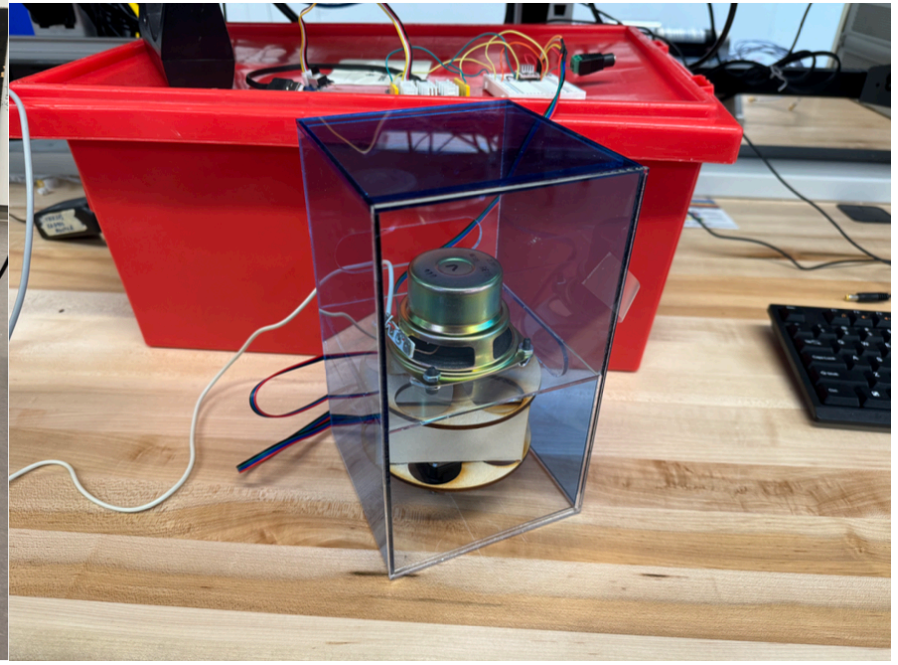
Elise Vergos - Portfolio

linkedin.com/in/elisevergos

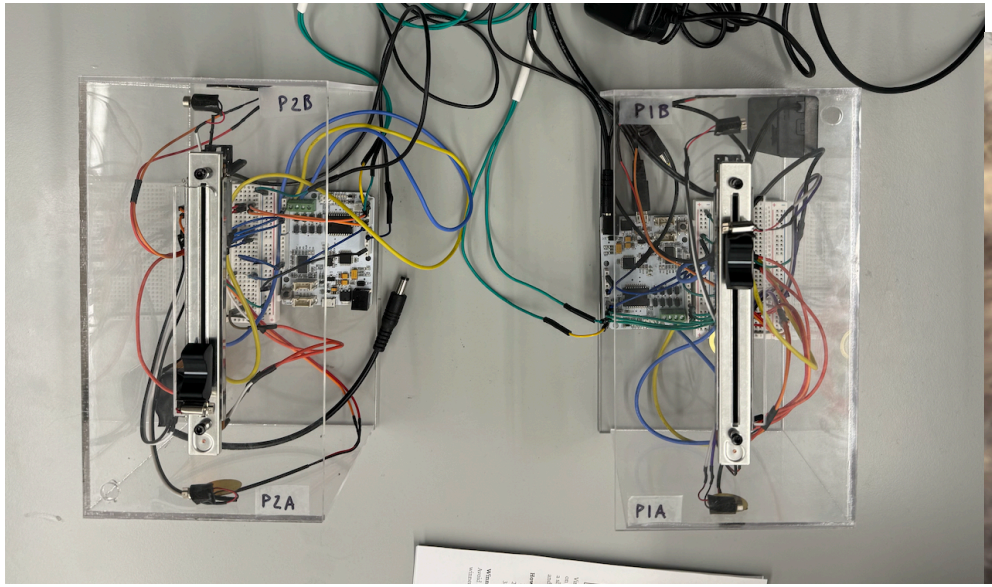
eav39@cornell.edu

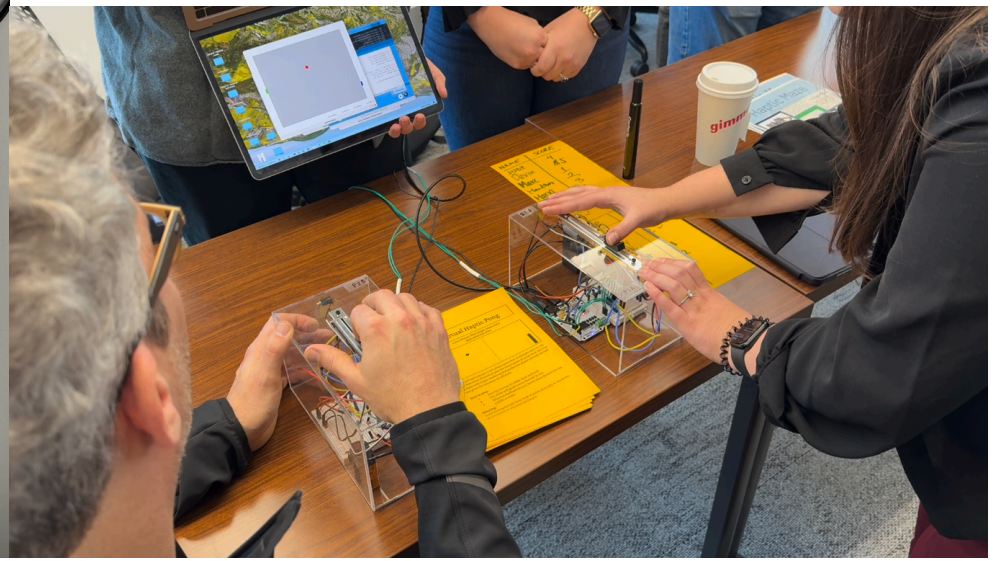




Leslie Speaker

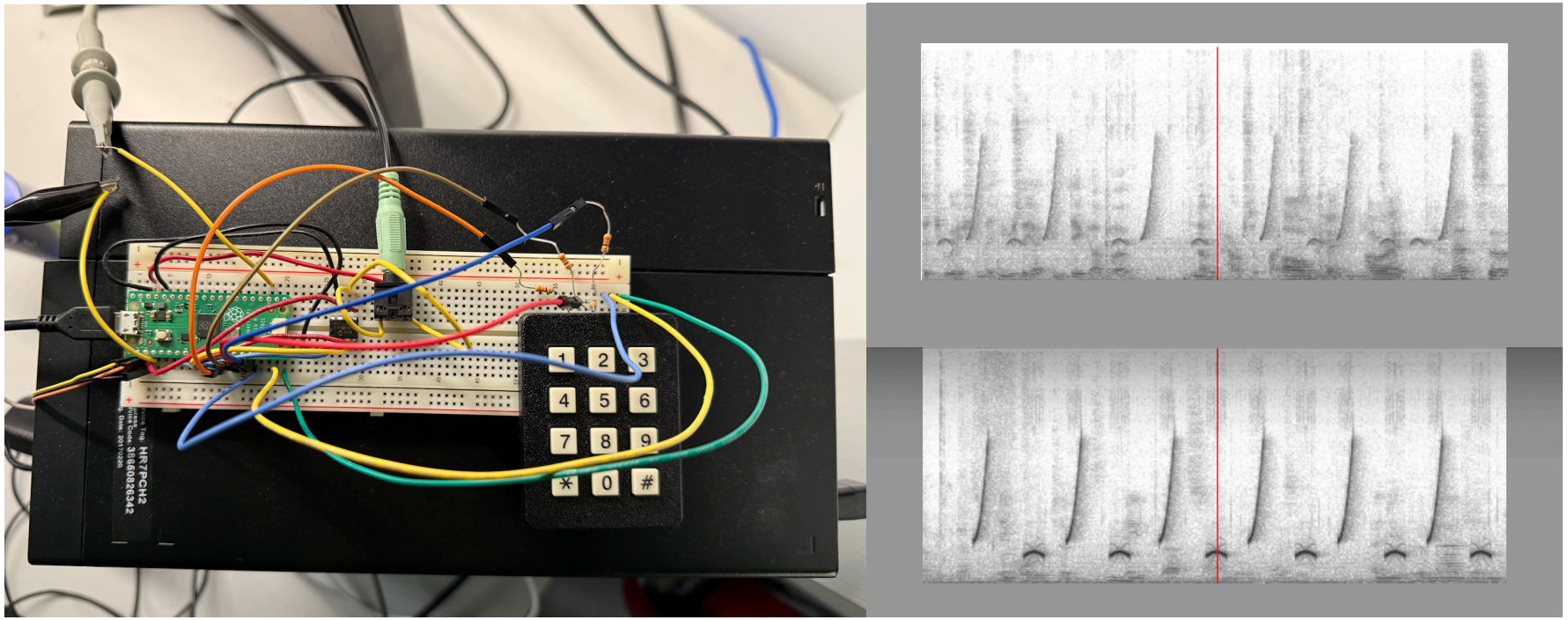
An iconic device that produces tremolo and vibrato effects through rotating assemblies, originally designed for the Hammond organ. This project aimed to recreate its core functionality by designing a mechanical frequency modulation system inspired by the bass rotor concept. The objectives included creating an easily operable, budget-friendly speaker system capable of achieving audible frequency modulation through mechanical means. The project leveraged principles like the Doppler effect and circuit design to simplify the complex mechanical aspects of the original Leslie speaker. One version was made with a pottery wheel, other with a stepper motor. Both included thrift shop speaker cones, scrap wood/acrylic, and some laser cutting.





