos based on song data
- Used PIL Library in Python to edit images based on Spotify API values
- Utilized Flask to build parts of application using Python

# Some Other Projects

- **Curling Game** – My first big coding project, a curling game coded in Python using Pygame
- **3D Printable Turntable** – Designed a simple turntable for my mom to hold kitchen spices in Fusion 360
- **Game of Pig** – Programmed the game of pig in Java for a culminating project
- **Phone Stand** – Designed an adjustable phone stand in SOLIDWORKS for project
- **IEEE754 Converter** – Programmed Java application that manually converts integers to IEEE754 and vice-versa
- **Millennium Puzzle** – Used Fusion 360 to design an intricate prop from a childhood TV show
- **Car CAD** – Designed a simple car using surfacing features in Fusion 360

**For More Check Out My**

**GitHub:** https://github.com/tigerqye

**GrabCAD:** https://grabcad.com/tiger.ye-1