**Brett Wyton – 45423229 – COMP255 Assignment 1 – Project Movement**

The purpose of this project is to extract specific human activities from a series of given datasets. The data set is recorded by a range of accelerometers and gyroscopes located on the body. They are located on the wrist, chest, hip and ankle. The accelerometer measures the linear movement of the x, y and z co-ordinates of each unit and the gyroscope measures the rotation of each of the devices.

SCRUM Sprint 1: The first sprint will be focusing on the loading of data sets and the visualisation of the data. Signal data will be filtered in the attempt to reduce the micro movements that will get picked up by the sensors.

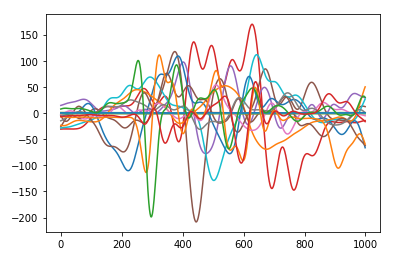
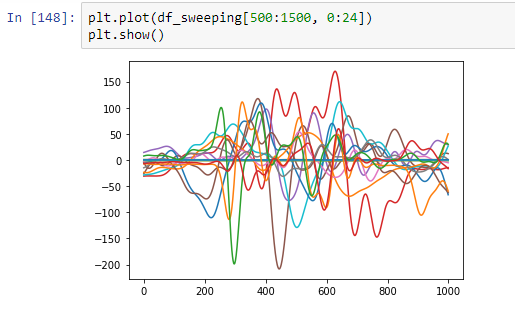
The three most useful technologies used for achieving this were the; pandas, matplotlib and SciPy libraries. All three working in tandem allowed for the reading of the data files, plotting the data itself and removing noise signal from the plotted data respectively. The activity that I chose to compare was the “sweeping activity”. In the case of the first data set, I recorded the unfiltered signal from the wrist accelerometers and then compared it to the filtered (using a lowpass filter) wrist accelerometer. I repeated this for all the accelerometers (the first four plotted data comparisons) and then used the same method for the gyroscopes. After the individual comparisons between devices were made, in the interest of a complete picture of the noise cancelling process, I compared filtered and non-filtered data plots from all the recording from both the first and the last data sets.



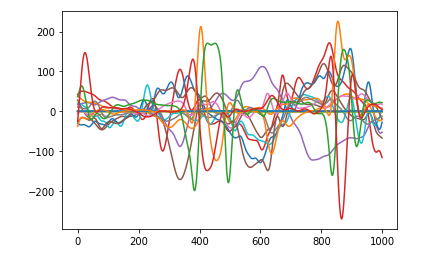
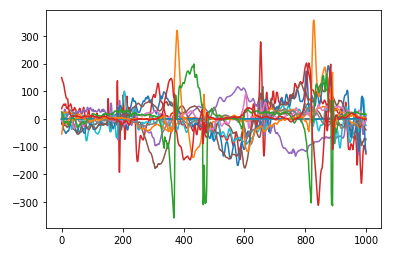
(Wrist accelerometer data plots)



(Ankle gyroscope data plots)



(Unfiltered sweeping data vs filtered sweeping data for dataset 1)



(Unfiltered sweeping data vs filtered sweeping data for dataset 19)

SCRUM Burndown Chart:

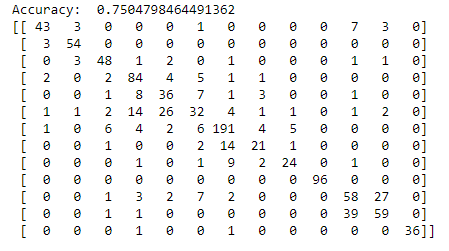
SCRUM Sprint 2: The second sprint will focus on feature engineering. The now cleaned sensor data can have features extracted. The KNN machine learning model can also be applied here to help recognise human activity patterns.

The most useful technology for this section was the use of the Numpy library. This library is useful for making multi-dimensional arrays and matrices which are incredibly useful for holding data in an easy to read and understand way.

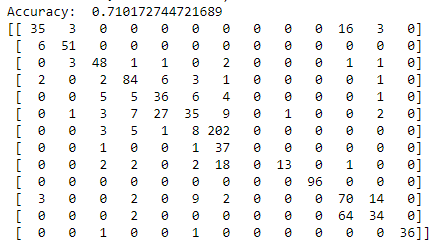
SCRUM Burndown Chart:

SCRUM Sprint 3: In this SCRUM Sprint the models need to be tested for their accuracy. Both a KNN and an SVM machine learning algorithm will be utilised to test the accuracy of the test data.

In this SCRUM Sprint, the KNN and SVM models were used to test the training data. Both models had a confusion matrix created to test their accuracy. The KNN confusion matrix was created with an accuracy of ~75% whereas the SVM model only had an accuracy of ~71%. Bicycling on an ergometer of 50 W and 100W were the two most confused activities. This is most likely due to how similar some of the results are in that it is a similar activity regarding movement.



(KNN confusion matrix).



(SVM confusion matrix).

SCRUM Burndown Chart: