# COMP6248 Lab 5 Exercise

**Adrian Azzareli, aab1g18@soton.ac.uk**

## 1 Initial Attempt

In this lab we constructed a 2-D convolutional neural net (CNN), with *Adam* optimiser and implemented the *cross-entropy loss* and *L1 loss* functions to determine the performance of the CNN as a result. After 100 epochs the test results provided in Table 1 show that L1 loss is more fitting for the this task under the constraints set by the CNN and is able to predict accuracy up to $90\%$. With respect to conventional CNNs, 100 epochs of training could be considered "short" thus the high accuracy measurement for L1 loss could indicate a good projected performance, though this would suggest that the current model at 100 epochs would still need improvement.

| Method | Test Loss | Test Accuracy |
|---|---|---|
| Cross Entropy | -16985232.0 | 0.632 |
| L1 | 2.365 | 0.908 |

**Table 1.** Loss and Accuracy of CNN with either cross entropy or L1 loss

## 2 Second Attempt

We expanded the prior CNN to have an additional convolutional layer (48 channels, 3x3 filter size, stride 1 and padding 1) as well as global max pooling, using the *AdaptiveMaxPool2D* function provided from *pytorch*. Running this CNN over 100 epochs yielded a test loss of $2.188$ and a test accuracy of $0.932$. Comparable to our first attempt we see an increase of around $3\%$ in accuracy. Though, again, this shows good projected performance, perhaps we would hope for a higher performance at 100 epochs.

We initially monitored the testing and training behaviours of all network variants over 50 epochs by measuring both loss and accuracy, as illustrated in Figure **??**. These results are interesting as the loss shows a convergence to around $-1.58$ for all network sizes, whereas the results for accuracy show a divergence from around 0.0198 after epoch 100 for most network sizes.

## 3 Taking in a Coloured Image

Prior to now we have been feeding our CNN with a images consisting of one channel. Considering this limits the model's observation of the multi-channel environment (e.g. and (R,G,B) coloured image) to a singular channel (e.g. a (0-255) grey-scale image), we can propose improvement in our CNN's generalisation process by accounting for additional information such as colour. Such information may improve the CNN's ability to differentiate between lines/-points present in the image, relative to our task/data set.

As a result of the incorporation of a 3-Channel (R,G,B) image input our model performs a test accuracy of 0.952 and a loss of 1.402. This indicates significant improvement from our initial model and perhaps suggests a more appropriate netwrok has been trained for the given task and data set.