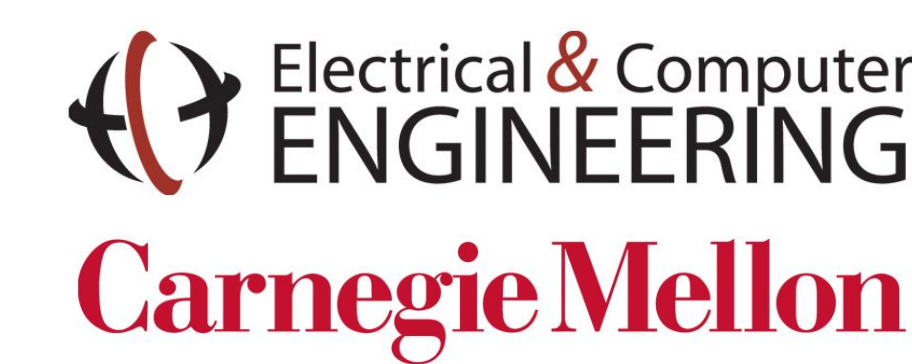


PadL1: Drum Learning Game

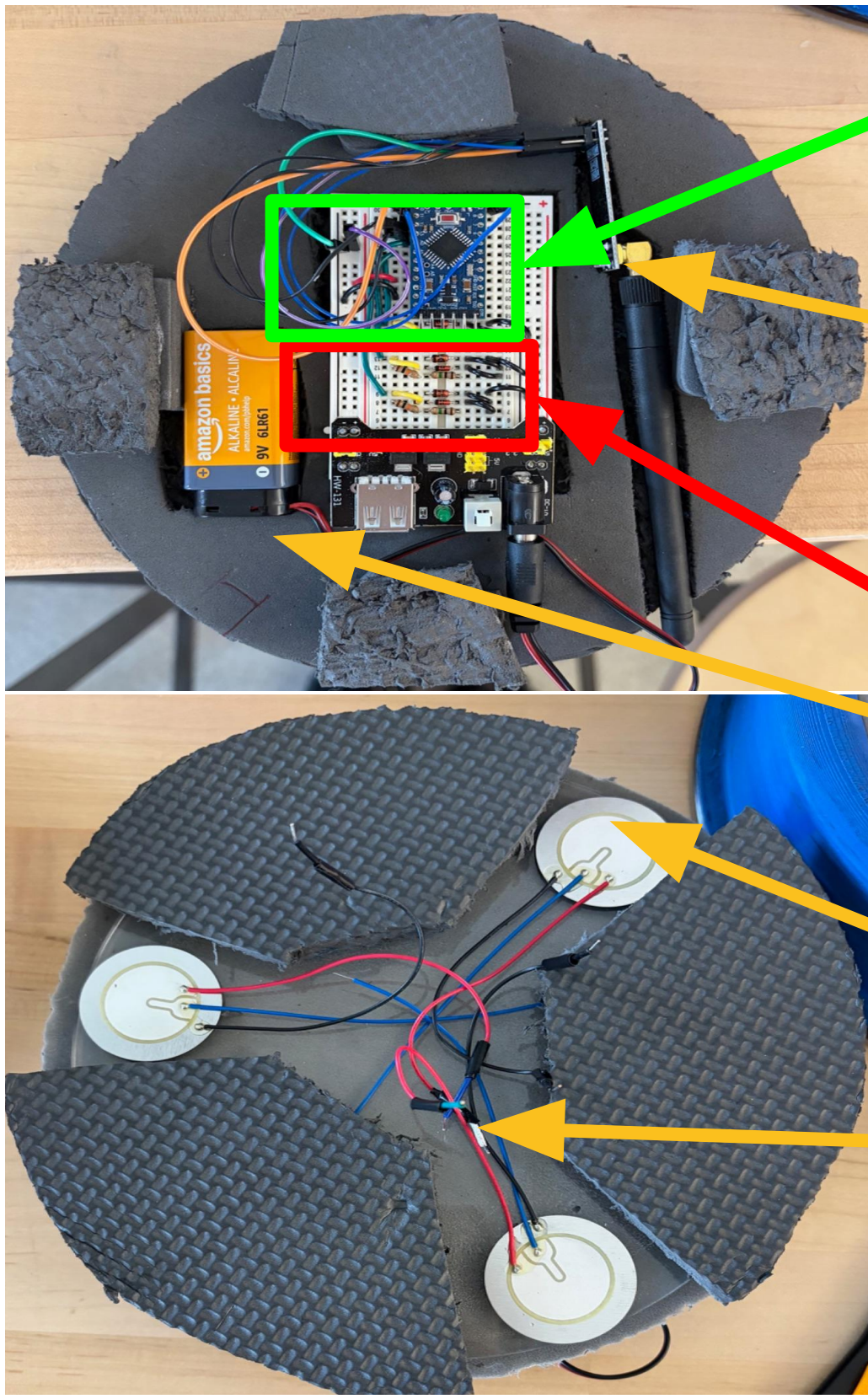
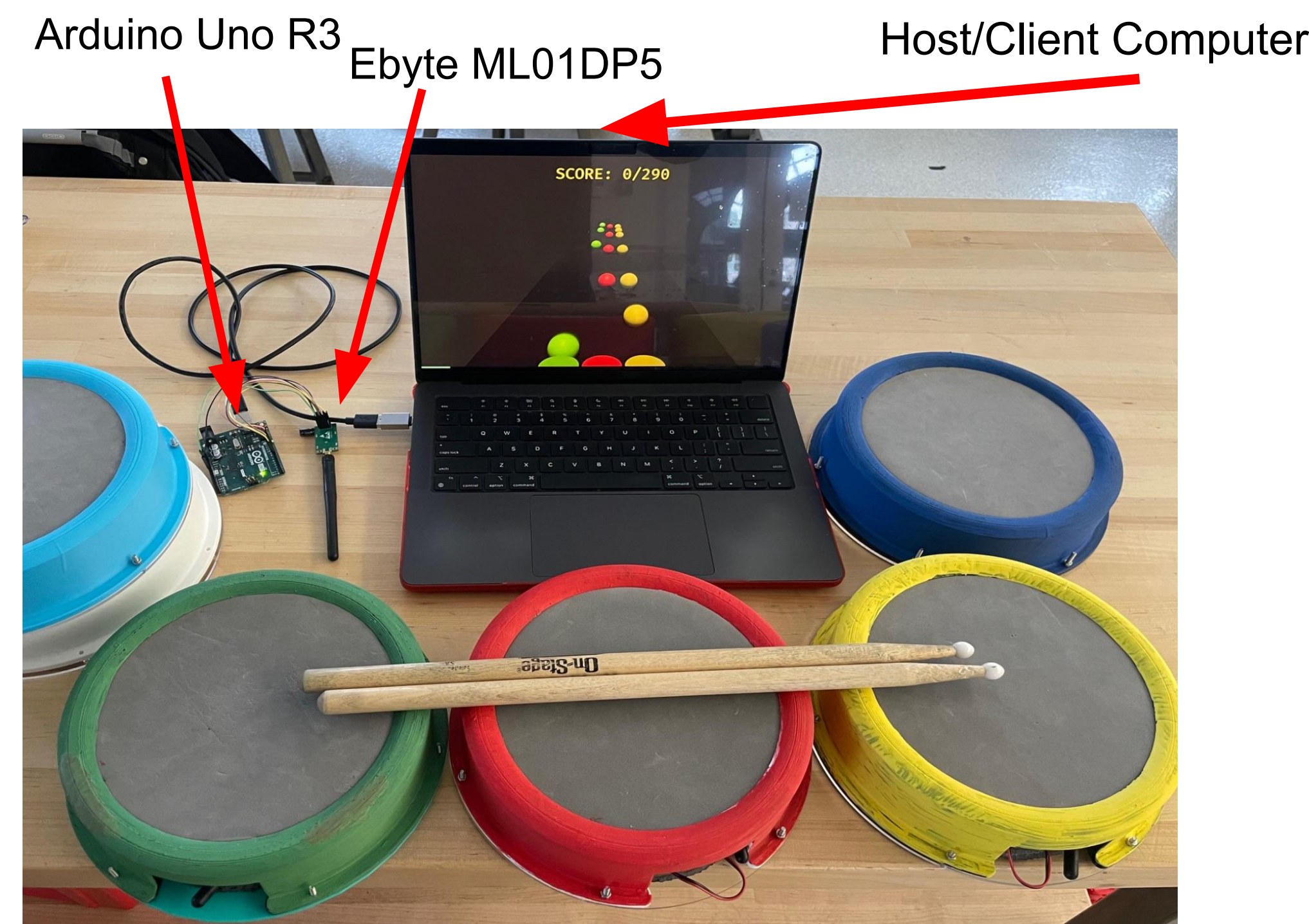
Team C1: Caleb Song, Rishabh Cowlagi, Abishek Anand
18-500 Capstone Design, Spring 2026
Electrical and Computer Engineering Department
Carnegie Mellon University



What is PadL1?

