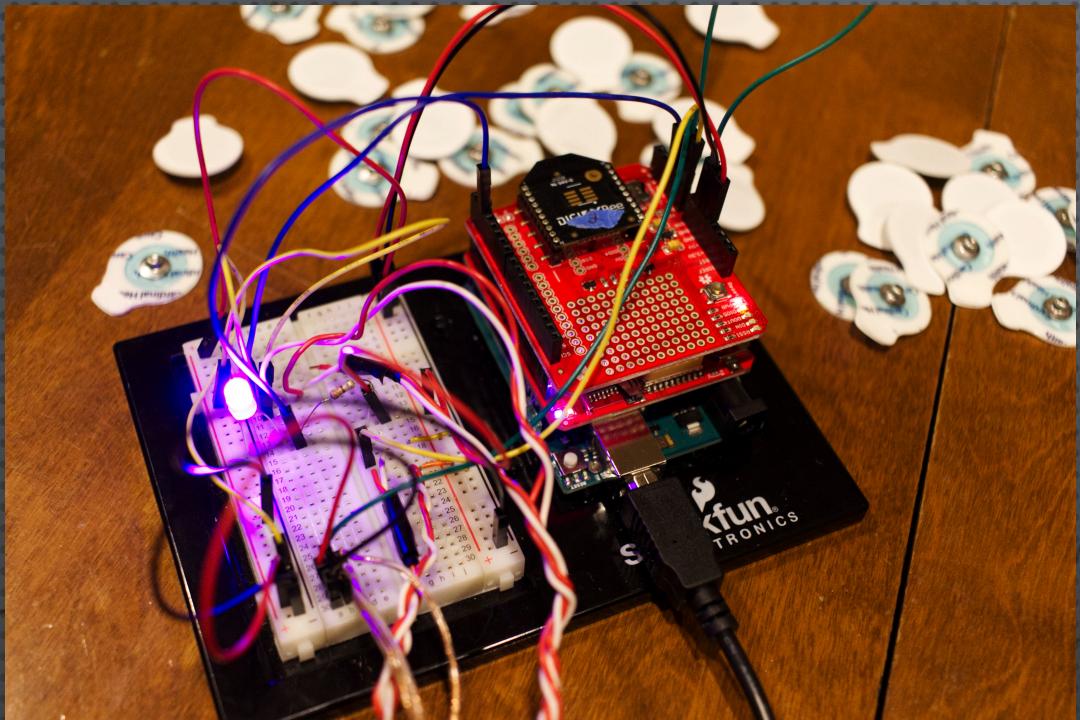


# WIRELESS MULTI ELECTROMYOGRAM DATA STORAGE



ANDREW NYLAND

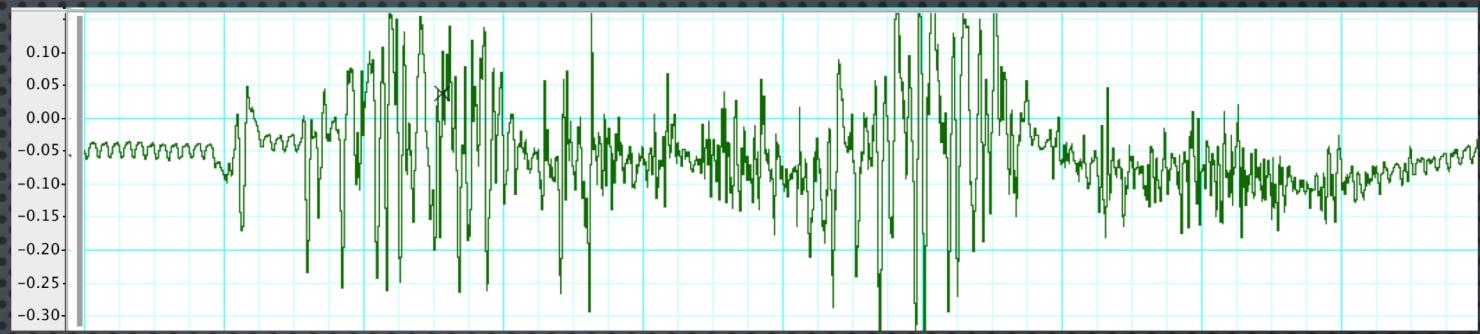
~ MICHAEL VIDUNAS

~ ANDREW WALSH

[HTTPS://GITLAB.COM/ALNYLAND/EMG-MULTI](https://gitlab.com/alnyland/emg-multi)

