Jenny Wu

Engineering Portfolio · Toronto, ON

ABOUT ME

I'm a recent Biomedical Engineering graduate from the University of Waterloo with a Computing Option and Medical AI Specialization. My interests are in robotics, embedded systems, PCB design, and building multidisciplinary hardware systems.

EMAIL
jingjw999@gmail.com

LINKEDIN
linkedin.com/in/jenny-wu2003

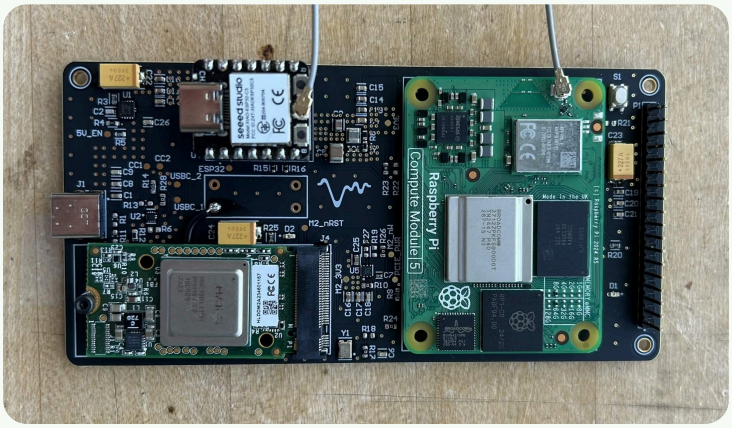
GITHUB
github.com/jennnywu

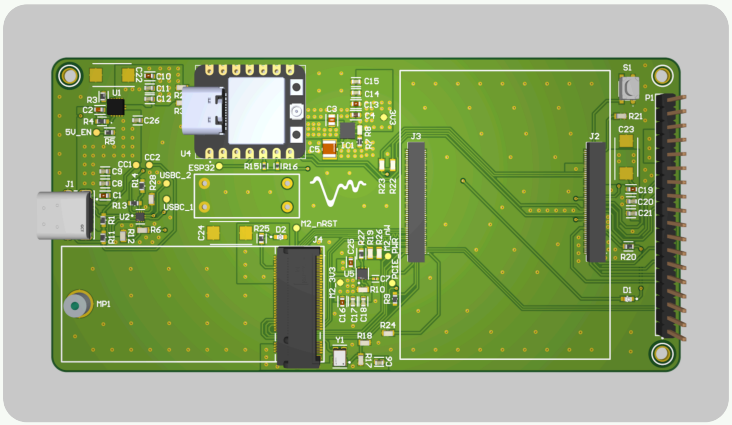
WEBSITE
jennywu.ca

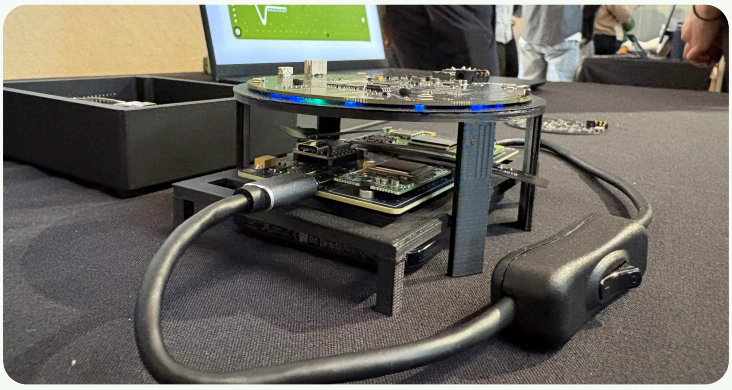
Table of Contents

VocalPoint

Portable assistive listening device that isolates a target speaker's voice in noisy, multi-speaker environments - using a multi-microphone array, custom PCB, and real-time DSP.







