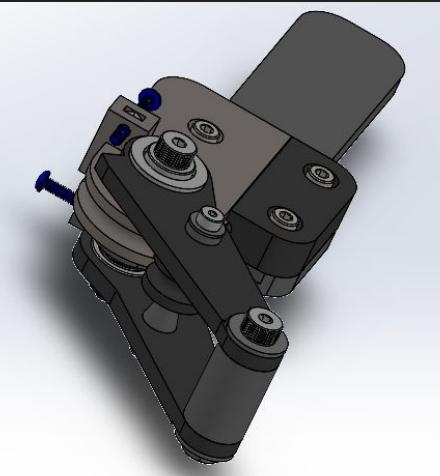


# A Project Portfolio

Eliot Wachtel

# Mechanical designs for Gener8 - Heat Pipe Bender



Situation: Mixed Engineering Internship at Gener8 assisting with alpha unit design for a biomedical testing product.

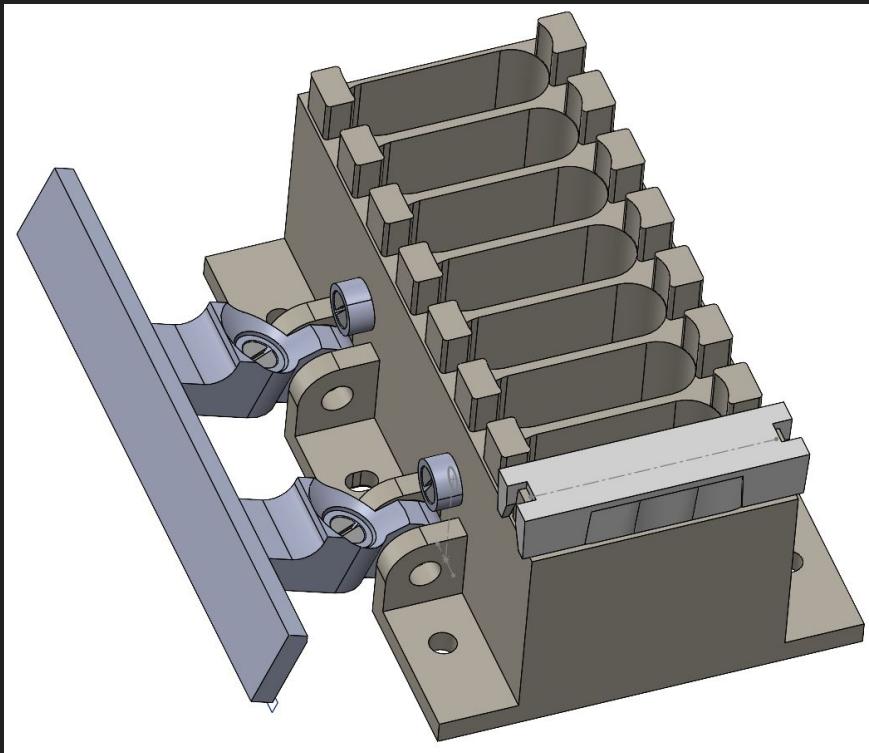
Task: Design and manufacture a device to repeatedly bend heat pipes to a specific angle without crimping or cracking.

Action: Designed in SolidWorks, Version controlled with SolidWorks PDM.

Result: A primarily 3D printed device using off the shelf parts from McMaster-Carr.

~15% of the cost of an off the shelf pipe bender.

# Mechanical designs for Gener8 - Chemical Cartridge Holder



Situation: Mixed Engineering Internship at Gener8 assisting with alpha unit design for a biomedical testing product.

