Recovery-Monitoring Knee Brace

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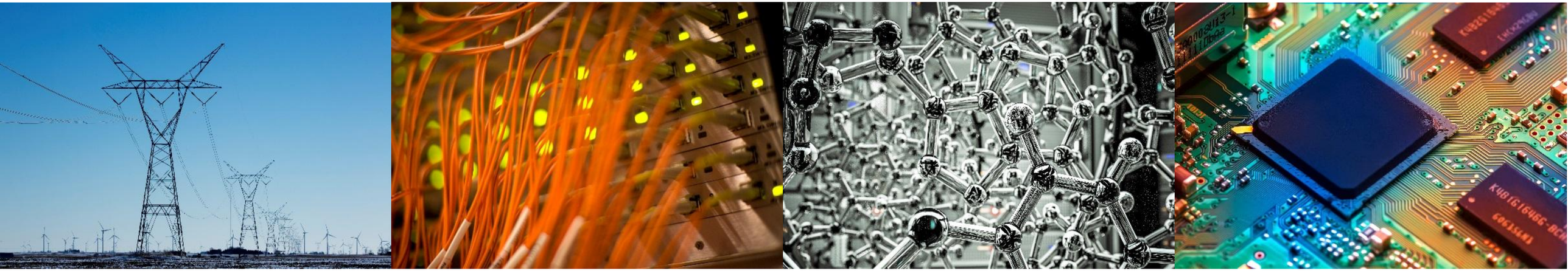
ECE 445 Fall 2017



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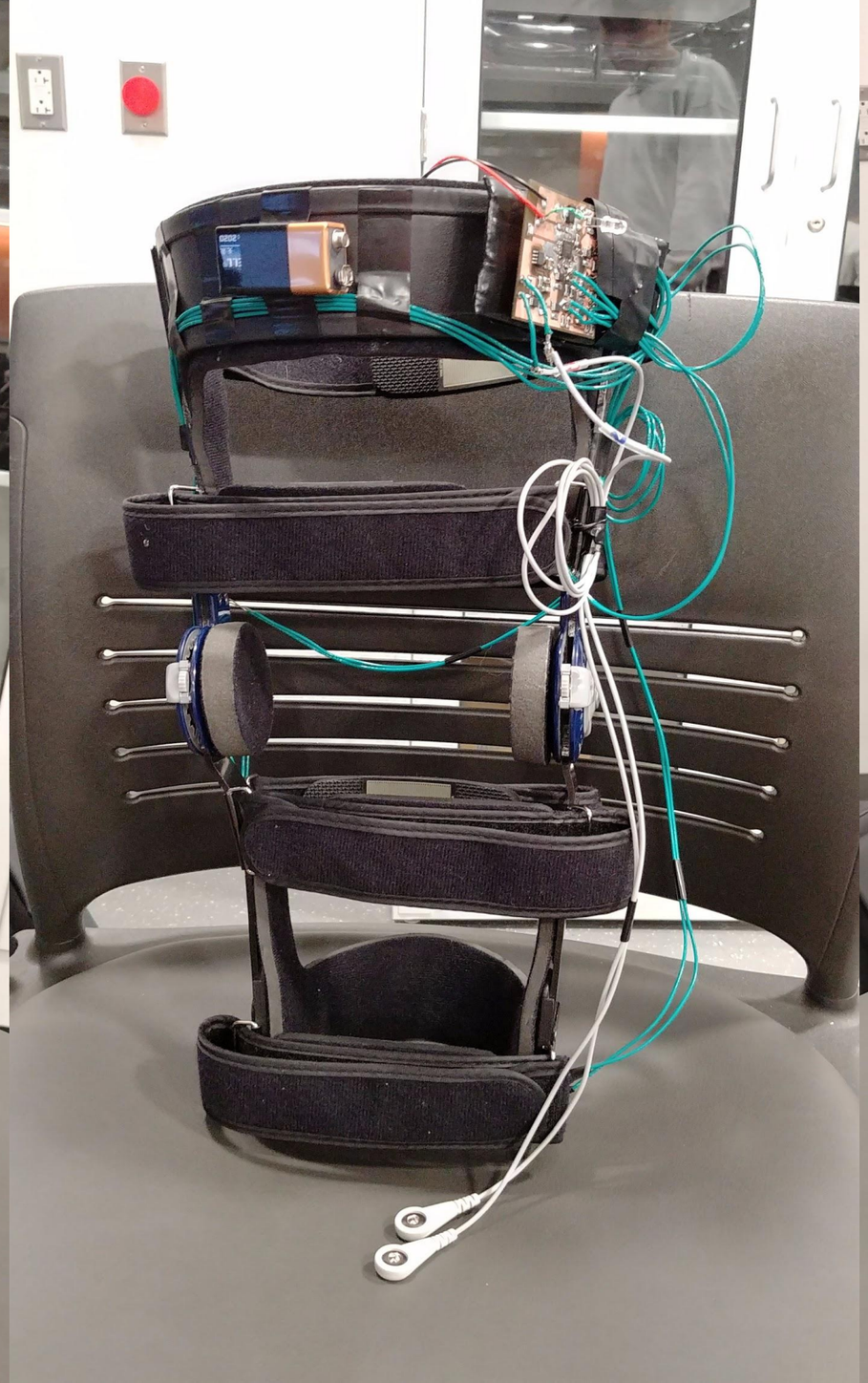
Introduction