Altium Designer | Raspberry Pi CM5 | ESP32 | DSP

PCB DESIGN

- Completed end-to-end PCB layout in Altium Designer for a custom 4-layer Raspberry Pi CM5 carrier board integrating audio, power, and wireless subsystems
- Routed impedance-controlled high-speed differential pairs for PCIe and USB, integrating the Hailo-8 accelerator, ESP32, USB-C PD, and 5 V → 3.3 V buck converter

CONNECTIVITY & CONTROL

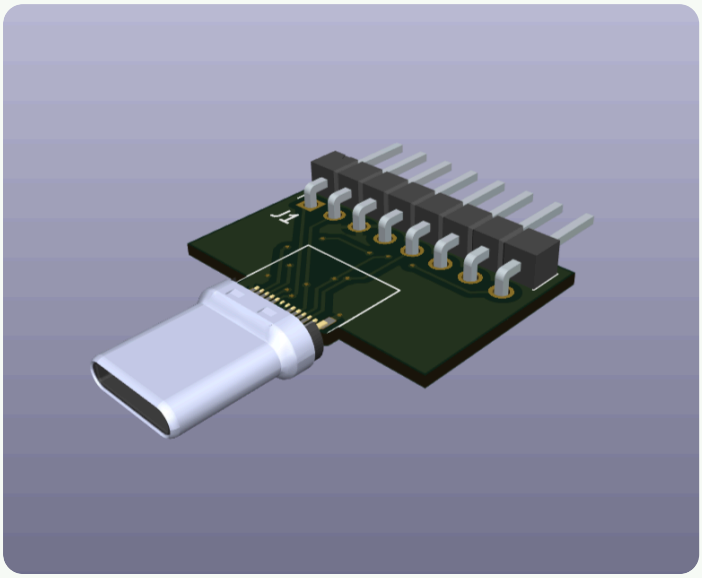
- Integrated a XIAO ESP32 communicating with the Raspberry Pi CM5 over I²C for wireless connectivity and peripheral control
- Interfaced peripherals including a multi-channel microphone array, buttons, LEDs, and power management circuitry

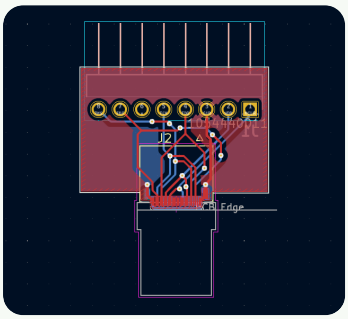
SIGNAL PROCESSING

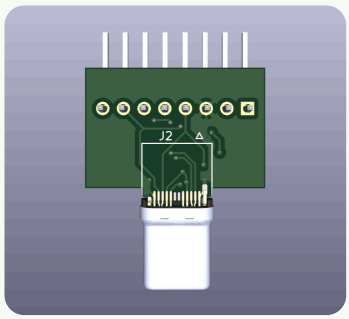
- Hardware platform supports microphone-array-based beamforming, target speaker isolation, and spatial audio acquisition
- Designed to support low-latency noise suppression and speech enhancement pipelines running on the CM5 + Hailo-8 architecture

USB-C PICkit Adapter

Custom adapter PCB bridging the MPLAB® PICkit™ 4's 8-pin header to USB-C, designed end-to-end in KiCAD during a firmware internship at Attest Laboratories.







KiCAD · PCB Layout · USB-C

DESIGN

- Developed schematic in KiCAD mapping the PICkit 4 8-pin debugging interface to a USB-C connector pinout for simplified debugging workflows
- Completed PCB layout including ESD protection circuitry, connector routing, and design rule checks (DRC) to ensure manufacturability and electrical reliability
- Generated Gerber files, fabrication outputs, and bill of materials (BOM) for PCB manufacturing and assembly