Learning drums is **hard, expensive, and requires a personal tutor**. PadL1 fixes this by combining physical drum pads with a **Guitar hero style game** for beginner-intermediate drummers! Users can hit 6 drum pads, which will generate unique drum audio and can play our built in songs or their own custom selection. PadL1 also offers **multiplayer game modes** and drummers can even try **rimshots** for an even better, more realistic experience!

System Description



Arduino Pro Mini 3.3V

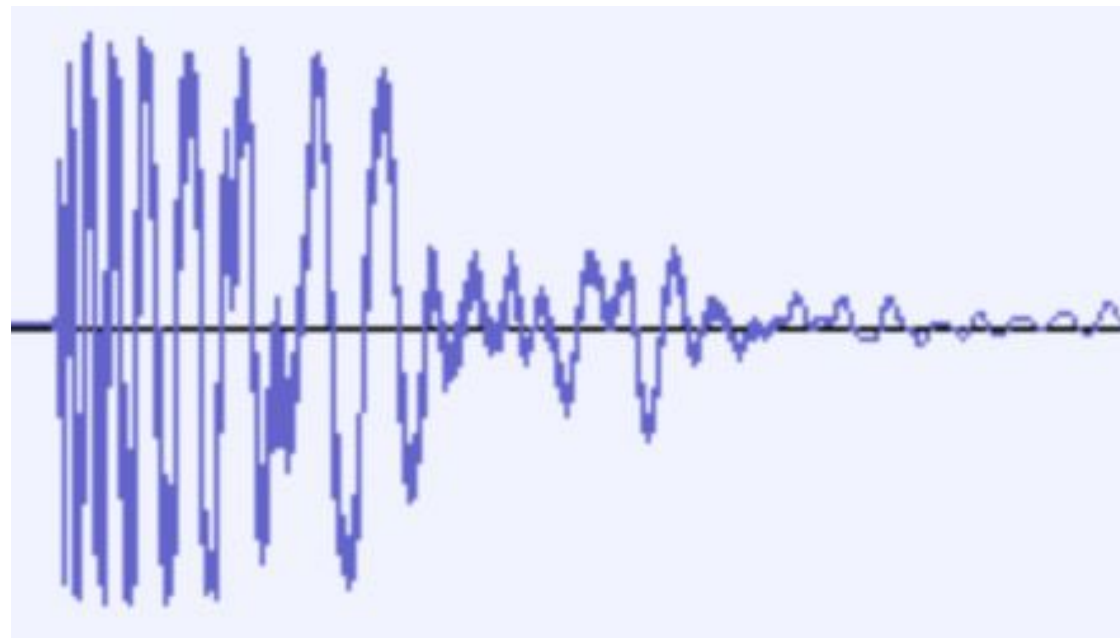
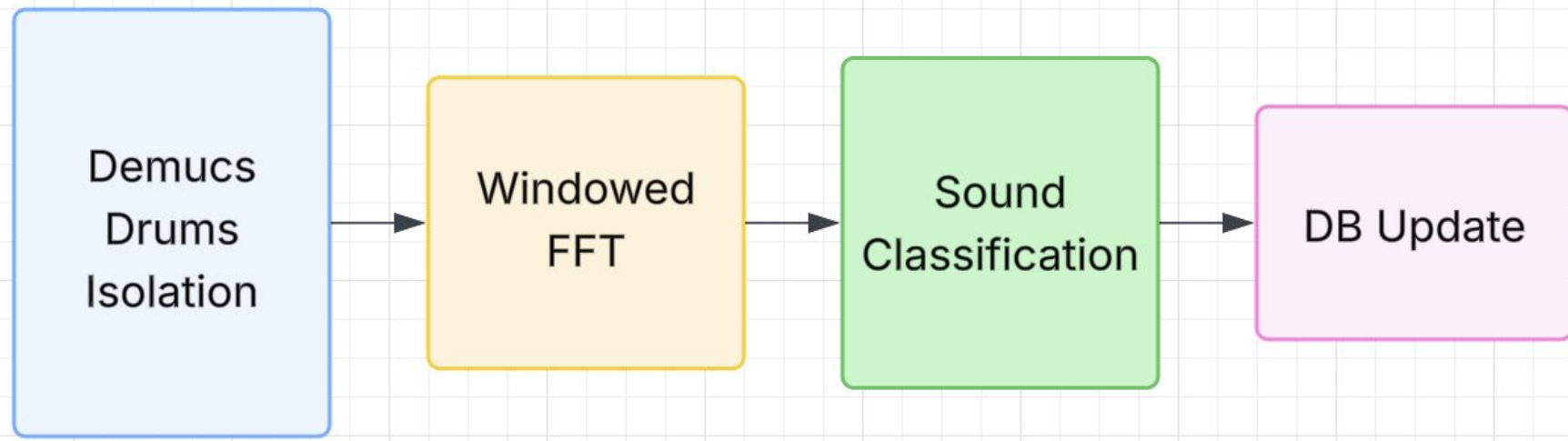
Adeeep nRF24L01+ & Antennae
3.3V Clamper

