Step Detection and Classification for Different Cardio Machines

Train an algorithm to detect steps and classify different cardio activities ranging from the stair master, incline treadmill, rowing machine, stationary bike and running.

Sensors
We plan to use the accelerometer and use a very similar data collection and preprocessing methodology to the ones that we use in class. The main differentiator of our project from the assignments is that we want to optimize for specific cardio machines.

Methods
We can use a combination of time and frequency domain features. We would use variance in repetitions, and the max and min values of peaks from time. We would also look at dominant frequency and signal energy to find rhythmic patterns, and potentially also look to see if the gyroscope could be useful for things like pedaling.

Plan
I think our advantage is that we have a clearly defined five activities and three teammates. We are planning on collecting 2 minutes of data each for each of those activities, which should only take a weekend of data collection at the recreation center. It's also our plan to go early and quickly inspect the data to look for any collection errors, and as the recreation center is always open, we can always go back and redo the data collection process if needed.

We plan to use sensor logger on each of our phones. We will turn it on, put it in our pocket, and immediately start the activity. We'll do the activity for two minutes, then take the phone out and end the recording. We'll each do the activity once so we have 6 minutes of activity data for all 5 activities. We'll title the activity in sensorlogger (who recorded it, what activity it was) then load it into Jupyter Notesbooks. We'll crop the first and last two seconds, add labels based on the file titles, then merge the datasets for training.