FABRICATION & BRING-UP

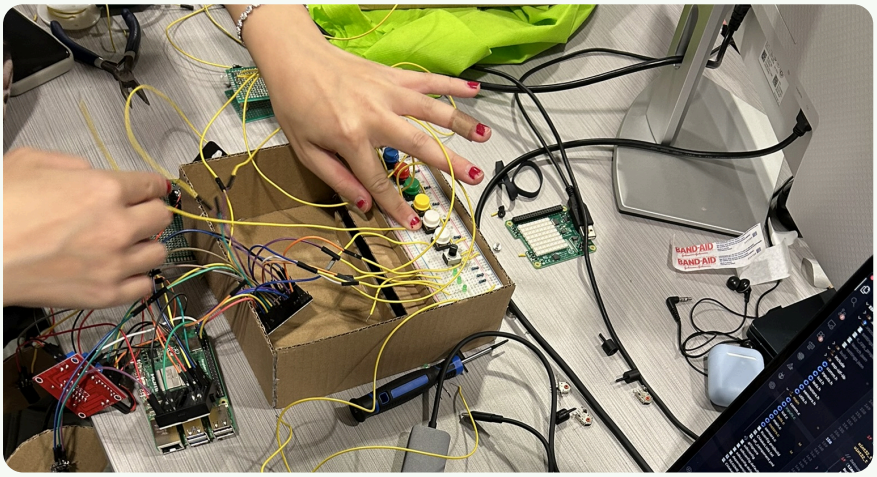
- Coordinated PCB fabrication and component assembly, including sourcing, manufacturing handoff, and post-build inspection
- Performed continuity testing, electrical validation, and functional verification to confirm full PICkit 4 programming and debugging operation after assembly

DESIGN CONSIDERATIONS

- USB-C pinout mapping and signal routing
- ESD protection for sensitive debugger signals

Box DJ

Portable DJ mixing system built in 48 hours at BoxBots, a cardboard robotics hackathon - combining embedded control, real-time audio processing, and Spotify integration.



ESP32 · FreeRTOS · Raspberry Pi 5

EMBEDDED CONTROL

- Implemented an ESP32 controller running FreeRTOS to process inputs from potentiometers, rotary encoders, and push buttons for physical DJ controls
- Transmitted control signals over I²C to a Raspberry Pi 5, interfacing embedded inputs with the audio processing system

AUDIO PROCESSING

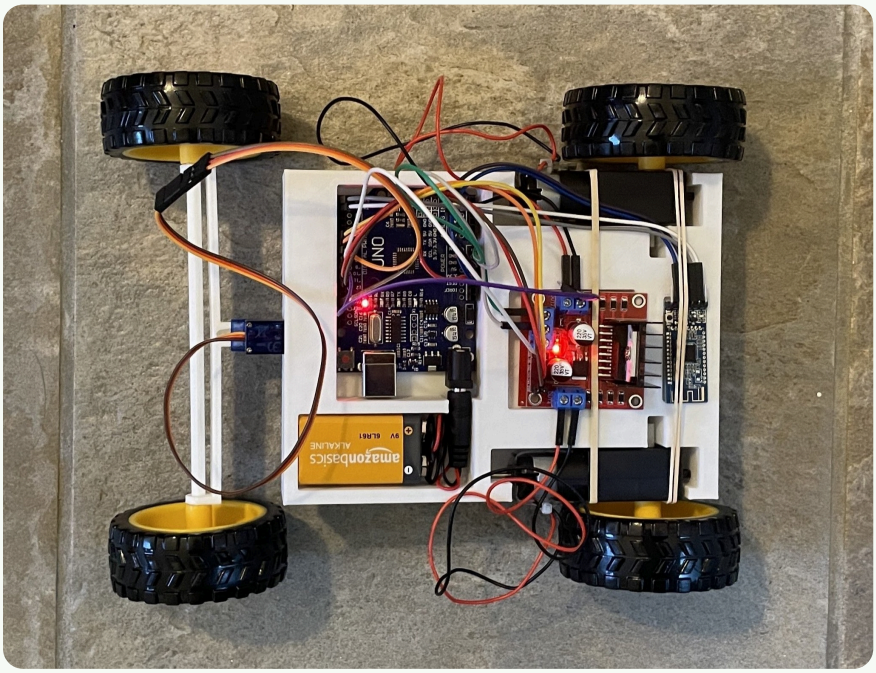
- Integrated a Raspberry Pi 5–based audio pipeline supporting mixing, equalization, tempo adjustment, and volume control across dual audio tracks
- Streamed processed audio wirelessly to a Bluetooth speaker, linking physical controls with live audio effects

WEB INTERFACE

- Custom web interface integrating the Spotify API for track search, playlist management, and song selection

Remote Controlled Car

Bluetooth-controlled vehicle with a custom SolidWorks chassis, built from scratch with an Arduino drive and steering system.