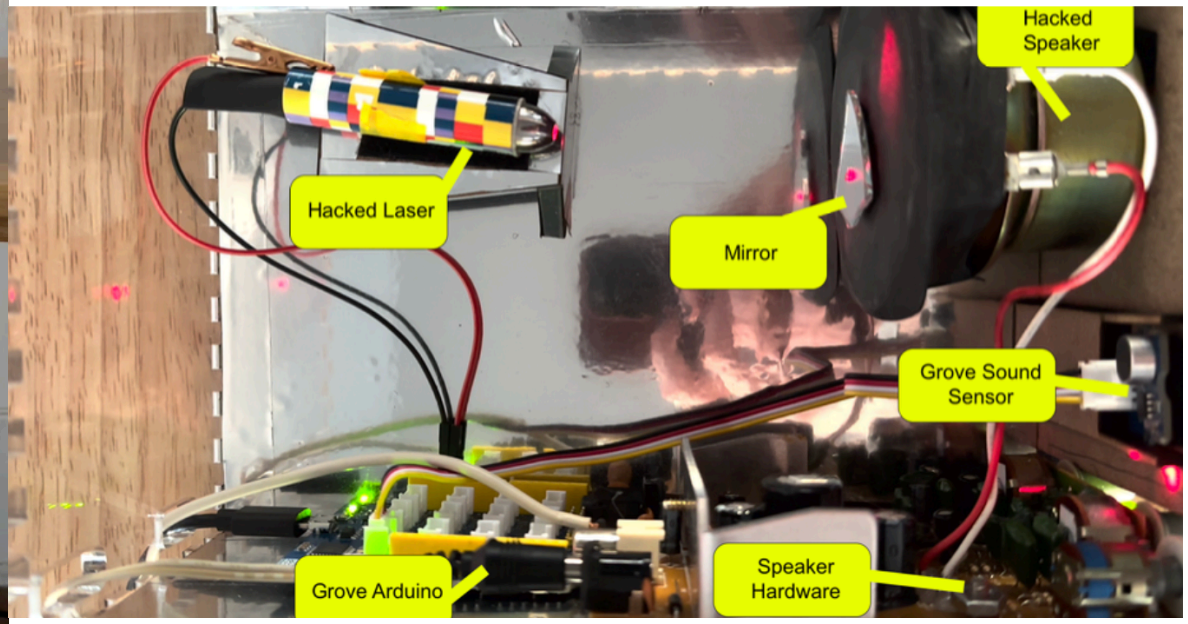
Haptic Pong

This project explores touch-driven gameplay by developing a display-less version of Pong, challenging players to rely solely on haptic feedback. The system repurposed motorized slide potentiometers, or flying faders, for force-based guidance, piezos for buzzing, and vibration motors to simulate collisions. This allowed participants to understand the position and movement of the ball, and also study the effectiveness of haptic feedback. Key skills learned here were developing haptic algorithms, filtering noise, communicating fast between two arduinos, determining gameplay mechanics and displaying them live on a screen for debugging. We exhibited this in a project showcase, recorded data from then, and analyzed our findings in an IEEE style paper. We found a linear relationship between player performance expectations and actual scores when they played blindly vs with a screen.