# OUTLINE

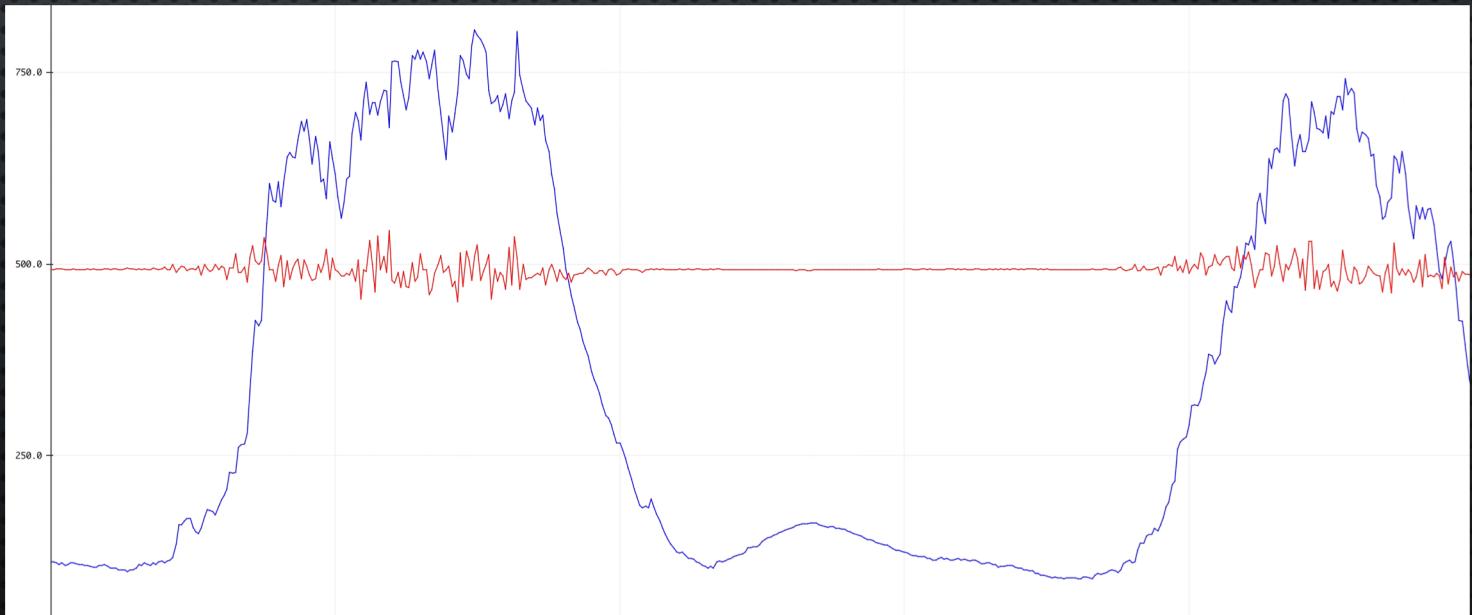
- MATERIALS
- PURPOSE
- ASSEMBLY
- IMPLEMENTATION
- TESTING
- RESULTS



Above - *Inspiration*: Electromyogram data recorded in 2018 on lab equipment at Virginia Tech in Neuroscience Lab 1

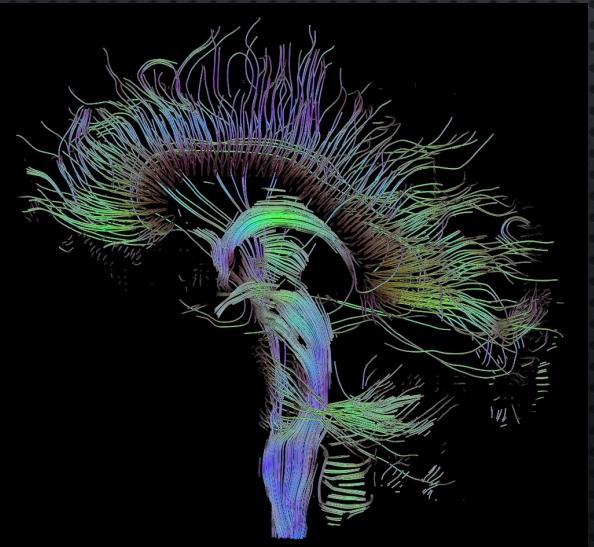
Below – *Current project*: Results recorded with our <\$500 project, supports web app control of 2+ muscle sensors