Arduino Uno · SolidWorks · 3D Printing

ELECTRONICS

- Arduino Uno with L298N dual H-bridge motor driver and HM-10 Bluetooth module
- Controlled wirelessly via BLEJoyStick iOS app

DRIVE SYSTEM

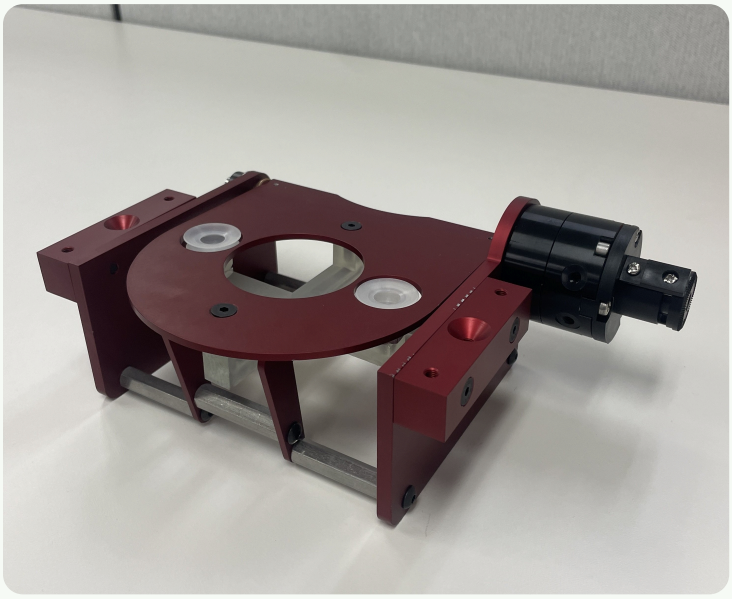
- Two DC motors for rear-wheel propulsion
- MS18 servo motor for front steering

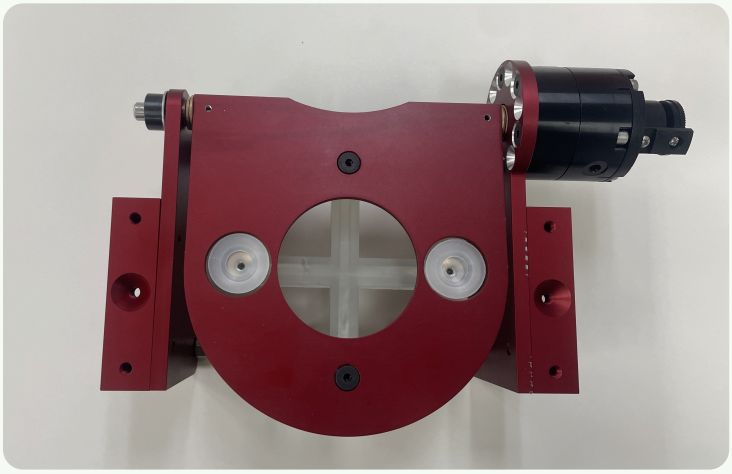
MECHANICAL DESIGN

- Chassis, axle mounts, and body panels modelled in SolidWorks
- 3D-printed to integrate electronics and drivetrain components

Automated Cell Flipper

Automated part-flipping system designed, fabricated, and deployed at FuelCell Energy - eliminating a manual handling step in the fuel cell manufacturing process by rotating parts 180 degrees using a pneumatic motor and suction cup platform.





SolidWorks | CNC Machining | Design for Manufacturability

DESIGN

- Observed that manual part-flipping during fuel cell assembly was a throughput bottleneck and a source of handling risk
- Developed an automated flipping mechanism in SolidWorks driven by a pneumatic motor, designed to operate in sequence with a 6-axis Epson robotic arm
- Modelled each component with suction cup retention, mounting geometry, and CNC machinability in mind

