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Classification of Hand Gestures Using Deep Learning Models on EMG Data

Problem Statement:
To compare the accuracy of Deep Learning models such as Temporal Convolutional Networks, LSTMs, RNNs, and others to the accuracy generated with traditional machine learning approaches such as SVM and KNN as discussed in the paper "putEMG—A Surface Electromyography Hand Gesture Recognition Dataset". This comparison of different approaches should allow for a deeper understanding of the possible ways to tackle the handling, processing, and analysis of EMG data with respect to using surface EMG data to classify hand gestures.

Dataset:
The dataset contains sEMG data from 24 different electrodes placed on the forearm as participants formed eight different hand gestures. 44 (8 female + 36 male) participants were used and each was asked to record measurements 2 times with a minimum of one week gap between measurements. More information about the dataset can be found here:

https://biolab.put.poznan.pl/putemg-dataset/

Deep learning models/approaches to be investigated
We will investigate a number of models in order to best classify the hand gesture EMG data. First, we will try a Long Short Term Memory Network (LSTM), a Convolutional Neural Network (CNN), and a combined CNN + LSTM model. We may also use a Temporal Convolutional Network (TCN) to see if we can improve upon our accuracy.

Method of Assessment
We will assess the success of our models by the accuracy of their classification. There are 8 labeled hand gestures for each input in the dataset, so accuracy will be based upon the proportion of correct predictions, and we will visualize the effectiveness using a confusion matrix to better visualize the predictions.

Allocation of responsibilities
Data Preprocessing & Abstract - Neil Kennedy
LSTM + CNN model design, train, validation, testing & conclusion - Shahad Albrahim
TCN model design, train, validation and testing & the introduction - Adi Shastry
Model related result analysis and description - Combined effort