Blue: rectified/integrated data used in these slides, Red: raw potential



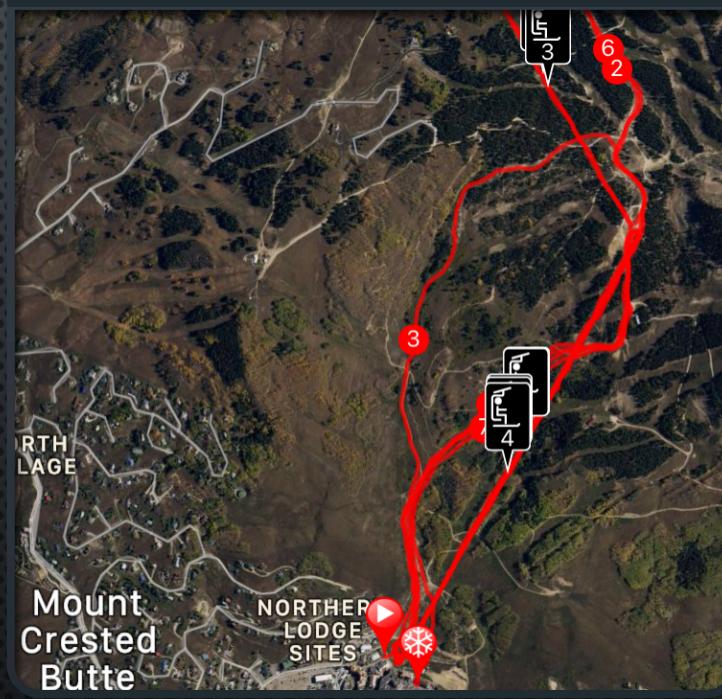
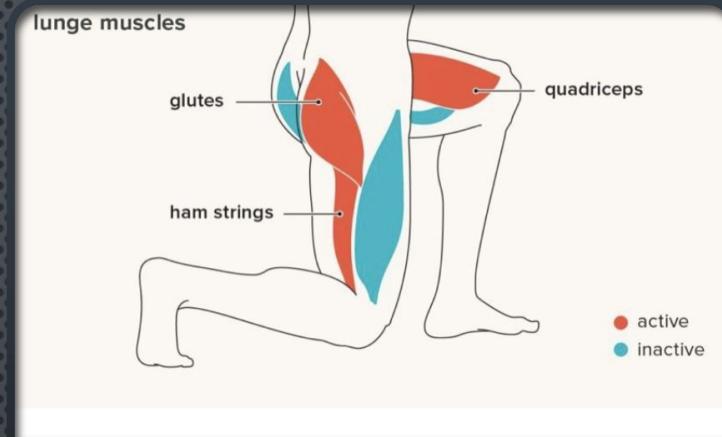
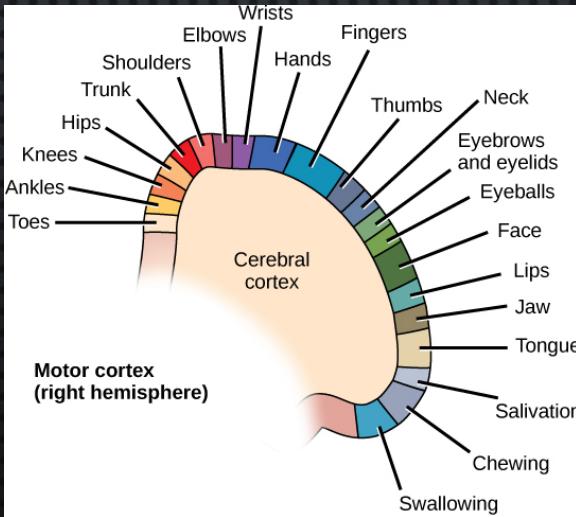
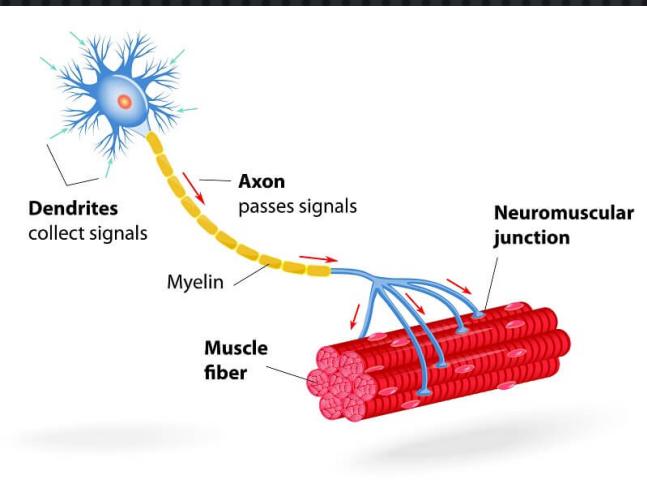
# MATERIALS

- 3 MYOWARE SENSORS WITH 9 ELECTRODES PER PERSON PER TEST
- RASPBERRY PI, ARDUINO UNO
- POWER-BANK(s)
- SSD BOARD TO STORE DATA VIA PI
- LED



# PURPOSE & GOALS

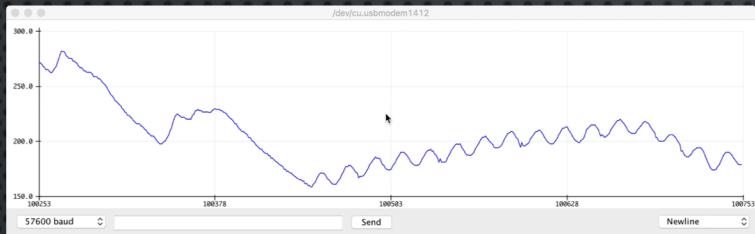
- TRACK DIFFERENT MUSCLE GROUPS OUTPUT IN TANDEM
- ANALYZE DIFFERENCES IN TEST SUBJECTS
- ANALYZE REAL-TIME PHYSICAL POSITION AND MOVEMENT