3.3V Power Supply

Piezo Disc 35 mm

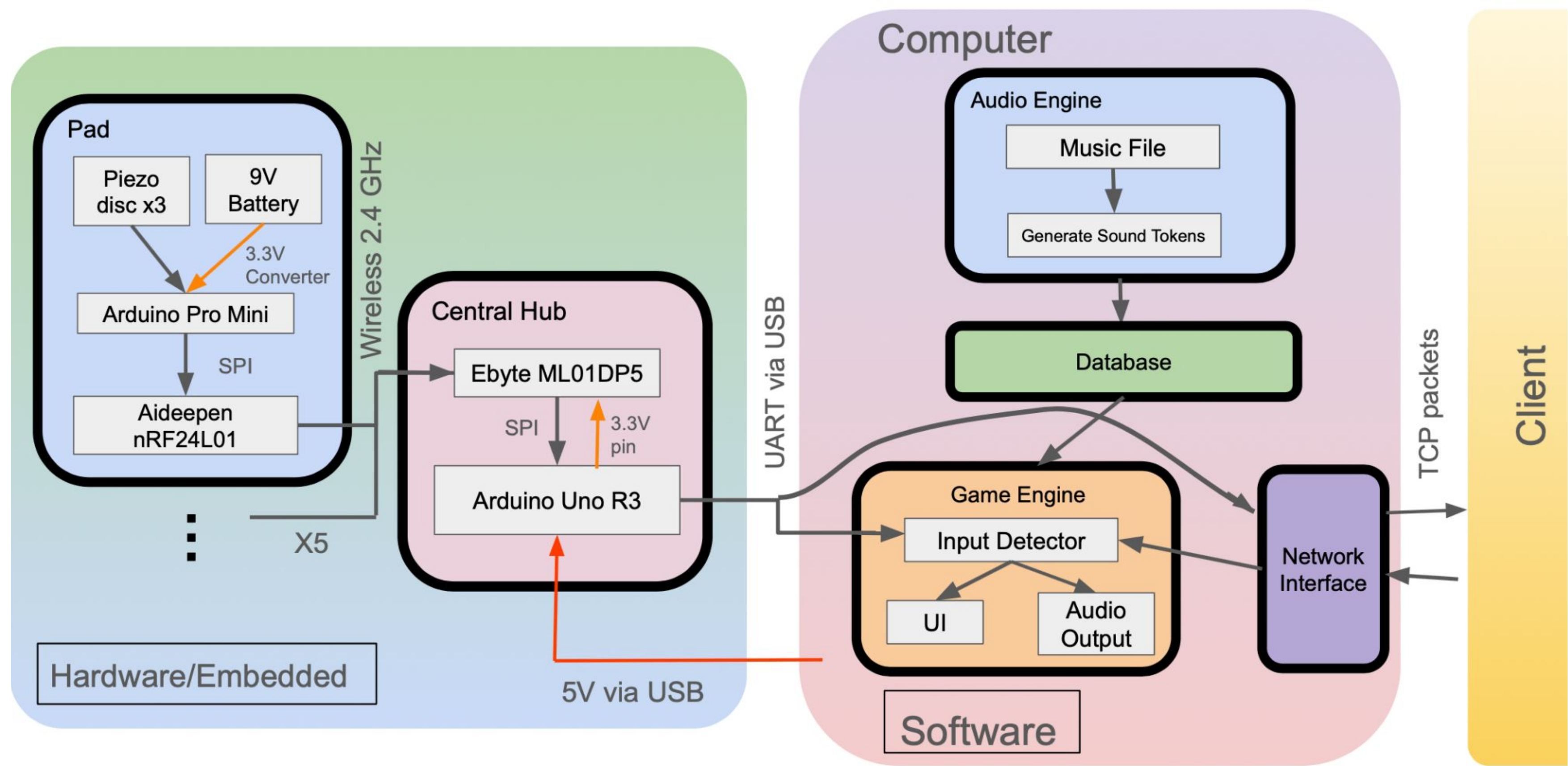