Birdsong Synthesizer

This project involved creating various sound primitives to produce a swoop/chirp birdcall and analyzing its characteristics through scope displays and spectrograms. By exploring the algorithm of Direct Digital Synthesis (DDS), it was possible to perform the desired noises via frequency modulation while meeting the timing requirements. To meet these timing requirements, the equations for frequency modulation had to leave out more complicated math, leading to decisions on certain approximations for these equations. The design was ultimately be implemented with a keypad that supports a record and playback feature. At the top is a real Northern Cardinal song, and below is mine. Made on a RP Pico.

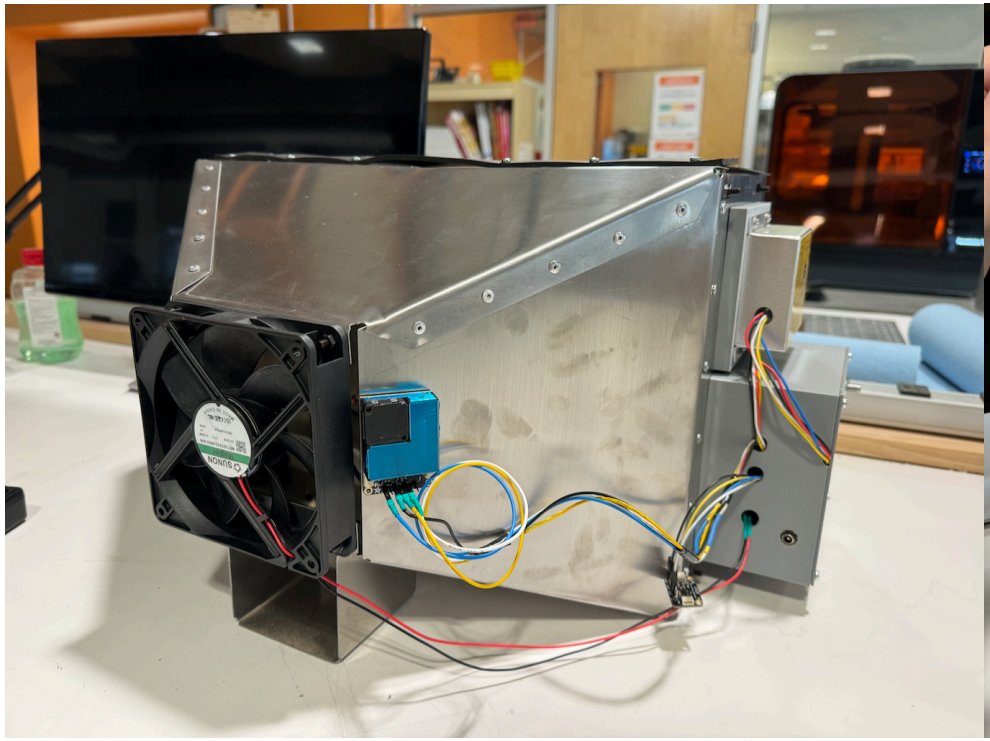


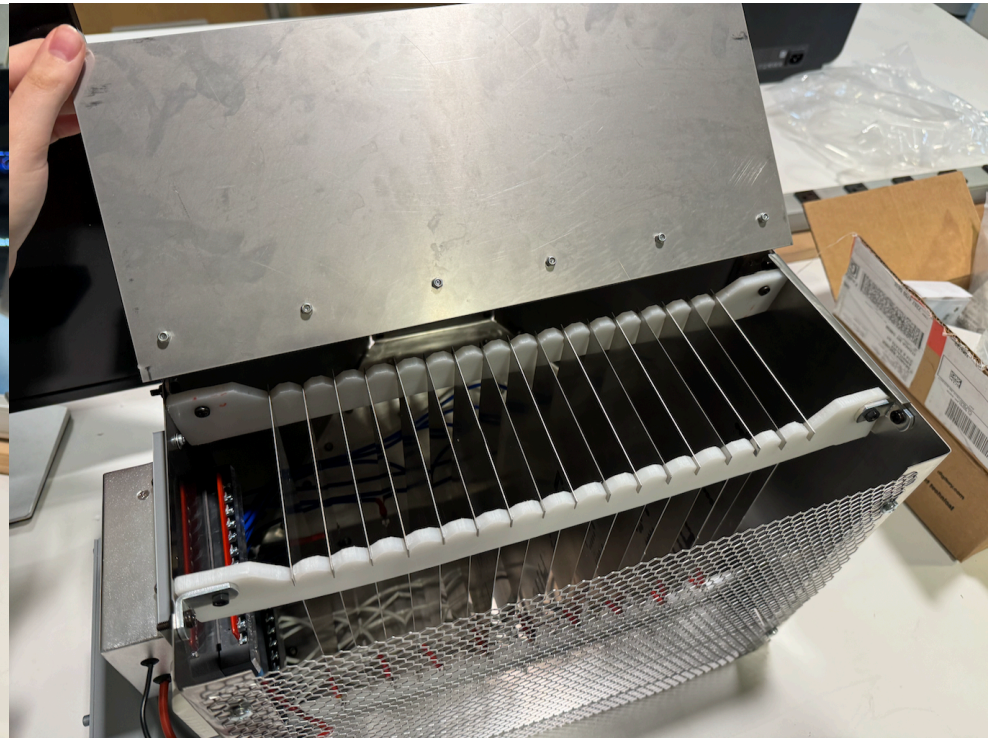
Oscillator

A device designed to visualize music through laser projection. It is designed at a portable size, so it can be brought out or displayed as easily as a speaker or record player. The Oscillator turns on a laser when it hears music, and the laser will "dance" to the music with the music listener/dancer. The box projects laser patterns in sync onto a nearby wall, and the size and intensity of the patterns can be controlled with the bass and treble controls on the speaker hardware. The mechanical interface between sound wave and projection is simply a balloon and a piece of mirror. The laser is a hacked cat laser.

Sock Sorter