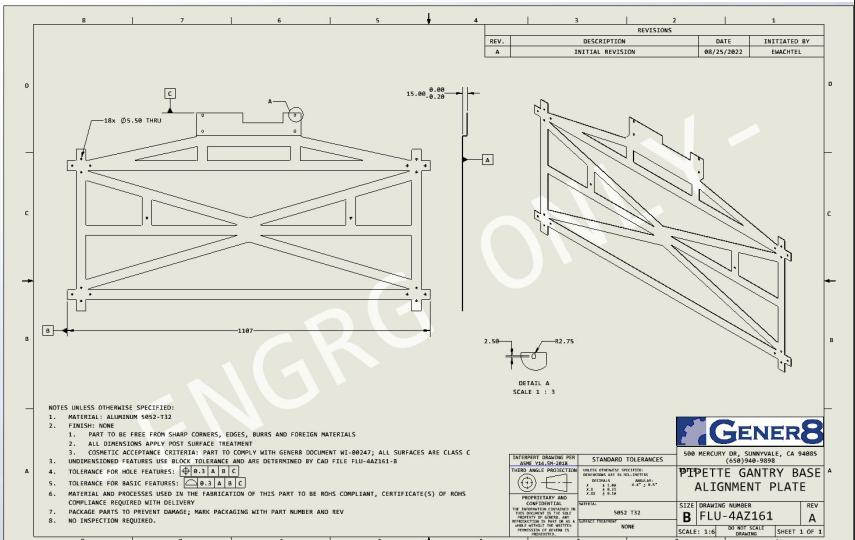
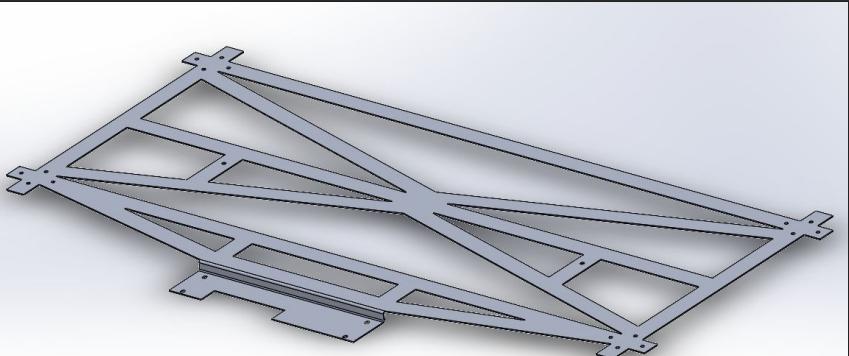
Task: Design for manufacture a device to hold cartridges with secure retention while suspending particles with magnets.

Design needed to be easily manufacturable and highly chemical resistant.

Action: Designed in SolidWorks, Version controlled with SolidWorks PDM.

Result: An assembly with two CNC machinable plastic parts and a small BoM of magnets and McMaster-Carr components.

# Mechanical designs for Gener8 - Sheet Metal Alignment Jig



Situation: Mixed Engineering Internship at Gener8 assisting with alpha unit design for a biomedical testing product.