Acrylic Impact Plate

Software Pipeline

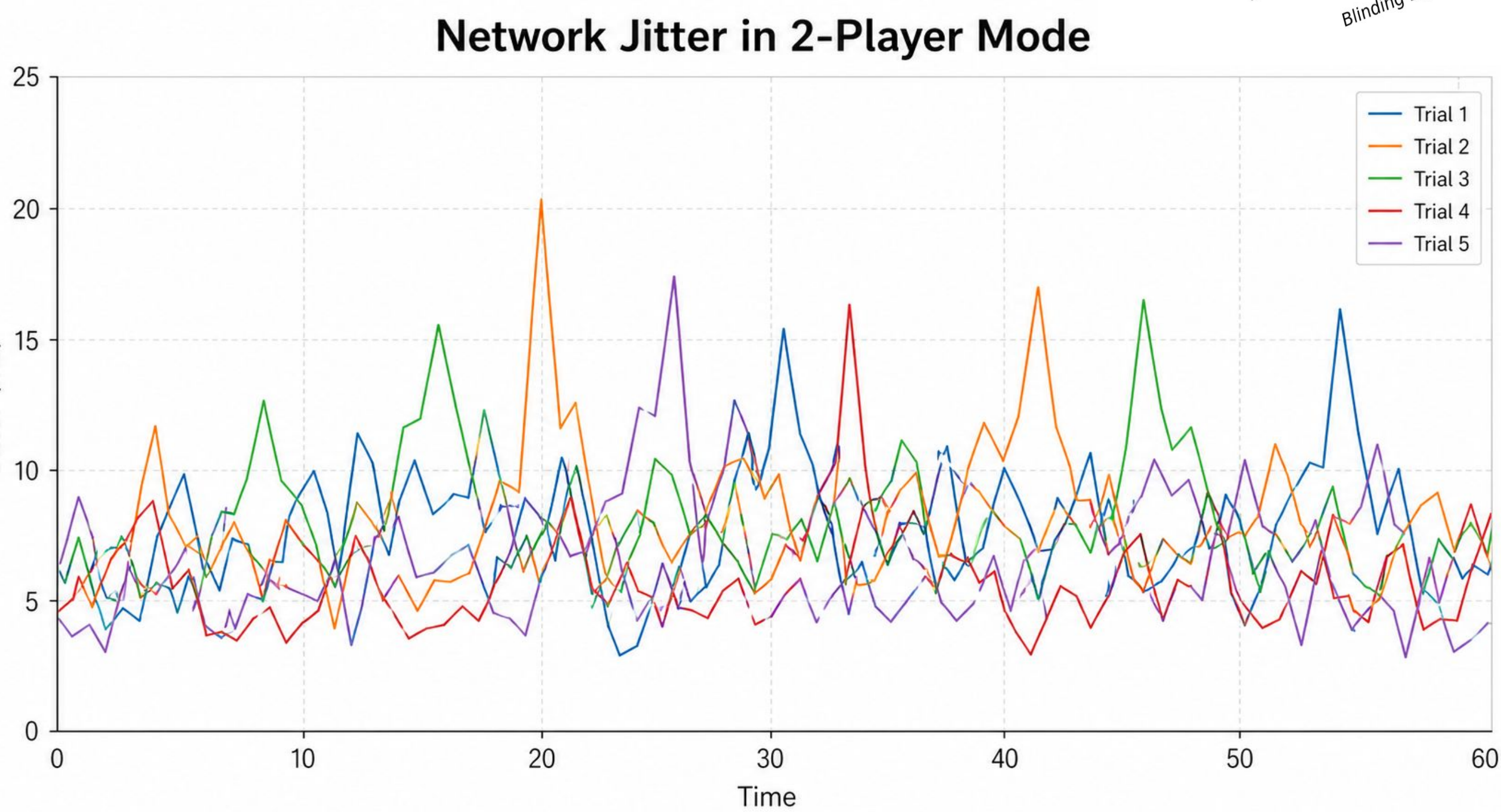
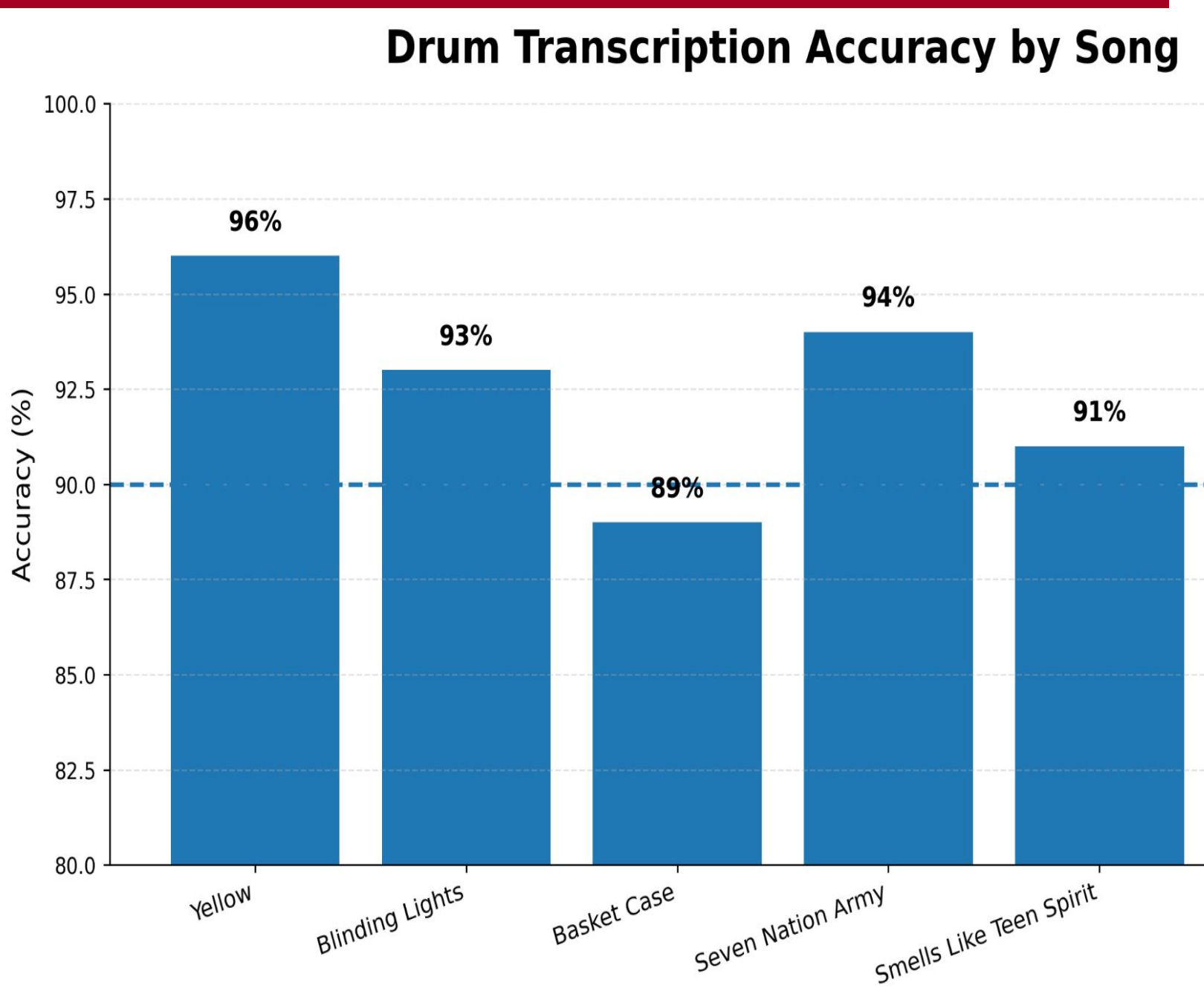