Taking a mundane task, such as choosing socks in the morning, and reinventing the way we accomplish it to add whimsy in our lives. The machine is loaded with a number of sock capsules in the very top tubes that are blocked until socks are requested. Once the user requests a sock they can use their own personal gesture in front of an exit tube to select which sock they want and from which exit they would like to receive it. The sock sorter uses two sorting disks to select a specific sock and move it to a specific output tube. The selected sock will fall down the tubes via gravity and the sock sorter directs it to a specific tube. Then the user can grab it from their selected tube and easily open the capsule to obtain a sock. Built with laser cut corrugated plastic, stepper motors, salvaged tube, ducts, and wood.





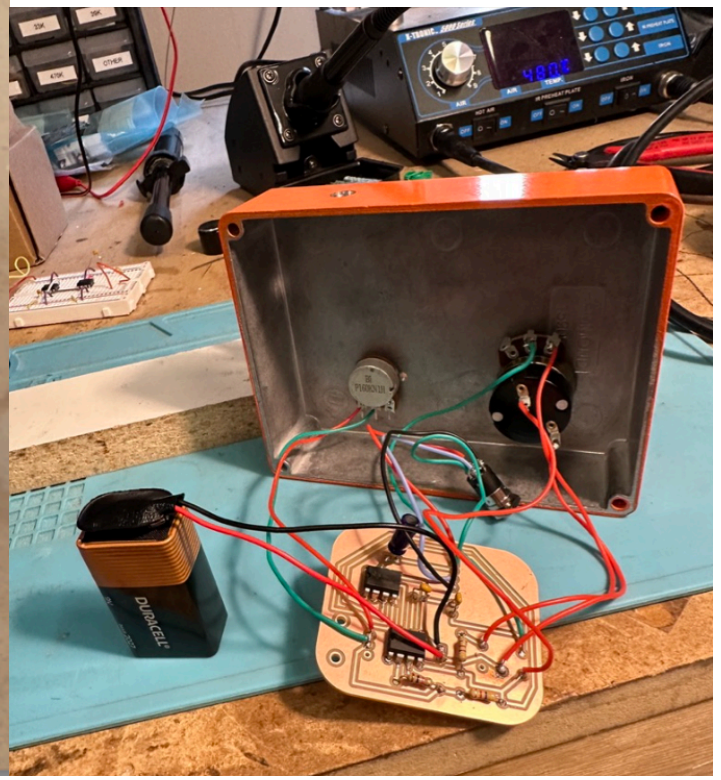
Electrostatic Precipitator

Designed a 'test chamber' scale model with my team at Rev: Ithaca Startup Works for a startup making non-industrial electrostatic precipitators for an outdoor air purification startup. Derived a model from textbooks and implemented it in an excel workbook since the startup founders were not very technical. Cut on a waterjet, riveted, and wired this myself to verify if the model I derived would work. Conducted successful tests with smoke from the Canadian fires that came to Ithaca. This startup then successfully made a full scale prototype based on my model; now they bring my mini precipitator around the country to show investors.

