Ben McAteer

0029592670

BME 511

Final Project

Hand Gesture Prediction via EMG Data

Electromyography (EMG) is becoming increasingly popular in gesture controls and other hands-free technology. The goal of the project was to predict four different hand gestures- Rock, Paper, Scissors, and “OK”, given EMG responses of the forearm, in as short of an amount of time as possible. The EMG data consisted of eight unmarked sensors and data was recorded for six trials of twenty seconds at a 200Hz sampling rate. The key innovation of this project involved finding the main differential characteristic to restructure the data before applying the model. The key differential characteristic was identified as the mean of the absolute value of each sensor. The data was defined by this characteristic in 1.00, 0.5, 0.25, 0.05, and 0.005 second time windows that would be used for the model. After restructuring the data, five models are applied in a 70% Train and 30% Test split. A peripheral objective became determining which type of model best predicts EMG data. The five models are: Multi-Layer Perceptron (MLP), Linear, Naïve Bayes Gaussian (NBG), K-Nearest Neighbor (KNN), and Principal Component Analysis (PCA). After applying each model, the MLP, Linear, and KNN models showed accuracies above 95% with only 1/20th of a second of data. These findings show that the four hand gestures can be predicted in a near instantaneous 1/20th of a second and therefore could allow for further gesture control devices. Future work would entail adding more gestures and testing these same models.