**EECE680C Neural Networks & Deep Learning**

**Homework 3**

Due: Thursday, March 25, 2021

1. Python & Tensorflow programming. Design and train CNN to classify the CIFAR10 dataset. Please use the all-convolutional layer architecture outlined in the following pseudo-code:

for scale in range(3):

conv2d(64<<scale, activation=leaky\_relu, kernel\_size=3, padding='same')

conv2d(64<<(scale+1), activation=leaky\_relu, kernel\_size=3, padding='same')

average\_pooling2d(2, 2)

last\_layer = conv2d(10, activation=leaky\_relu, kernel\_size=3, padding='same')

output\_logits = tf.reduce\_mean(last\_layer, [1, 2])

* 1. Please sketch (by hand) a block-diagram showing the architecture of the CNN model, marking out important parameters such as layer size.
  2. Please plot the learning curve and the test (generalization) curve together as functions of epochs. The first curve shows the change of the loss function (or the accuracy function) over the training dataset, while the second curve shows the change of the loss function (or the accuracy function) over the test dataset. Can you find any underfit or overfit problem in your figure?
  3. After training, please plot 100 sample images that are corresponding to all possible classification cases, such as an image in class a is classified to class b, for all a and b in 0 to 9. You can plot all these images in the following table form. Please also try to print the logit over each image to indicate the confidence of the classification.

True/detect 0, 1 2 3 4 5 6 7 8 9

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | Image0 | Image1 | Image2 |  |  |  |  |  |  |  |
| 1 | Image10 | Image 11 |  |  |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |  |  |  |
| 7 |  |  |  |  |  |  |  |  |  |  |
| 8 |  |  |  |  |  |  |  |  |  |  |
| 9 |  |  |  |  |  |  |  |  |  |  |

Please put your code and the results into a pdf file and upload to blackboard.