Bill Nye Me

MAE Forklift Studio

I disassembled a Toyota Forklift with 2 peers then helped set up and build lab equipment surrounding the forklift and another two (whole, operational) forklifts to be used in Cornell Mechanical Engineering curriculum. Then I TAd Fluid Mechanics, which focused heavily on the torque converters and hydraulic jacks that I helped build the labs for. Also I met Bill Nye while elbow deep in hydraulic oil from this forklift.

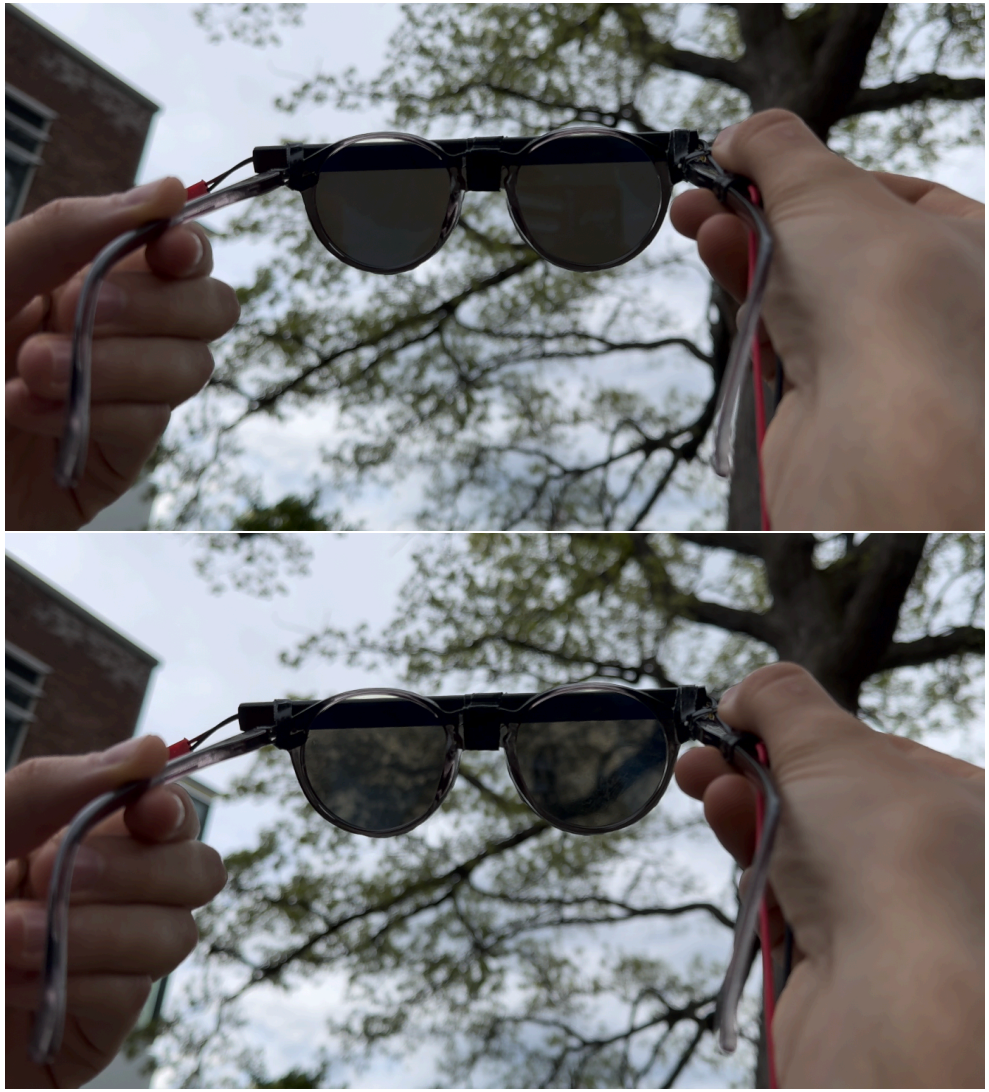


Atari Punk Synth

I made this standalone synth from a circuit online. The most fun part was designing and milling a double sided PCB for it in the shop.