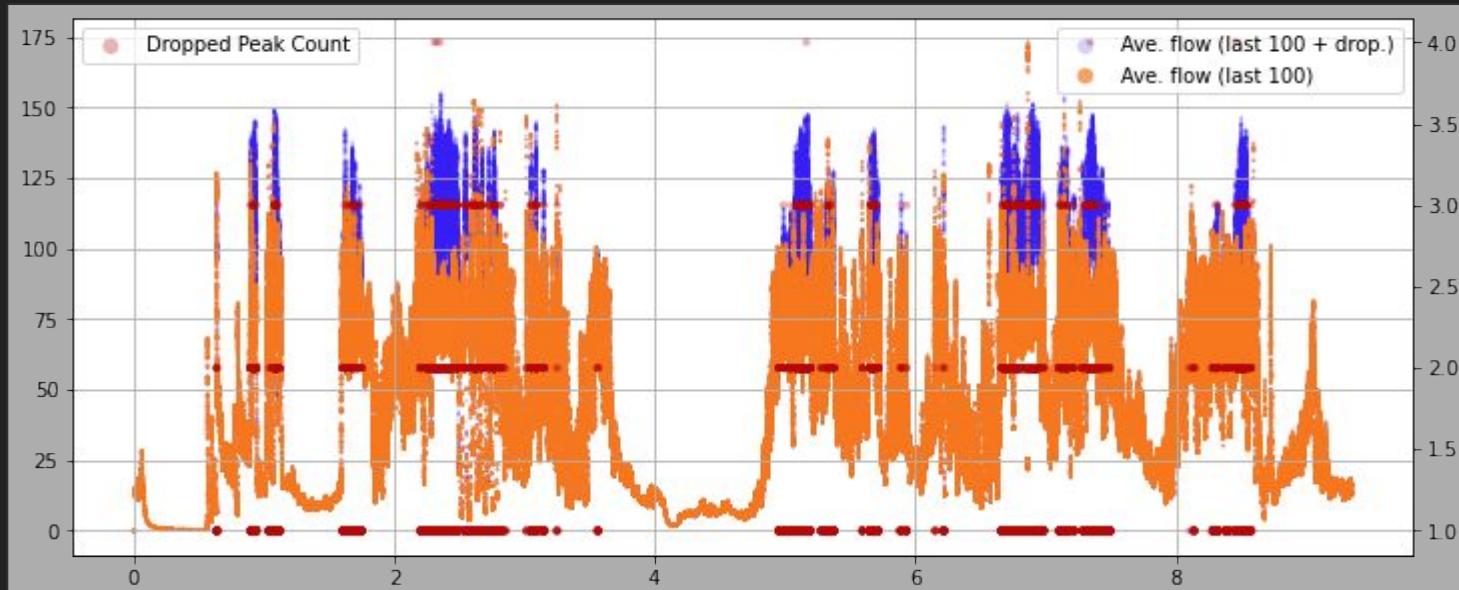
Task: Design for manufacture a part to assist with the alignment of a two axis gantry during assembly.

Design needed to be easily manufacturable so sheet metal manufacturing was selected.

Action: Designed in SolidWorks, Version controlled with SolidWorks PDM.

Result: An assembly with two CNC machinable plastic parts and a small BoM of magnets and McMaster-Carr components.

# Data Science for Gener8 - Analysis of million line Excel file



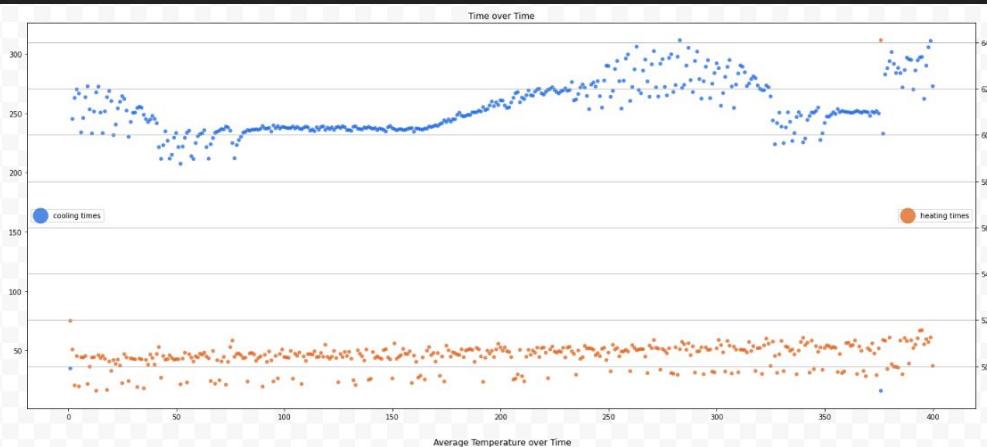
Situation: Mixed Engineering Internship at Gener8 assisting with a biomedical testing device.

Task: Processing and analyzing million line CSV files. Assigned using Excel but I chose to use Python to automate the process.

Action: Python tool programmed in Google Colab using Python with the Numpy, Pandas, and Matplotlib libraries.

Result: A tool for future processing and graphs compiling relevant information (purpose of information can not be specified).