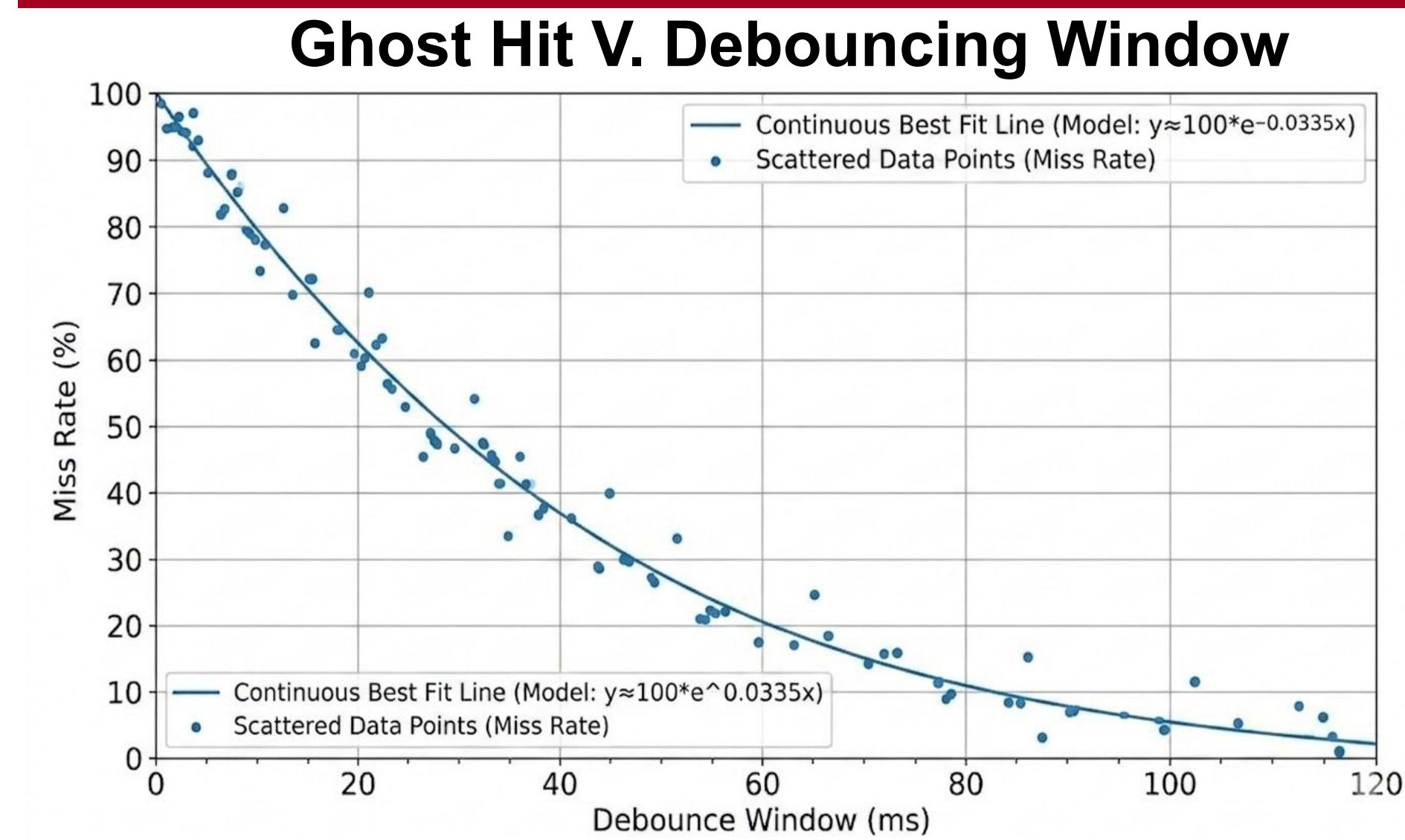