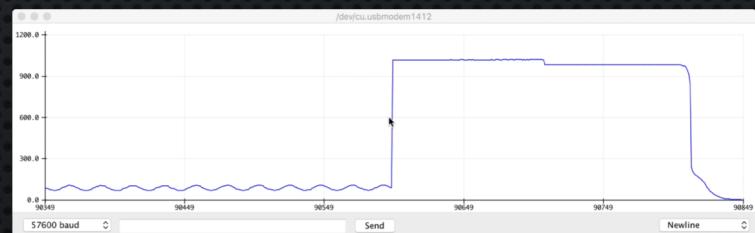
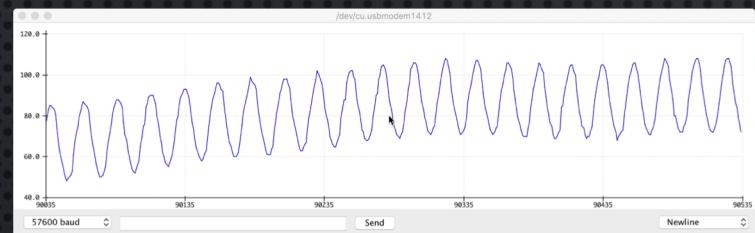
# ASSEMBLY – INITIAL ATTEMPT



Configuring reliable connections to the sensors.



Calculating bandwidth required to pull data from each sensor concurrently



4 bytes = timestamp

3 \* 2 bytes = 6 bytes of sensor data

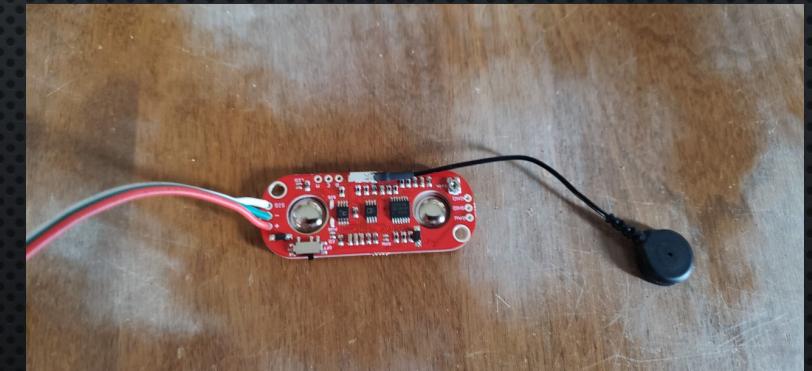
1kHz = 10,000B = 80,000 bits/sec

Benchmarked ADC Converters:  
1000 x 6 samples computes in  
Roughly 0.61 seconds

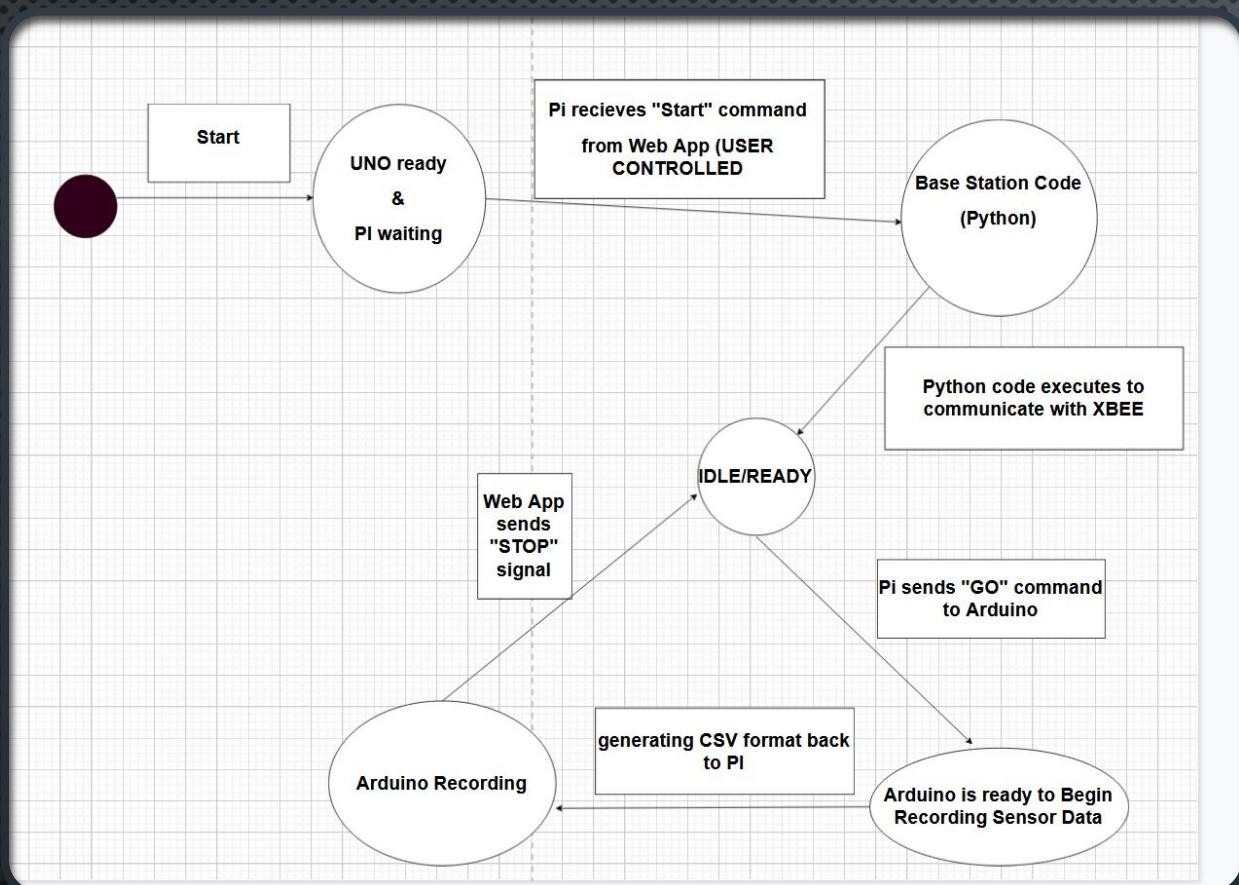
- Leaves 39% of time for transmitting, etc