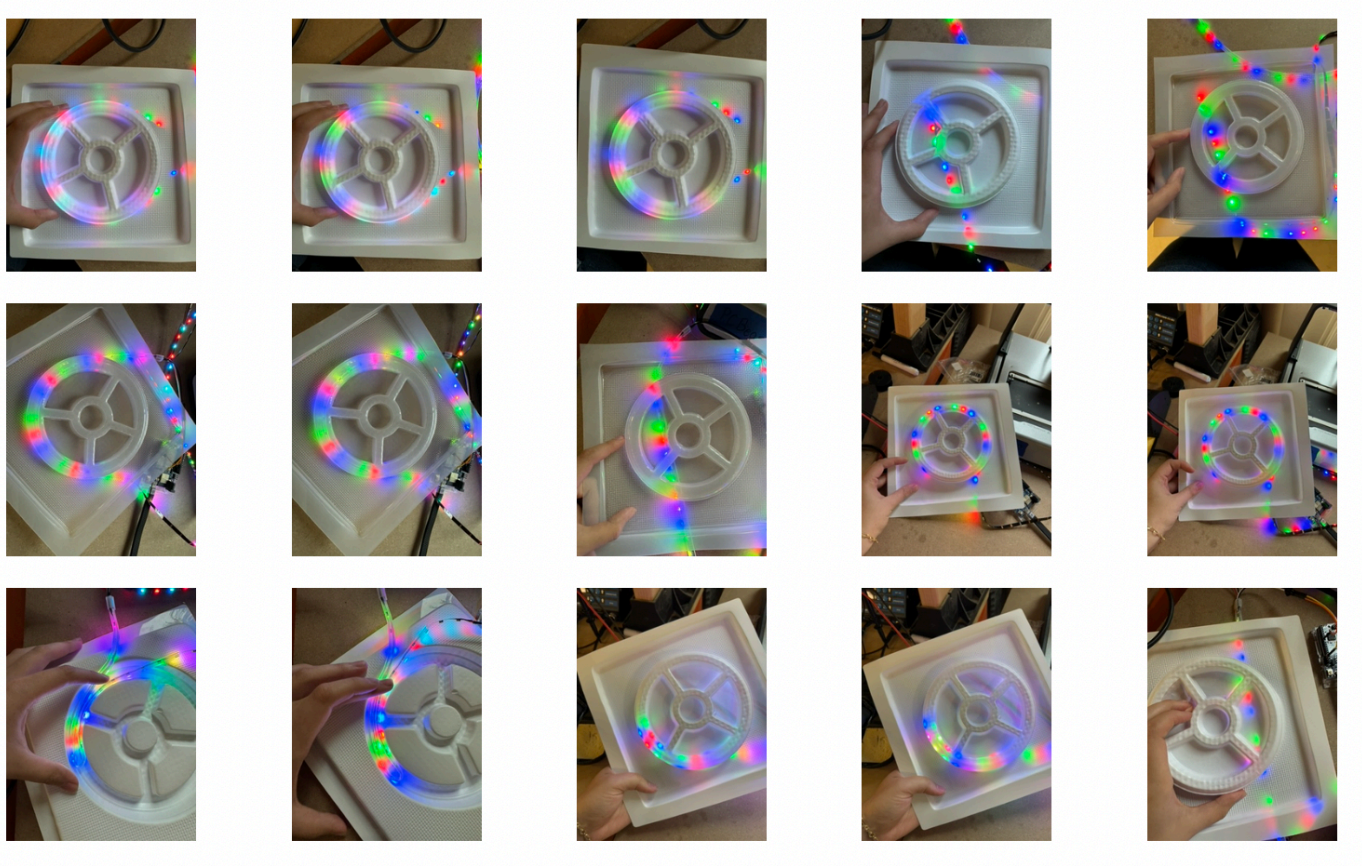
Copper Kiragami Cube

I waterjet some copper, folded and inserted it to adapt the classic modular Sonobe Cube to metal kiragami form.



Dimmable Sunglasses

Dimmable sunglasses made of electrochromic film. Controlled by simple potentiometer. In addition to the prototype, I did a full House of Quality, Choice-Based Conjoint Analysis, Market Analysis and Net Present Value using a Bass Model.



Vacuum Formed Material Testing

This is data for a startup that had designed an interactive plate to help kids eat healthy. I vacuum formed different materials and tested their opacity with different modifications to LED strips in order for the startup CEO to choose their preferred look.

Spork

An steel spork I designed, cut, and hammered. It is more of an art piece, but one of my favorite creations.

Bell Siphon

Optimization a bell siphon (an automated type of cycling siphon) design for one of our startups. Here is my testing setup including some flow meters, a pump, a high float switch. I wrote a Matlab script with constraints to optimize multiple design variables involved.