# Data Science for Gener8 - Heating Element Lifetime Repeatability



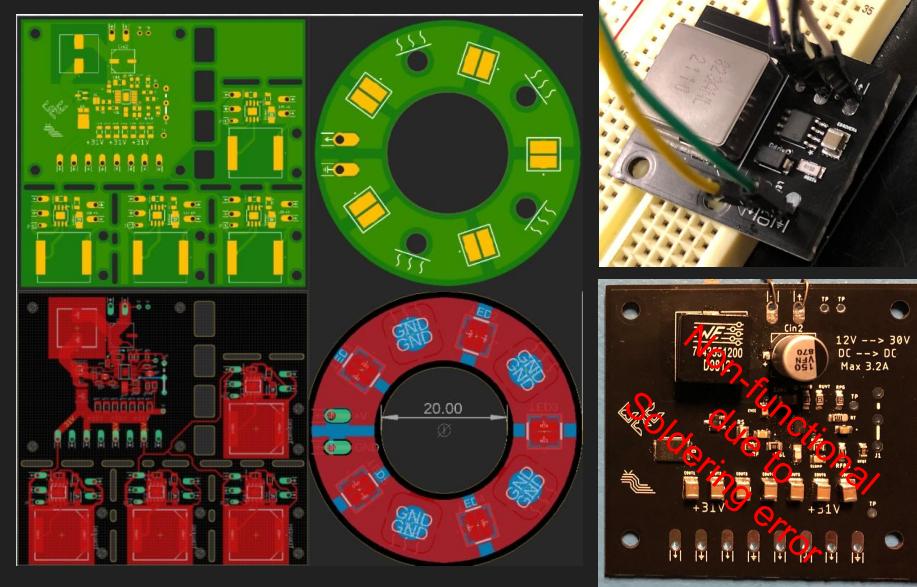
Situation: Mixed Engineering Internship at Gener8 assisting with a biomedical testing device.

Task: Testing the repeatability of a heating element throughout its estimated lifetime cycles.

Action: Test program to control the heating element and record sensor data written in python. Tool to process and visualize data written in Python using Numpy, Pandas, and Matplotlib.

Result: A tool for future processing and graphs compiling relevant information (purpose of information can not be specified).

# High Powered ROV Lighting System - Part 1

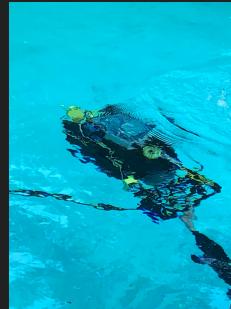
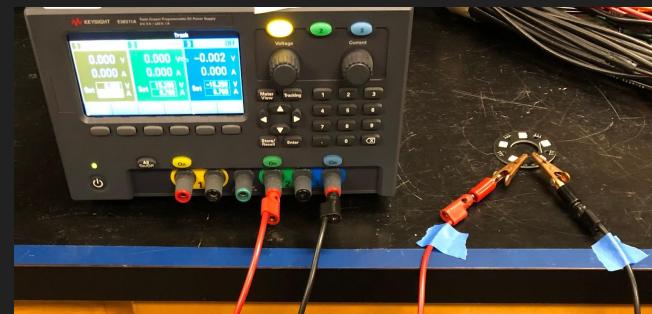


Situation: The UCSC robotics club (Slugbotics) needed an improved lighting system for underwater computer vision which needed to run off of 12 volts.