FABRICATION & INTEGRATION

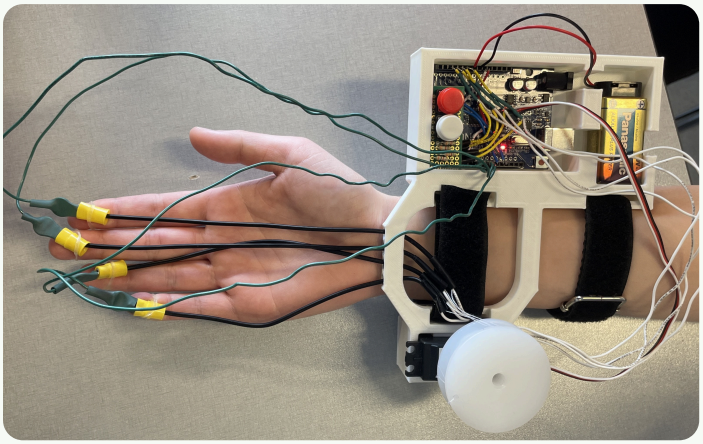
- Collaborated with machinists to finalize tolerances and oversaw CNC fabrication
- Managed mechanical and control integration with the robotic arm and PLC system

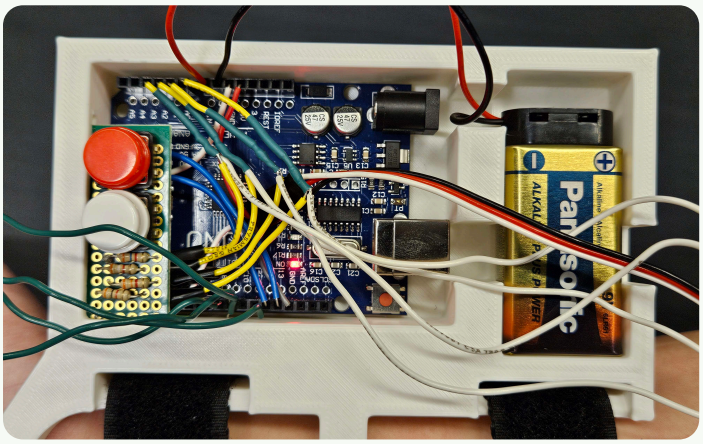
OUTCOME

- Deployed on the production floor, eliminating manual flipping entirely and improving both throughput consistency and operator safety

Hand Rehabilitation Device

Wearable cable-driven device supporting finger mobility recovery for individuals with hemiparesis, using a motor-actuated cord system guided by force feedback.





SolidWorks · Arduino · Assistive Technology

MECHANISM

- Cable-driven system uses a motor connected to four elastic cords - one per finger, excluding the thumb - to guide the hand through a controlled grasping motion
- Motor retracts the cords to curl the fingers, providing repeatable, adjustable actuation for rehabilitation exercises

ELECTRONICS

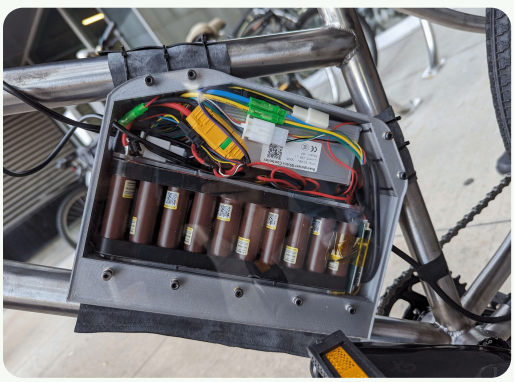
- Arduino interface continuously monitors force and resistance data during actuation, enabling real-time feedback on rehabilitation intensity
- Dedicated pushbutton controls for motor actuation enable/disable and cable tension adjustment, allowing the user to tune resistance in real time

HOUSING

- Led mechanical development in SolidWorks, designing the wrist-worn housing to integrate the motor, cord routing, and electronics into a compact wearable form factor

Electric Bicycle

Fully functional electric bicycle designed and built from scratch with a 15-person student team (Electrium Mobility) in one summer, achieving 32 km/h.