Soldering electrode wires to sensors

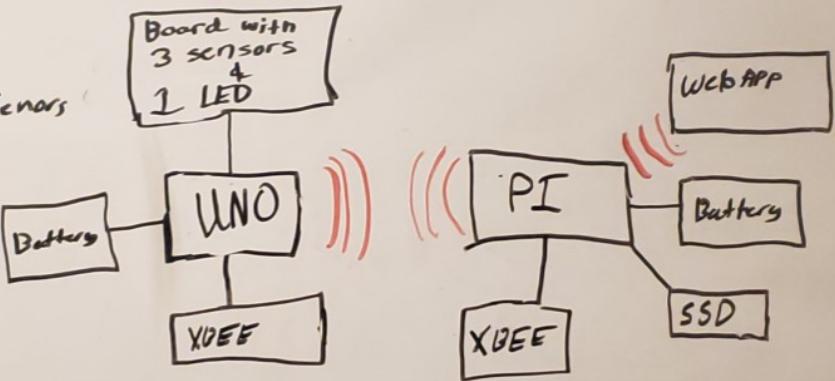


# FUNCTIONAL FLOWCHART



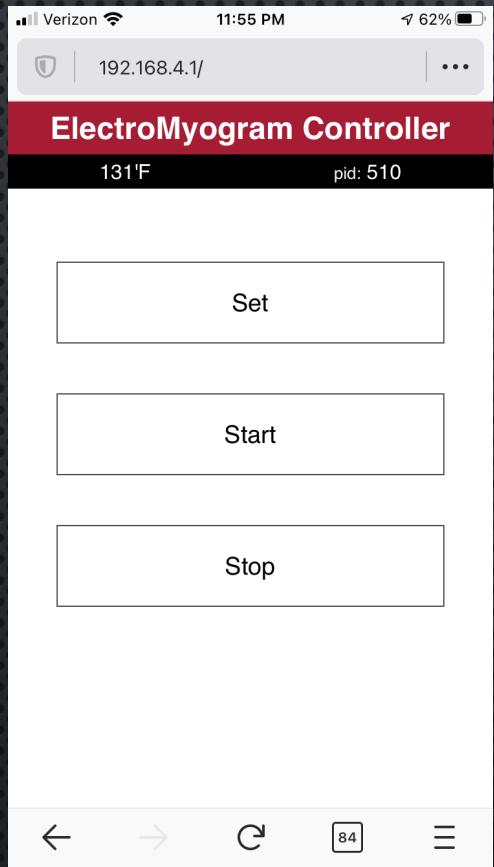
## Wiring Diagram

Arduino Uno  
2 XBEE Radios  
Raspberry Pi  
3 MyoWare Muscle Sensors  
1 blue LED