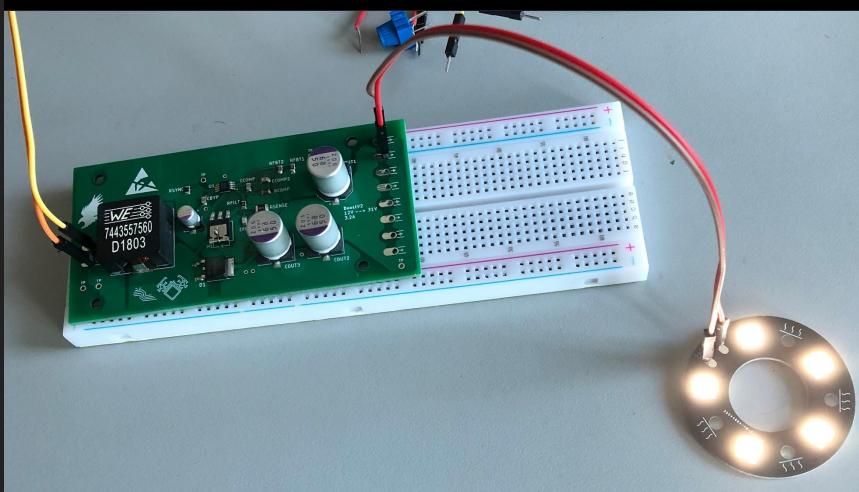
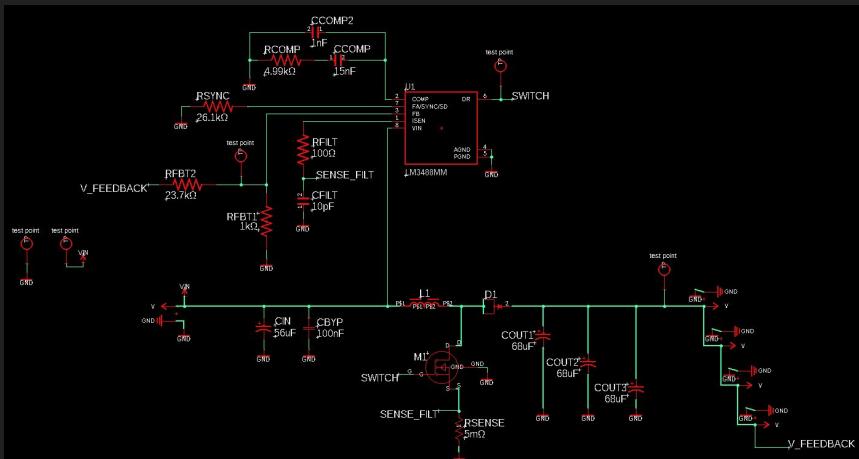
Task: The research, sourcing, and design for manufacture of a light ring, current control LED driver, and boost converter power supply.

Action: Designed in EAGLE, Version controlled on GitLab.

Result: Assembly for the ring lights and constant current drivers was successful. The boost converter had a short and Digi-Key was out of stock of replacement ICs.



# High Powered ROV Lighting System - Part 2



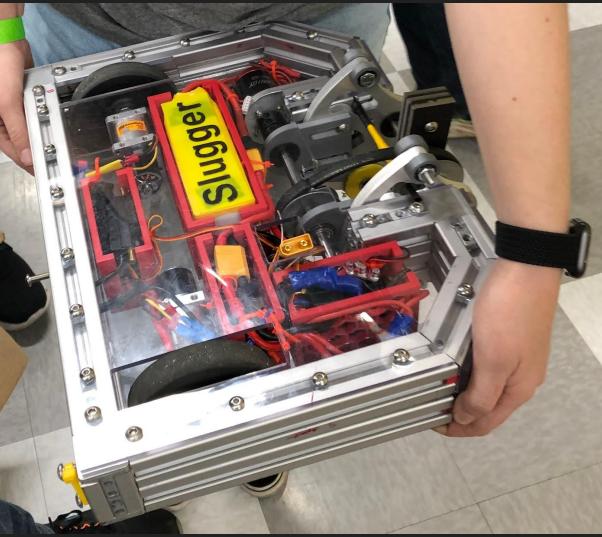
**Situation:** My first design for boost converter failed and replacement parts were unavailable so a new design was necessary.

**Task:** The research, sourcing, and design for manufacture of a replacement 12 to 51 volt boost converter power supply for my custom dimmable light ring system.

**Action:** Designed in EAGLE, Version controlled on GitLab. I used this redesign as an opportunity to use new routing techniques.