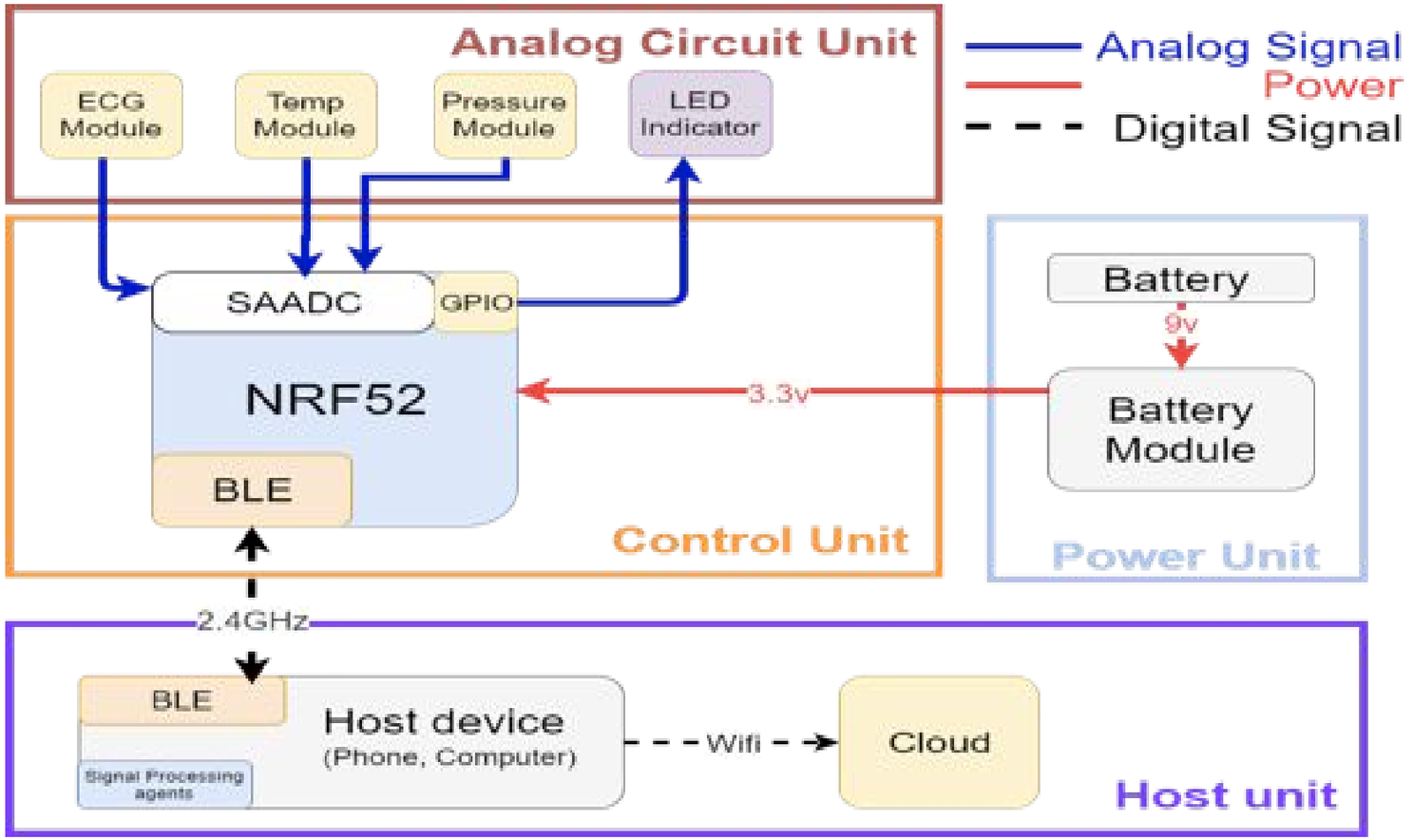
- Assist patients in the recovery stage
- Provide feedback so both doctors and patients can keep track of the progress