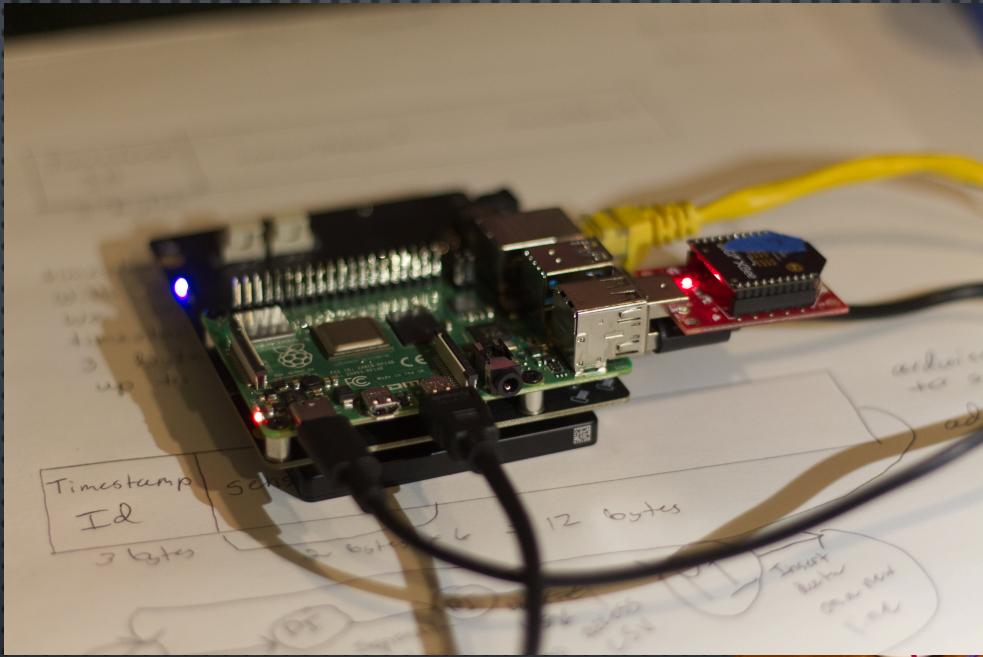


# WIRING DIAGRAM

# IMPLEMENTATION W/PICTURES

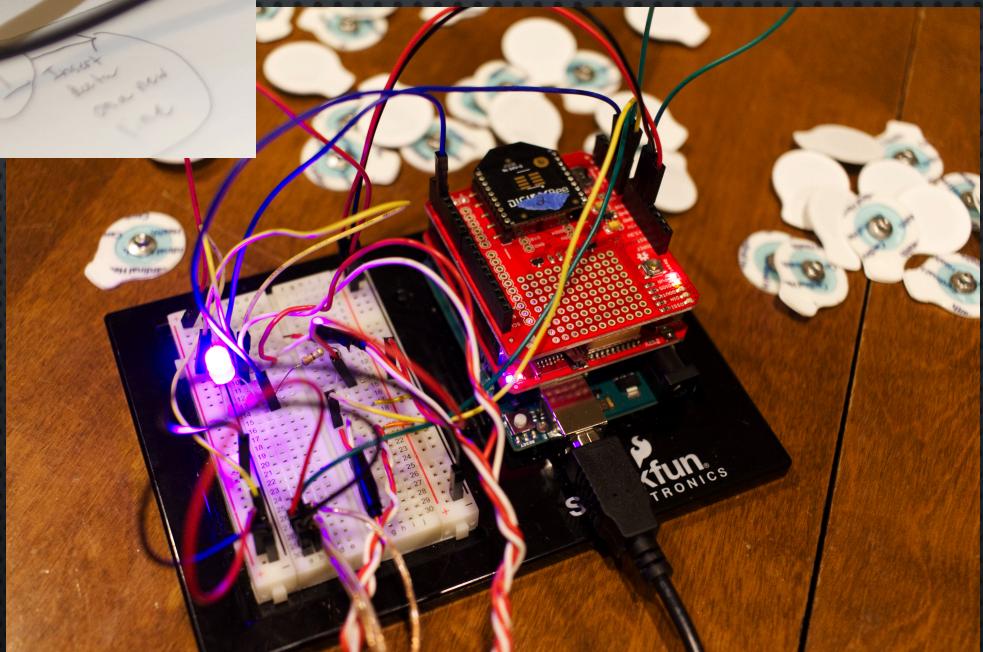


192.168.4.1/data  
shows all recorded  
csv's



Raspberry Pi receives payload via xbee

- Controlled via web app by user
- Controls relayed to Arduino
- Data stored in .CSV on 1TB SSD