0.48761904:DrumSnare
0.48761904:DrumKick

System Architecture



System Evaluation

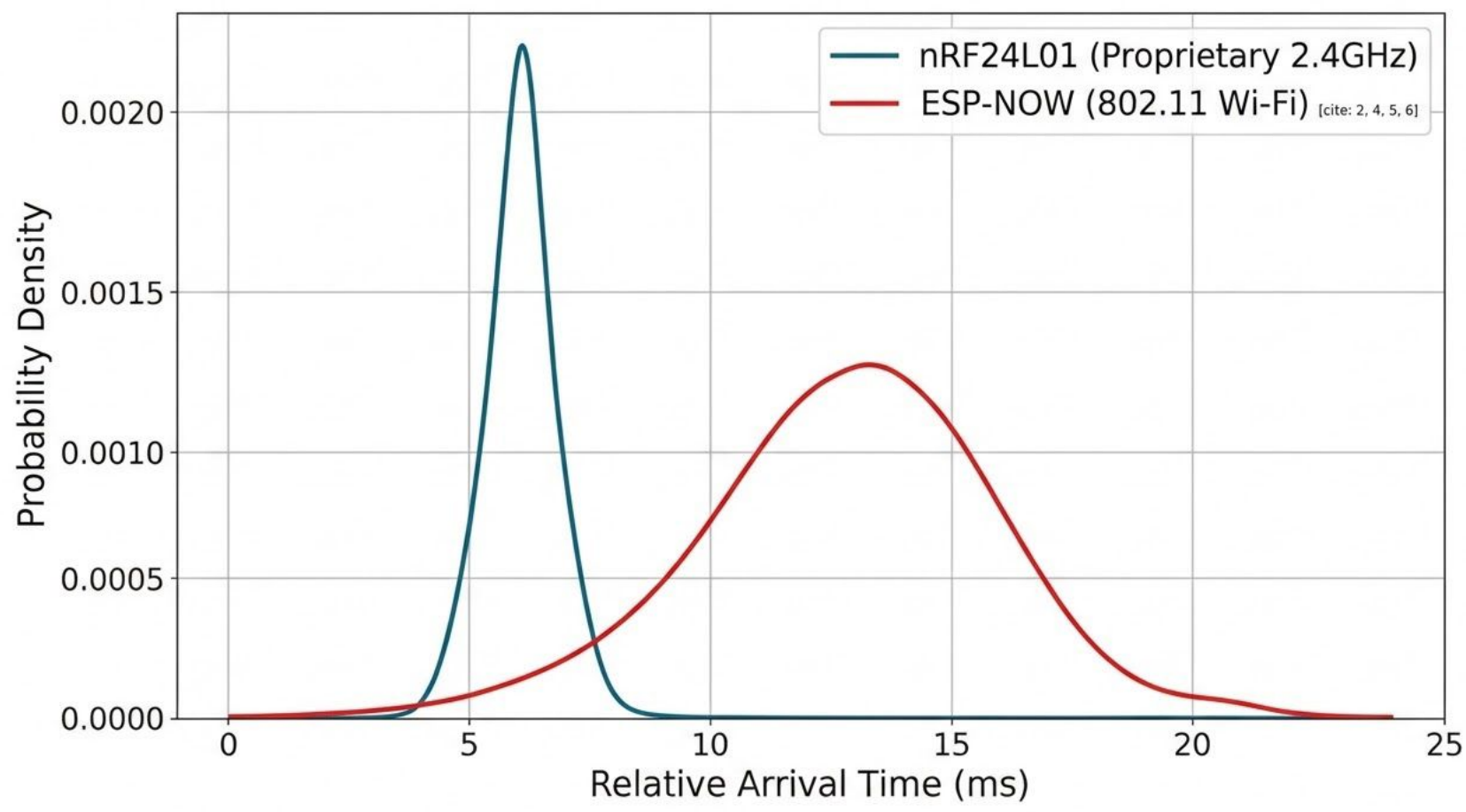


Conclusion & Tradeoffs

Arduino Uno R3 V. Daisy Seed

Arduino Uno cost is a lot cheaper than the Daisy Seed while supporting SPI for nRF24L01 modules. Daisy seed has onboard DAC and 65 MB SRAM for storing audio. In the end, we realized we could offset workload onto software

ESP32 V. nRF24L01



This graph is at microsecond granularity, shows that nRF24L01 consistently delivers 50% packets reliably over distances under 100m at 5ms compared to ESPNOW at 13ms. We wanted to stay within our 20 ms budget so nRF24L01 was better and cheaper.