C++ Firmware · SolidWorks · Motor Control

FIRMWARE

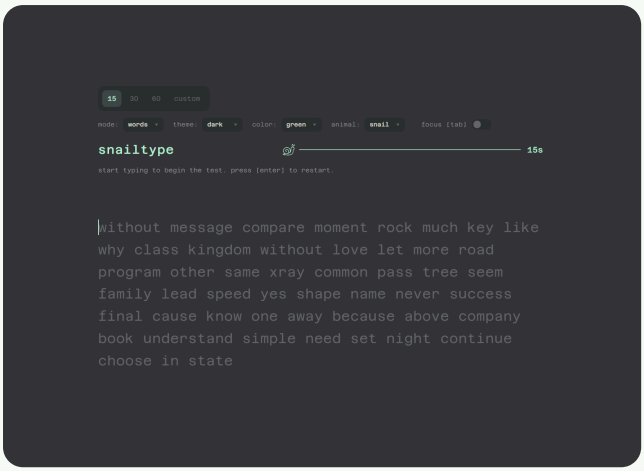
- Motor controller firmware written in C++ using the SimpleFOC library to implement field-oriented control (FOC) for regenerative braking
- Tuned PID velocity and torque control loops for stable throttle response across varying load conditions

MECHANICAL DESIGN

- Designed frame geometry, dropout mounts, and drivetrain interfaces in SolidWorks, optimizing for structural rigidity and component clearance
- Welded aluminum tube frame construction, balancing weight and torsional stiffness
- Integrated motor mount, battery enclosure, and cable routing into the frame design to minimize exposed wiring and maintain a clean form factor

SYSTEM INTEGRATION

- Brought together motor controller, battery pack, circuitry, and frame across firmware, electrical, and mechanical teams



snailtype

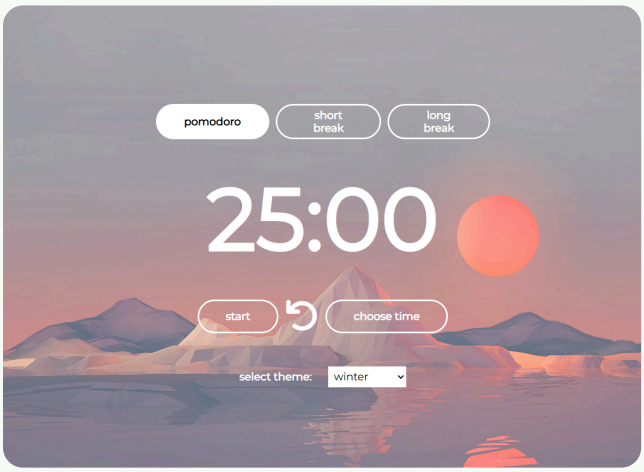
HTML/CSS | JavaScript | Game Dev

Browser-based typing game with animated gameplay, real-time WPM tracking, and customisable themes. Keyboard interaction, scoring, and animations handled in vanilla JavaScript.

i miss my cafe

HTML/CSS | JavaScript | Productivity

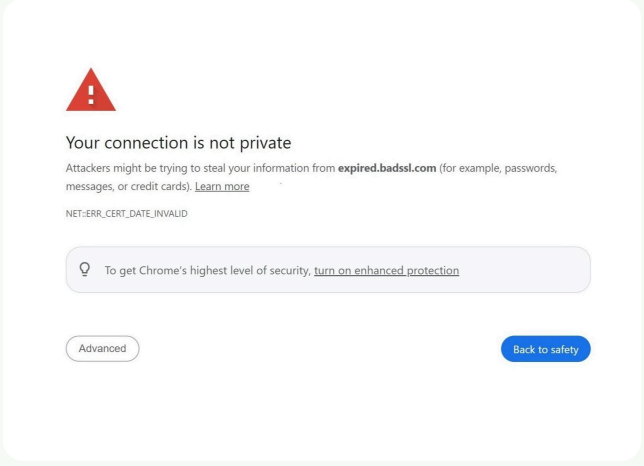
Ambient study environment with layered environmental soundscapes and an integrated task manager. Dynamic audio mixing and to-do list functionality built in JavaScript.



Pomodoro Timer

HTML/CSS | JavaScript | Productivity

Productivity app implementing the Pomodoro technique with configurable intervals and selectable visual themes. Countdown logic, session cycling, and theme switching in JavaScript.



SSL Certificate Checker

Python | SSL/TLS | Networking

Python CLI tool monitoring SSL certificate health across multiple sites. Categorises results into expired, expiring-soon, unreachable, or valid, and exports a structured audit report.