Exercise classifier final project

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We took on the task of building an exercise classifier that could identify various exercises using data gathered from our smartphones for our final project. The goal was to create a machine learning algorithm that could differentiate between various exercises using particular patterns in the data, which was being recorded by the accelerometer and gyroscope in the phone.

To enable more thorough testing and training, we initially looked at the idea of combining our own data with internet datasets. But after doing more investigation, we came to the conclusion that it would be best to use exclusively our own data for the project. This choice was chosen to guarantee the data's accuracy and applicability to our particular objective.

Pushups, situps, and pullups were the first three major activities we chose for classification. These exercises were chosen because they have recognizable movement patterns that made them simple to recognize and categorize, given the location of the phone in the front pants pocket. Each one has a very different average orientation (as given by gyroscope), and consequently a very different acceleration across each axis (as given by accelerometer). Furthermore, each event occurs at a

distinguishable frequency (relatively). We would expect the longer and slower movements of a pullup to show a lower dominant frequency on average than a situp. The orientation for a pushup has a slight and periodic change back and forth, but a situp has almost no change, and a pullup may have more turbulent change in orientation associated with the legs swinging or moving. Here we can analyze variance in the gyroscope and time between peaks. We intend to investigate more exercises that can be classified using techniques comparable to those we employ to categorize these movements as we continue our work.

What we have learned in class and through past assignments has had a big impact on how we are approaching the project. Since we are not starting from zero, we can comprehend what is happening and save time by drawing on our prior experience and expertise. At this time, our attention is on feature extraction and identifying the features that will be most helpful in reaching our objective. It is likely that certain exercises will look really similar, even when we collect the data from multiple sensors. For example, exercises like bicep curls and hammer curls will have a very similar motion, and should look nearly identical. Mostly, anything where you are standing and doing a rhythmic motion with a weight will be nearly indistinguishable, since the gyroscope will not help while standing in all of these, and accelerometer movements will look largely the same from the pocket.

We intend to gather information from every group member in order to improve the amount of data that is available for testing and classification. As a result, we will have

access to a wider variety of data to work with, which could enhance the precision of our classifier. In addition, we hope to use the data and findings to produce some visualizations that will allow us to assess how accurately our classifier identified each exercise.