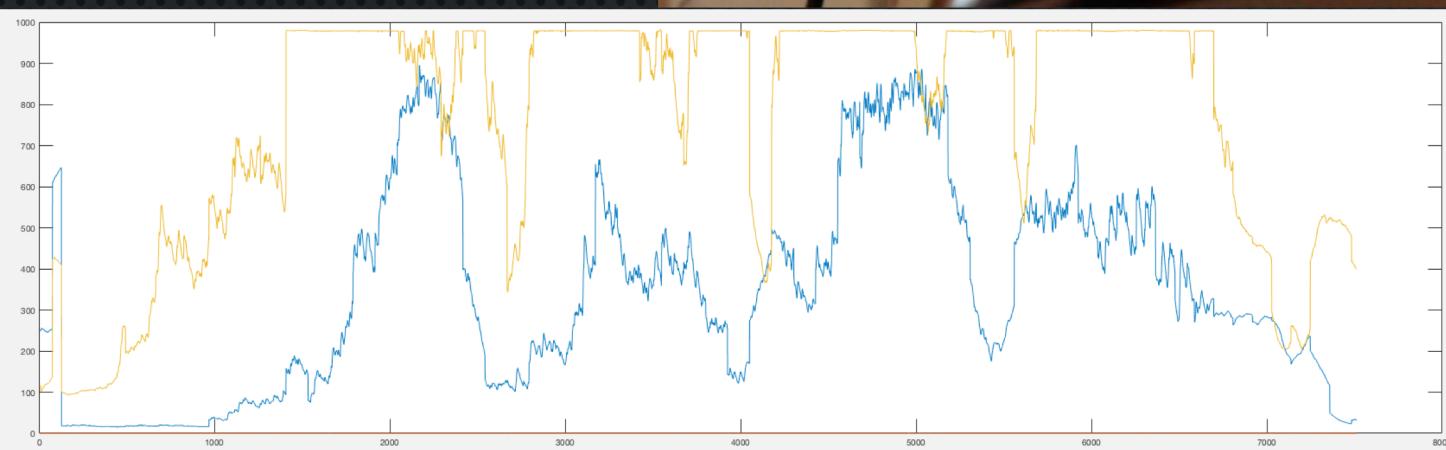
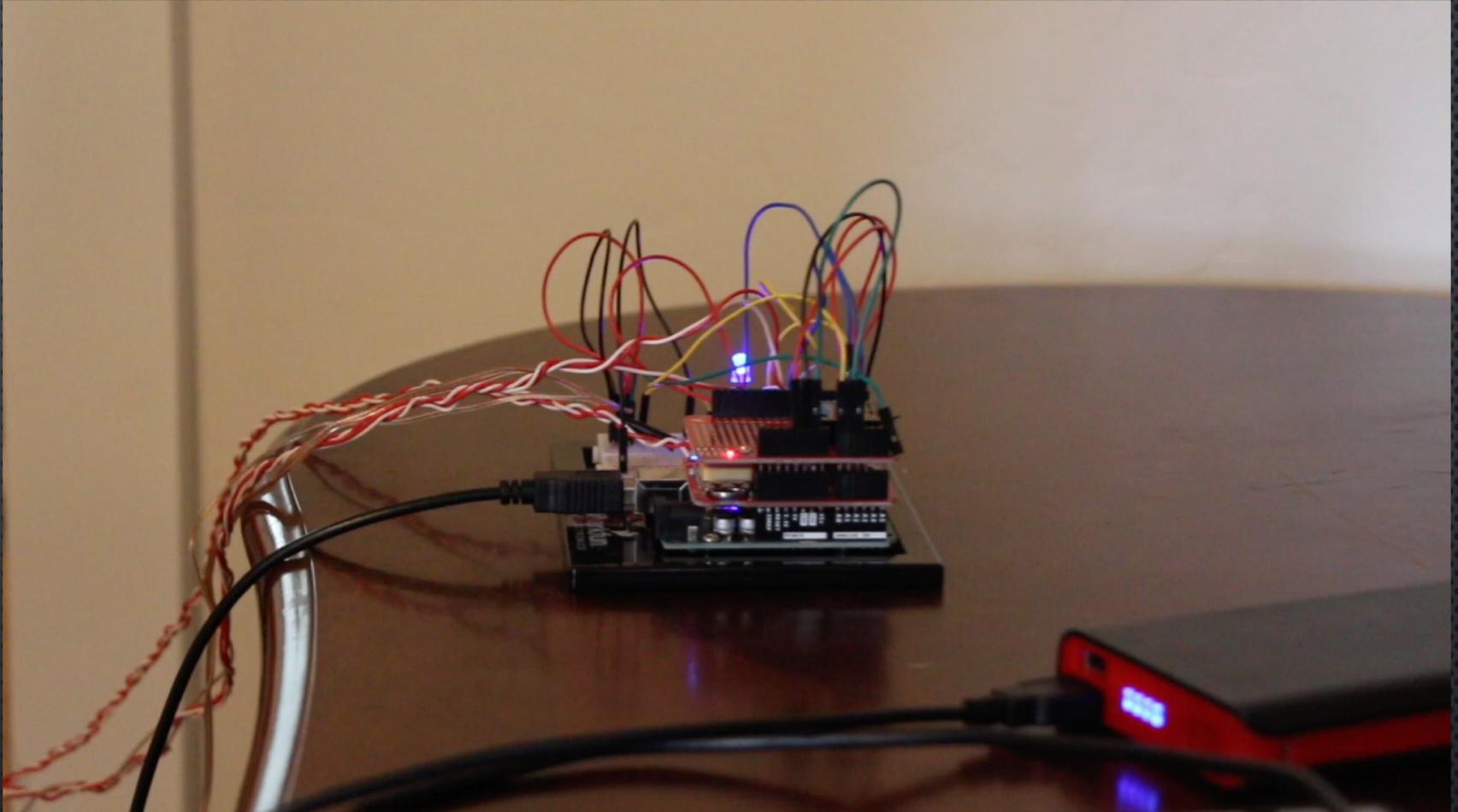


