Background Info

- Our project has two parts: 1. Data collection 2. Building machine learning model for activity classifier.
- The availability of a system capable of automatically classifying the physical activity performed by a human subject is extremely attractive for many applications in the field of healthcare monitoring and in developing advanced human-machine interfaces. By the term physical activity, we mean either static postures, such as standing, sitting, lying, or dynamic motions, such as walking, running, stair climbing, cycling, and so forth. [1]

Data collection and manipulation

- Our plan is to use Android wear to collect sensor data, then save the data as the training data.
- Grab other person’s code from Github, contributing to it and turning a data viewer to a logger
- Set the frequency to be 50HZ so that the data is collected at steady rate
- Collect both the Accelerometer and Gyroscope on many different motions, like lifting, pushing, pulling and so on.
- Write a python script to extract data and do some data cleaning so that it will be useful for our next step.

Building Model

We select two methods to do this: Vector Quantization and Hidden Markov Chain.

Vector quantization:
We use signal processing technology to find out the pattern in those signal, and using these to do classification.

Hidden Markov model (HMM):
We build a model for each motion and compare the probability to determine the classification.

For both methods, we build a semi-real-time model, and we tried different parameters to find the one that gives us the best accuracy on test sets.

Conclusion

The hidden Markov chain model works much better than the vector quantization model. The reason may be that the vector quantization model is not good for real-time classification.

Next plans

- Optimize the model and consider other machine learning algorithms that can be used to here.
- Optimize the Android App to collect more steady data and consider using kalman filter to clean the data.
- Build the model into APP and make the classification and prediction real time.

Reference