**Result:** New boost converter was successful!

# Slugger: 15lb combat robot



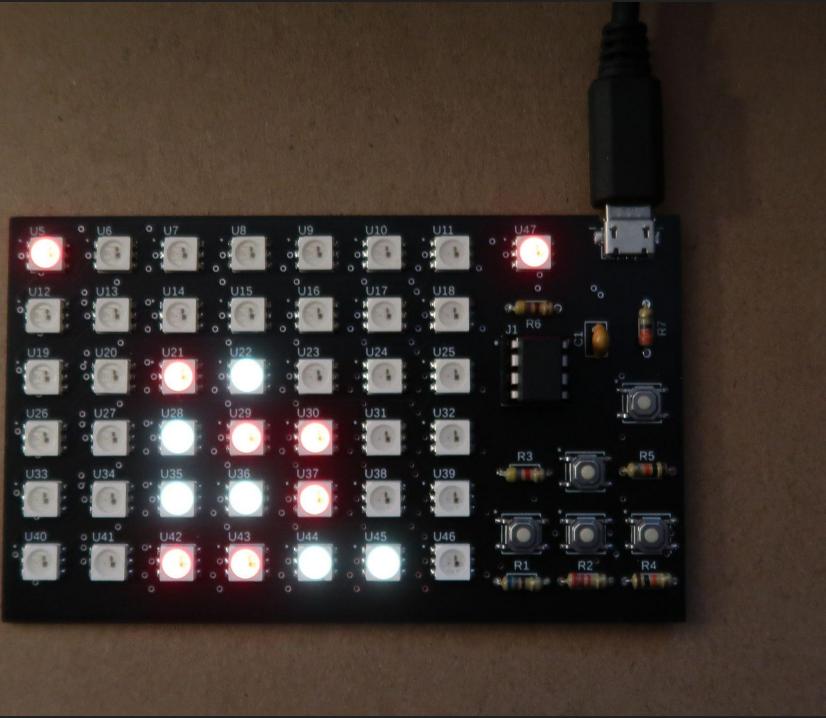
Situation: Robotics team wants to compete in a 15lb combat robotics event.

Task: Source and assemble the electrical system for the robot.

Action: Calculated necessary motor torques and speeds, sourced electrical components and hardware to interface with them, assembled the electrical system.

Result: A fully functional robot who's electrical system stayed working even after the frame was rendered too deformed to drive.

# Pocket Sized Connect Four on a PCB



Situation: I wanted to practice DFM and assembly for SMD components.

Task: Design a pocket sized game of connect four using WS2813 addressable RGB LEDs.

Action: Designed in Fusion 360 (CAD and ECAD), programed in Arduino IDE C++. Documented on Github.

Result: A playable game of Connect Four running on an ATTINY 85.

# Special Character Key Pad with Variable Keys



Situation: I was attending university online, so I ended up needing to type out a lot of math notes.

Task: Design a tool to help speed up the process of writing notes.

Action: Designed in Fusion 360 (CAD and ECAD), programed in CircuitPython. Documented on Github.

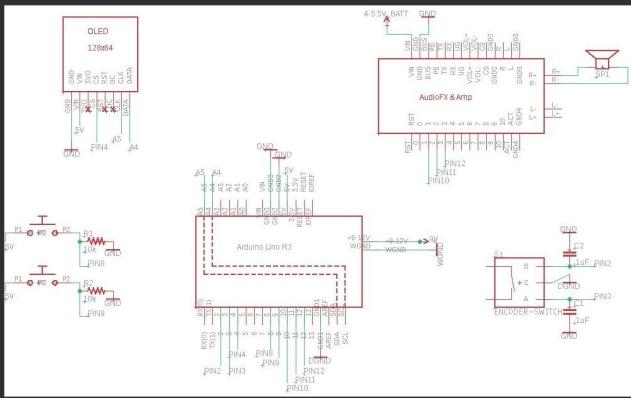
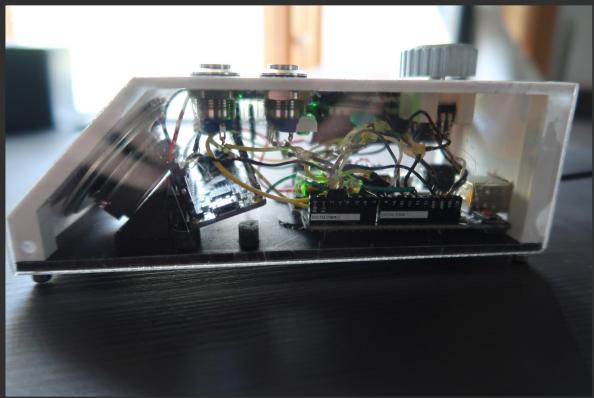
Result: A device which significantly simplified the process of typing special characters and opens up the ability to type programming shortcuts and hotkey combinations.

