



Content and purpose of this lab

The main focus of the lab is to more classification with neural nets using keras and tensorflow.

Required Preparations

You need to finish part three of the lab and be able to show the result in the beginning of the lab.

- You also need to record one more datafile. This file should be 1 minute long and include all four (4) different movements. Approximately 15 seconds for each movement/class. Remember which order you made the different movements. You could for example do this recording two and two so you have a video of the movement as an independent source of your classes/movements.
- You also need to write the first draft of the labreport. The sections introduction and materials and methods should be finished in a first draft. That is all required parts of these sections should be present in the text. This report should be uploaded before the lab. You can find the assignment in the same module as the labmanual.

NOTE. This new datafile should not be cleaned as the previous ones. We want to know how your algorithm works with some more realistic data.

Classification of the four movement classes

You should use RNN as a classifier. To save time we will just use the GRU neuron. Hyperparameters you can change for optimizing are:

- Number of neurons in each layer. You need to provide result for at least three different sizes of a layers.
- Number of layers. We can limit ourself to 1 and 2 layers.
- Window length, you need to provide result for at least 3 different window lengths

This does mean that you need to train $2 \times 3 \times 3$ models.

As previously:

Performance is measured by accuracy and confusion matrix as you have done before.

- You should use the training and validation set for tweeking the hyperparameters.
- You evaluate the model with the test set, looking at both the accuracy and the confusion matrix.
- With the the new combined datafile predict the classes.

We do not know what the true result is, but you can make a plot where we see the raw data, one for the acceleration and one for the rategyro. In the plot indicate the predicted classes as well, by horizontal lines and text or in another way.

You are free to use regularization and drop-out to improve your results.

Extra required for grade four

Note this is necessary for grade four, but the grade also depends on your report.

You need to expand your hyperparameter search regarding the one you used for grade 3. You also need to add at least two new ones that are relevant. If you want to use even more, you are welcome to do so. In the report a motivation is needed for this expansion, both the choice of hyperparameters and ranges. You can use gridsearchCV for this if you want. You also need to use crossvalidation instead of hold out.

For this grade you need to run your code on a GPU.

Extra required for grade five

Firstly you need to fulfil the above requirement for grade 4.

Note this is necessary for grade five, but the grade also depends on your report.



Here you need to work two and two. Exchange your training set, validation set, and test set. You now have doubled the data set, that is you have the double amount of instances. Also exchange the new combined datafile you recorded for this lab.

You should now build a model that both can classify the movement and the person. You have in total eight (8) different classes.

- You have to do the same procedure as you did for grade 3 and grade 4, but with the eight different classes.

For this grade you need to run your code on a GPU.