**EMG Protocol**

**Placement**

Myoware 2.0:

A diagram of a diagram of a sound wave

Description automatically generated

* For 3-sensor forearm placement

A person's arm with multiple fidget pins

Description automatically generated

* Targets the Brachioradialis, the Flexor Digitorum Superficialis, and the Brachialis
* In the opensource NinaPro dataset 1 these are sensors 7, 9, and 10 respectively

**Data Collection Circuit**

A diagram of a computer

Description automatically generated

**Pre-Processing**

* Needs a filter usually filtering out below 80-100 Hz and above 450-500 Hz
  + Generally used a bandpass filter to get both high and low at the same time
  + We could also use a high and low pass
  + Signals typically around 50 Hz should also be filtered out
    - The sensor itself usually does this automatically
* Usually has a gain applied (size depends on how what you need)

**Feature Extraction**

* Features
  + Histogram
    - 20 Bins
    - MATLAB: HIST = histogram(data, bins, 'Visible',
    - 'off');
    - Make sure all histogram bins are hard coded to be the same otherwise this can make some issues. Also make sure that the histogram function is creating an array, not a histogram
  + Root Mean Squared
    - MATLAB: RMS = rms(data);
  + Mean Absolute Value
    - MATLAB: MAV = mean(abs(data));
  + Slope Sign Change
    - MATLAB: SSC = sum(abs(diff(sign(diff(data)))));
  + marginal Discrete Wavelet Transform
    - Use Daubechies Wavelet
    - Signal Data ‘d’
    - Low-pass Filter ‘h’
    - Coefficient Approximations ‘cA’
    - Number of coefficient approximations ‘M’

for

* + - MATLAB: [cA, ~] = wavedec(data(:,1), 1, 'db1');

mDWT(1,1:3) = mean(abs(cA));

* + Waveform Length
    - MATLAB: WFL = sum(abs(diff(data)));

**Machine Learning**

* Mostly used Ensemble Bagged Trees and Quadratic SVM
* Need to rebalance amount of rest compared to the amount of other data
* Make sure that the histogram bin size is hard coded otherwise it can get messy

**EMG Data Collection**

* Make sure a usb isolator (Adafruit 2107) is used even with a unplugged laptop
* Make sure skin is shaved and cleaned with isopropyl alcohol

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