# Custom Desktop Alarm Clock

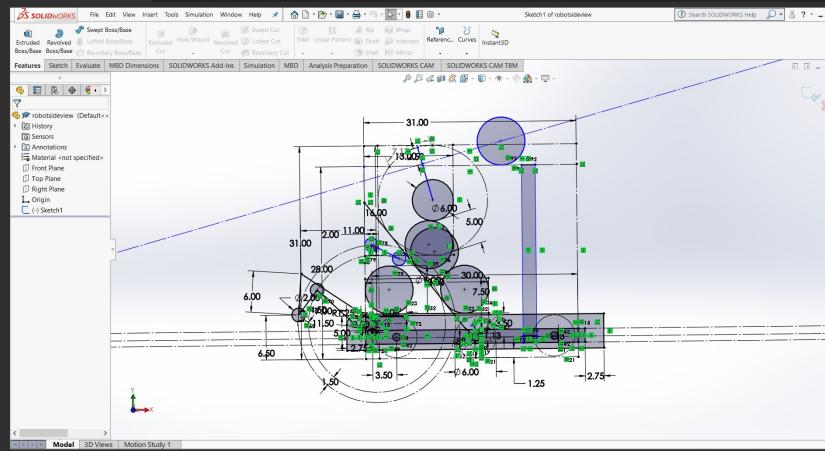
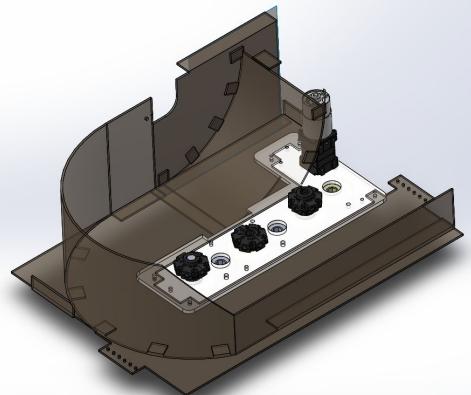
Task: To build a digital alarm clock to reduce my reliance on a phone to provide timing.

Action: Designed in Fusion 360 and Autodesk Eagle. Programmed in Arduino IDE (C++). Documented on Github.

Result: A fully functional clock with the ability to set alarms and run a Pomodoro timer.



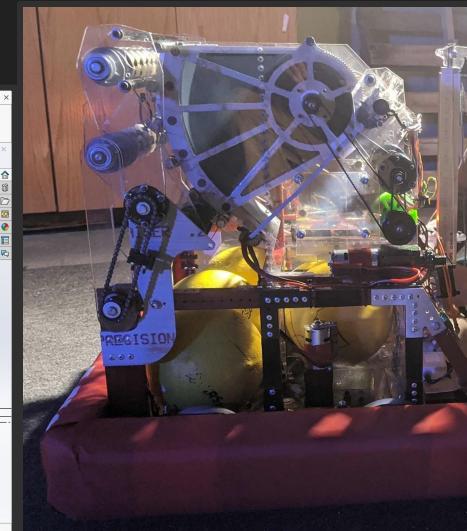
# Ball Storage and Loading System for the 2020 FRC Game