Objective

- Notify user about maintaining secure fit
- Help refrain from excessive leg use
- Monitor injury via swelling

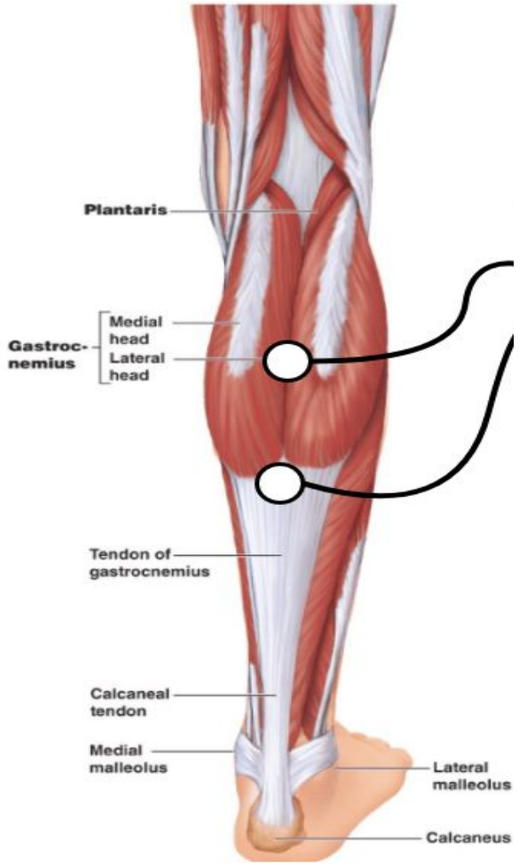



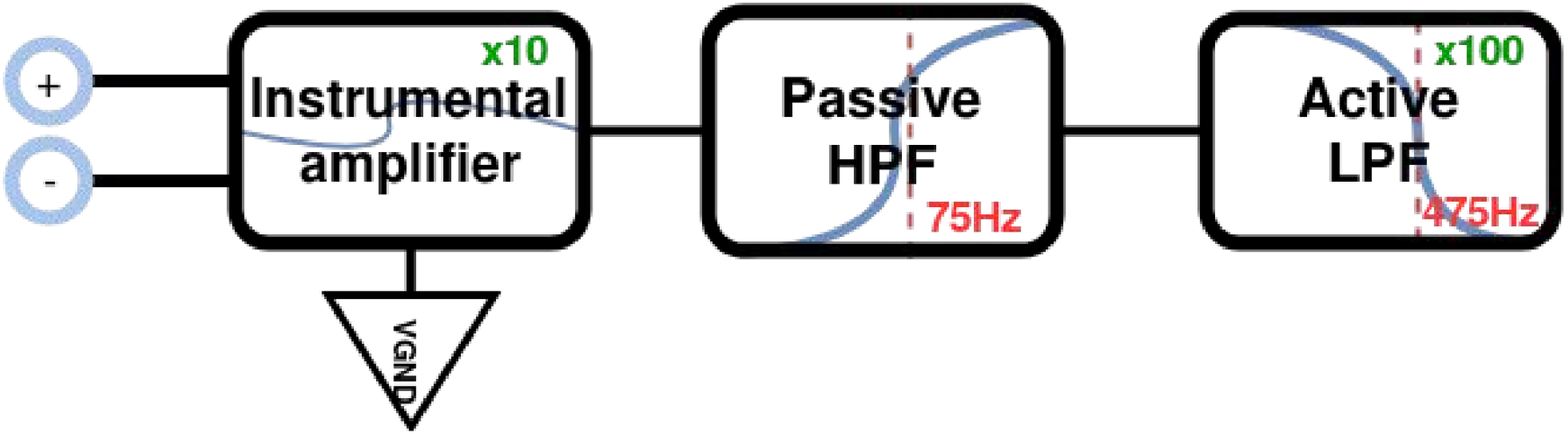

Block Diagram



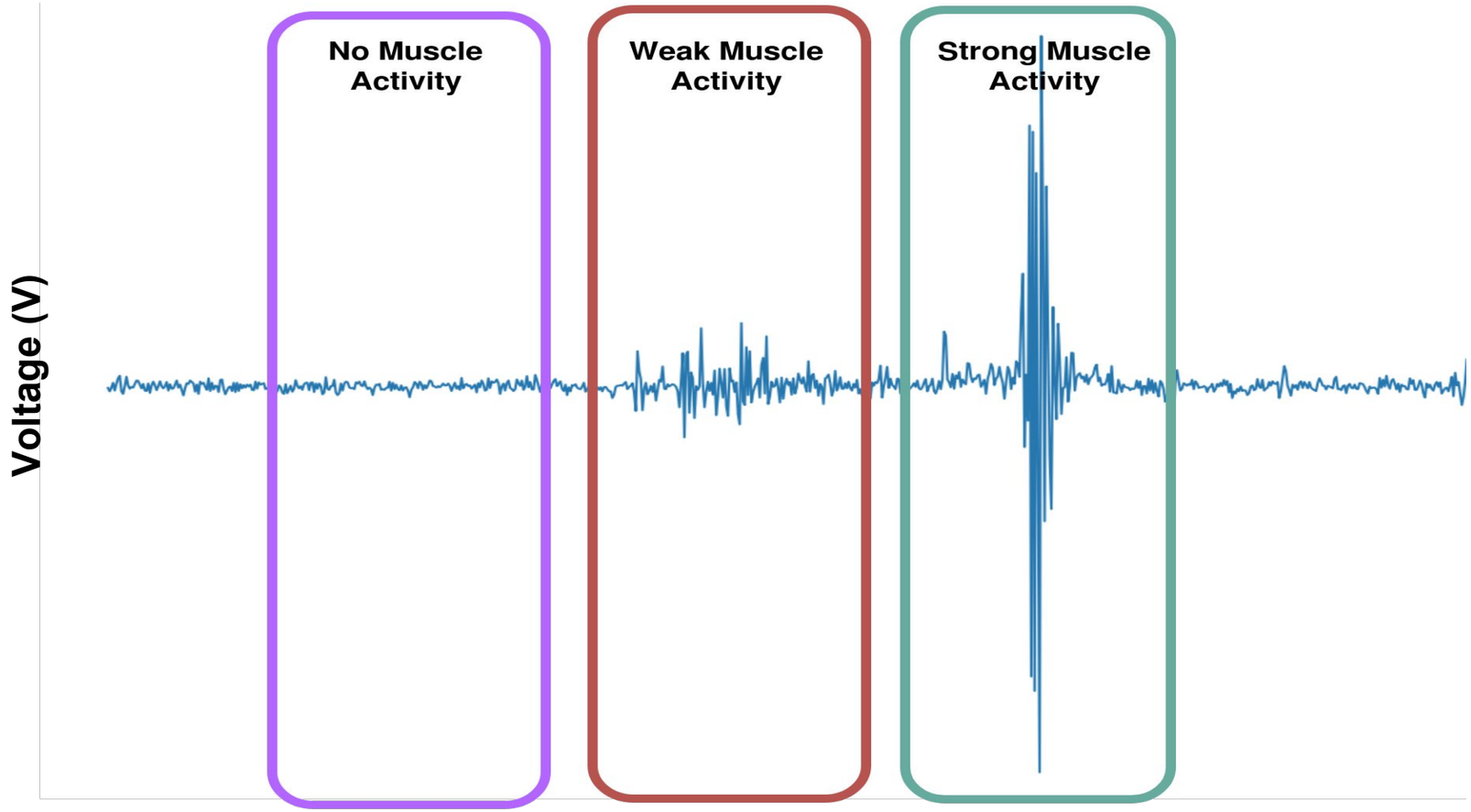
Host User Interface

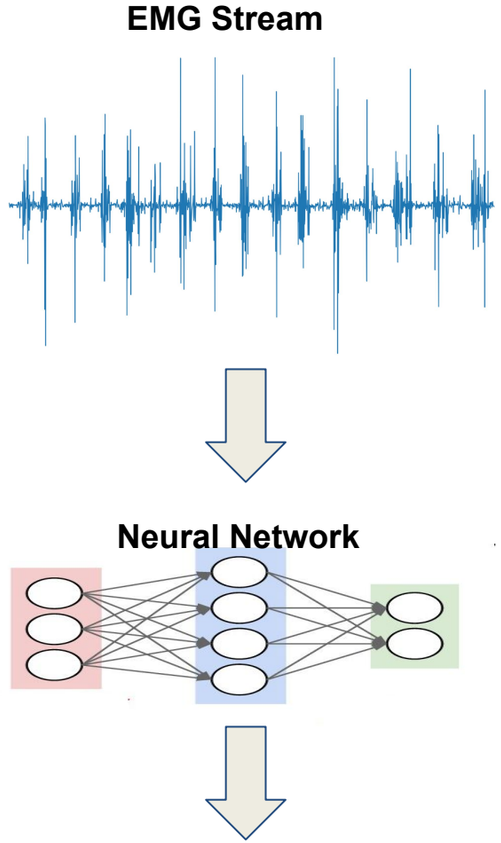
Design: EMG Sensor





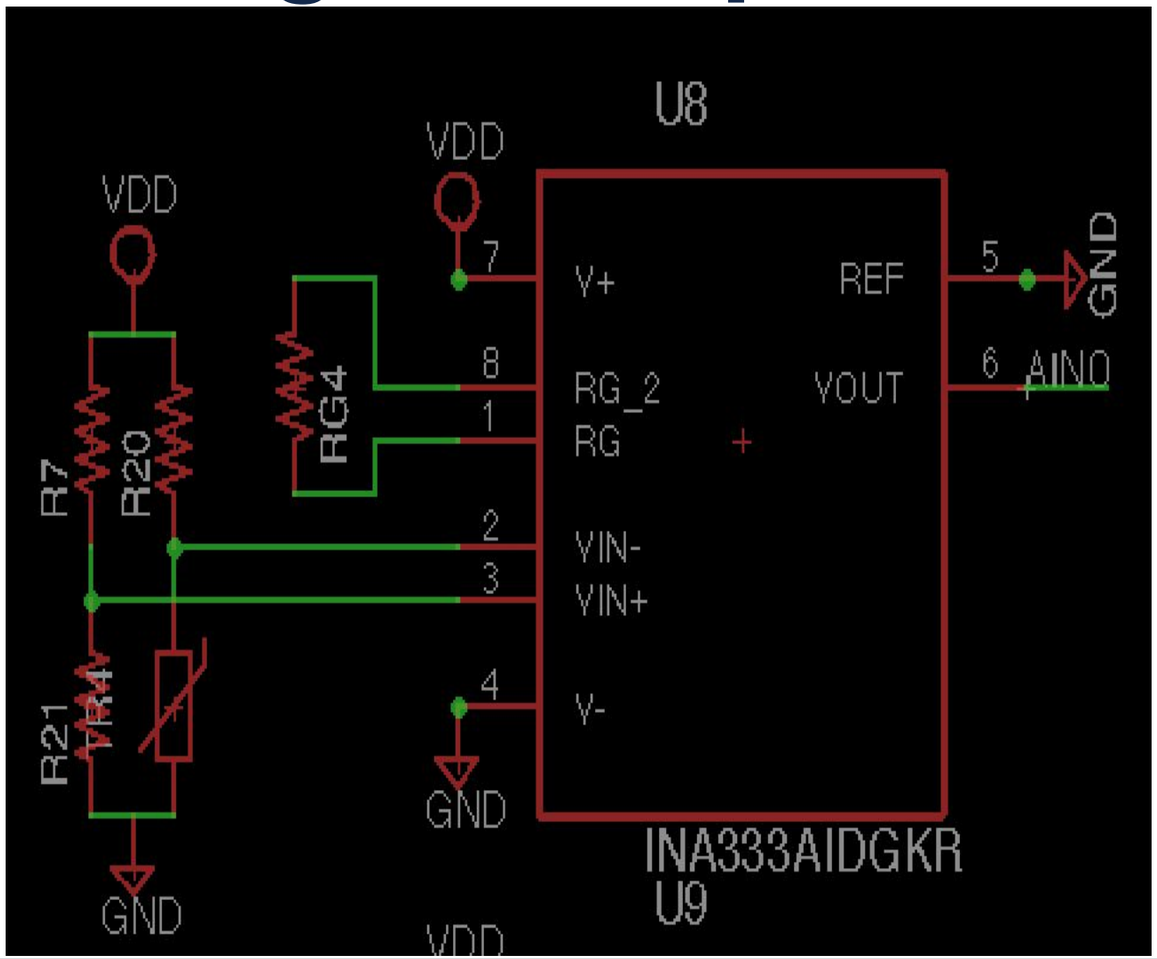
Design: EMG Sensor





- Strong Muscle Activity
- Weak Muscle Activity
- No Muscle Activity

Design: Temperature/Pressure Sensor



- Bridge Circuit Implementation Using Resistance sensor.

$$V_{out} = V_{in}\left(\frac{R_7}{R_{21}+R_7} - \frac{R_{sensor}}{R_{20}+R_{sensor}}\right)$$

Design: LED Circuit

- Simple LED Circuitry: Positive side to power input to negative side to resistor (220Ω) to nRF52 (microcontroller).
- nRF52 controls the duty cycle of the LED to ensure that the device is connected into the HOST device via bluetooth.

Conclusion

- EMG sensors distinguish between different usage strengths
- Pressure sensors work together to provide feedback
- Use difference in temperature to assess swelling
- Future work: mount on a flexible substrate for better aesthetic appeal & optimize circuitry/sensors for ideal signal output