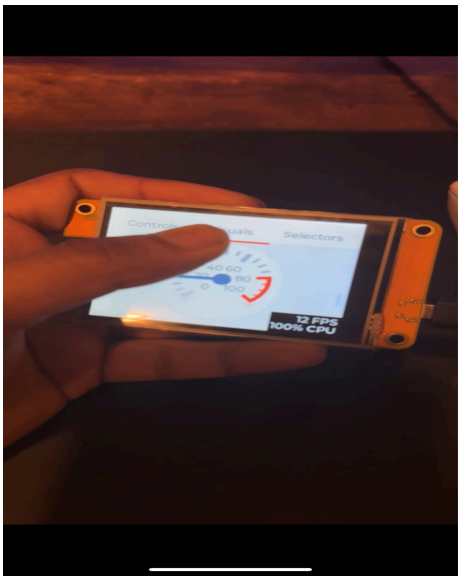
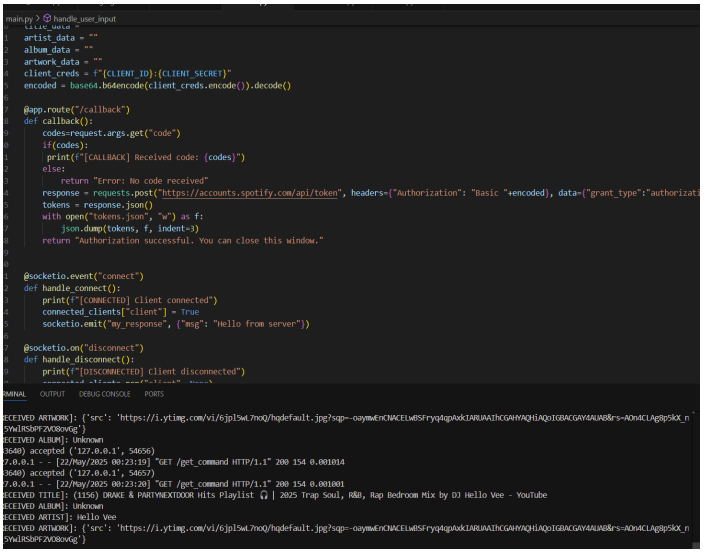
Portfolio

Jonathan Jacob Koshy

ESP32 Media Controller Dashboard (GitHub)





ESP32 UI Showing CPU Usage *Python Server receiving metadata from Spotify & YT (Server Github)*

Overview: Handheld touchscreen device that displays and controls YouTube, Spotify, and Discord media without needing to touch your computer.

Hardware & UI: ESP32 drives a 2.8″ SPI TFT display and capacitive touch panel, with LVGL layouts for play/pause, skip, and volume controls.

Browser Extension (Extension Github): Created chrome extension to call the YouTube Metadata API to pull video title, playback state, and timestamp, packages it into JSON, and sends it via WebSockets.

Communication:

- **Incoming:** Flask WebSocket server (`ws://localhost:5000`) relays JSON messages from the browser to the device.
- **Outgoing:** Device sends button-press commands back to the server over UART to trigger play, pause, or skip actions.

Real-Time Feedback: Touch commands instantly update media on your computer, and live status (e.g., current video title) appears on the device screen.

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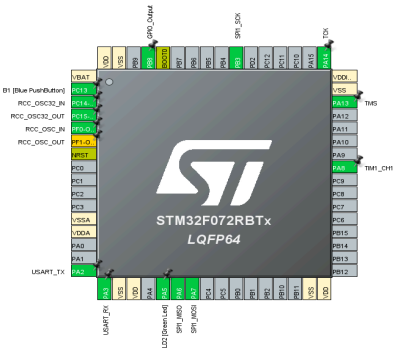
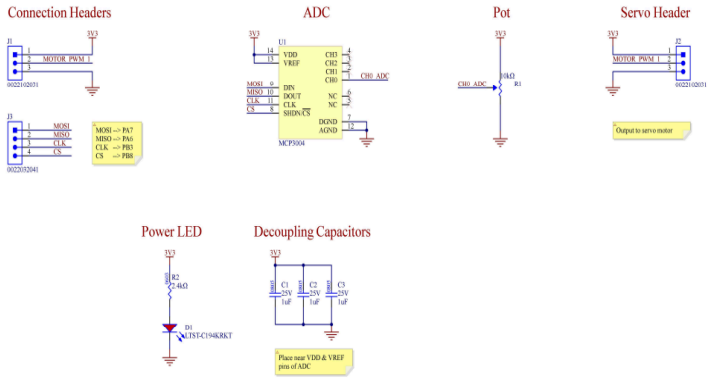
Motor Tester ([Github](#))



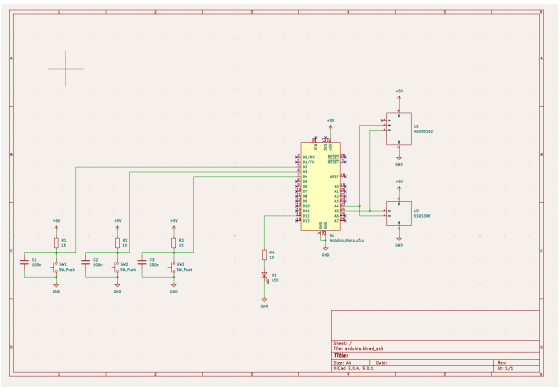
STM32 IOC Pinout



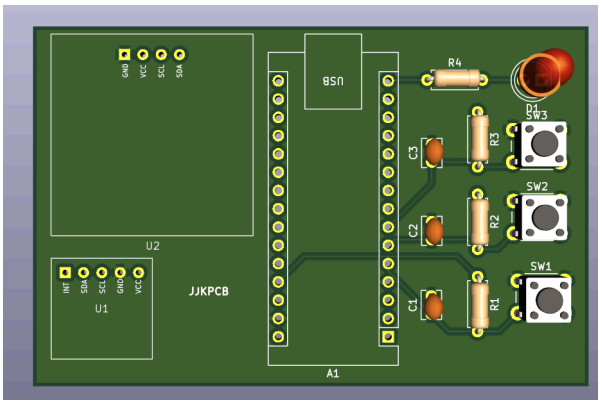
Motor Tester Schematic (ADC, LED, Servo, SPI)

- Automated servo and continuous-rotation motor evaluation by implementing STM32 firmware that reads potentiometer positions via an SPI-connected ADC and outputs corresponding PWM control signals
- Developed robust SPI drivers to sample external ADC voltages (0–3.3 V) in real time, ensuring accurate capture of analog control inputs
- Tuned STM32 timer-based PWM to translate ADC readings into precise speed and direction commands, enhancing test consistency and repeatability

Heartbeat Monitor PCB Design



SPO2 KiCad schematic overview



SP02 Sensor PCB Design

- Designed a custom PCB in **KiCad** around the **MAX30102** pulse-oximetry sensor for heartbeat and SpO_2 monitoring
- Integrated **I²C** communication with an Arduino for live BPM and SpO_2 tracking on an OLED display
- Optimized component placement and decoupling-capacitor layout to minimize noise and maximize signal clarity
- Implemented **USB-C** power input with ESD protection and proper footprint for reliable power delivery
- Exported production-ready Gerber files and verified manufacturability, ensuring correct footprints and clearances