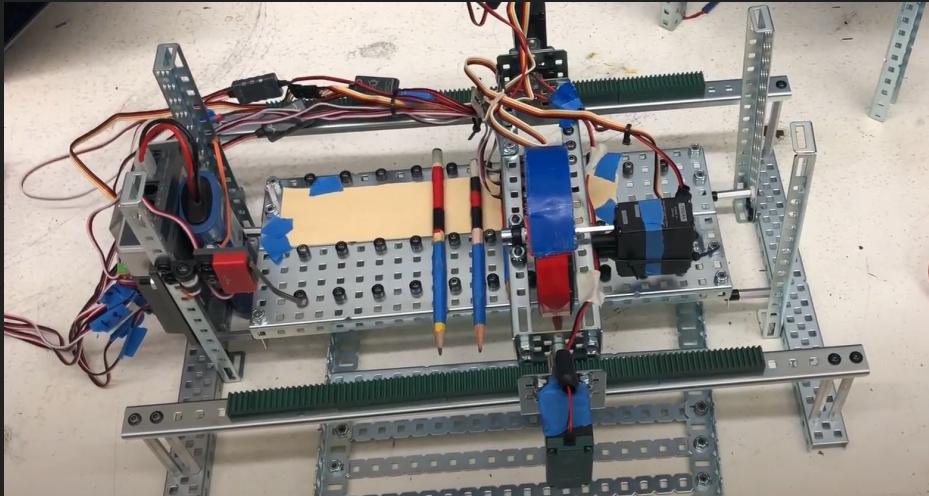
Task: Needed to hold five dodge balls in as compact a space as possible while also feeding a launcher positioned as close to the side where balls were collected as possible.

Action: Designed the mechanism in Solidworks (initial prototyping in OnShape)

Result: A low pressure undercutter system running in a U-shaped path that fed reliably.



# Unnecessary Pencil Bot



Task: Design a “useless” robot that performs an unnecessary or mundane action badly. I decided to design a robot to dispense specific pencils.

Action: Designed with VEX components and programmed with a C based VEX Cortex language. Pencils were dispensed based on a barcode entry and were detected with a digital color sensor.

Result: It functioned consistently at its very simple task.

# Electrical Test Bench



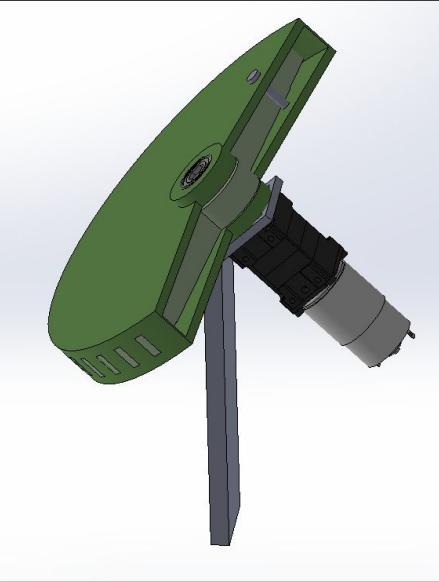
Situation: The new undergraduate lab space I am helping to design and build needed a table to host electrical test equipment.

Task: Design, source, and assemble a custom table to serve that purpose.

Action: Designed the table in CAD (OnShape), worked with four other students to source reclaimed wood and mild steel, welded table legs and cut tabletop planks.

Result: A fully functional work table capable of tool-less disassembly into four parts for transportation. Able to support the weight of at least three people when assembled.

# Misc. Projects



Mechanism for deploying and rotating a wheel with one motor.  
(SolidWorks)



3D printed tongs with low durometer hinge and pincers with more rigid handles.  
(Fusion 360, FDM print)



lathe machined rings on a resin 3D printed die.



Animated diorama attraction.  
(Fusion 360, 4DGL)



CNC milled wooden sword.  
(Fusion 360, Shopbot CNC)

# Thank you!