# MAJOR PROBLEMS

- PI INTERNAL STORAGE (SD -> SSD)
- PI RESTRICTS PERMISSIONS ON /TMP
- FORGOT TO SEND START SIGNAL
- WIRE CHAOS, GROUNDING PROBLEMS
- PROCESSES HAD TO BE OWNED BY THE SAME USER TO COMMUNICATE VIA SIGNALS
- NOT ENOUGH USB PORTS
- WLAN ON PI CAN NOT BE SHARED
- ADHOC NETWORK
- GPS CONFIGURATION/RAM REQUIREMENTS
- GETTING EQUIPMENT TO CB

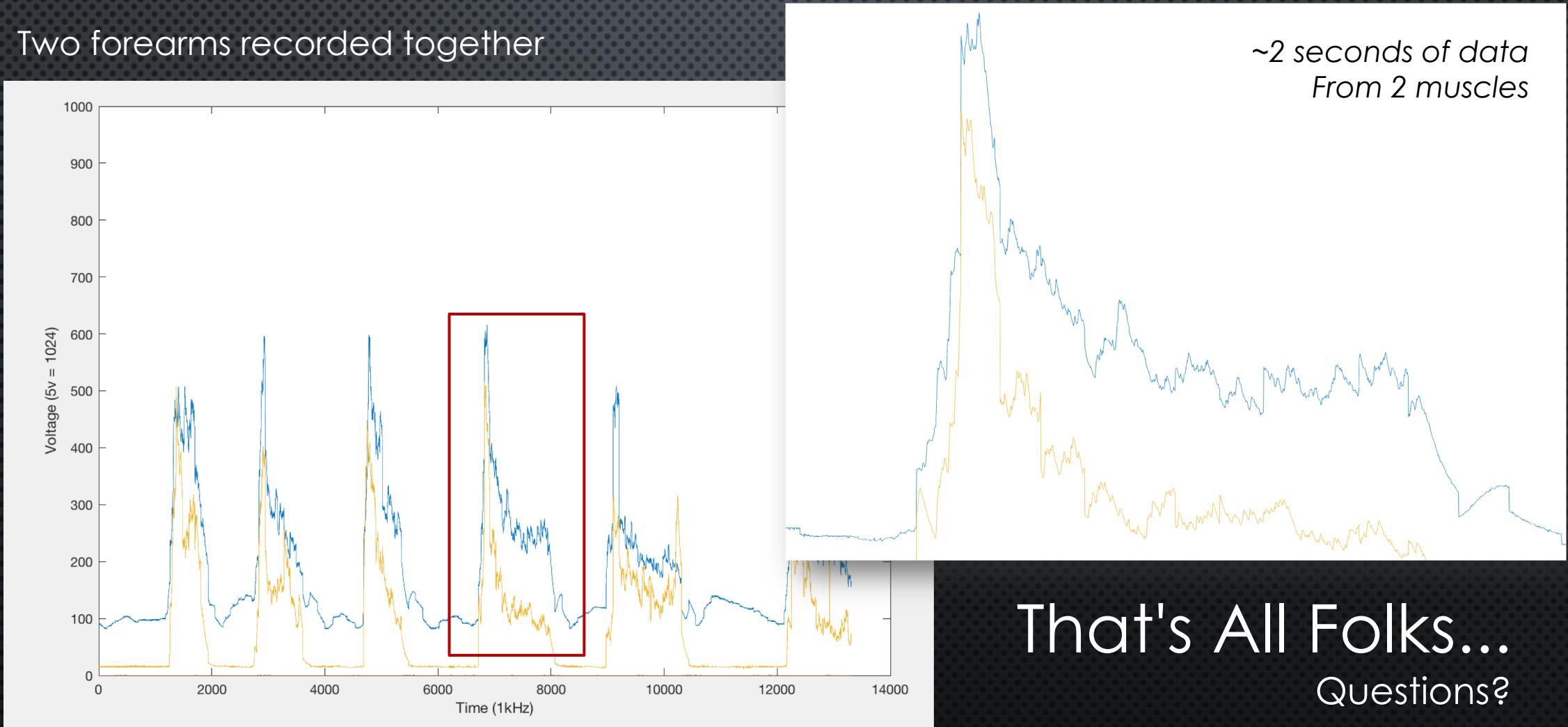


# TESTING



# RESULTS

Two forearms recorded together



That's All Folks...  
Questions?