ELE 49409 - Spring 2019 **Due date: April 11, 2018**

Assignment 3: Deep Convolutional Neural Networks

Summary

- Submit all of your code and results in a single zip file with name IDnumber_A03.zip. Submit single zip file containing

  a) Code b) results c) report

- There should be **Report.pdf** detailing your experience and highlighting any interesting result.
- Email instructor or TA if there are any questions. You cannot look at others code or use others code, however you can discuss with each other.

Description

Here you will design and train a Convolutional Neural Network (CNN) for image classification in Keras. You will be using CIFAR-10 dataset. You can download it from (https://www.cs.toronto.edu/~kriz/cifar.html). Download the python version of the dataset and follow the instruction on the web page to load the dataset in python. This dataset consists of 60000 (32x32) color images in 10 classes, with 6000 images per class. There are 50000 training images and 10000 test images. Each example in this case is of 3072x1 size i.e. 32x32x3=3072. There are 10 classes, where each image contains one object.

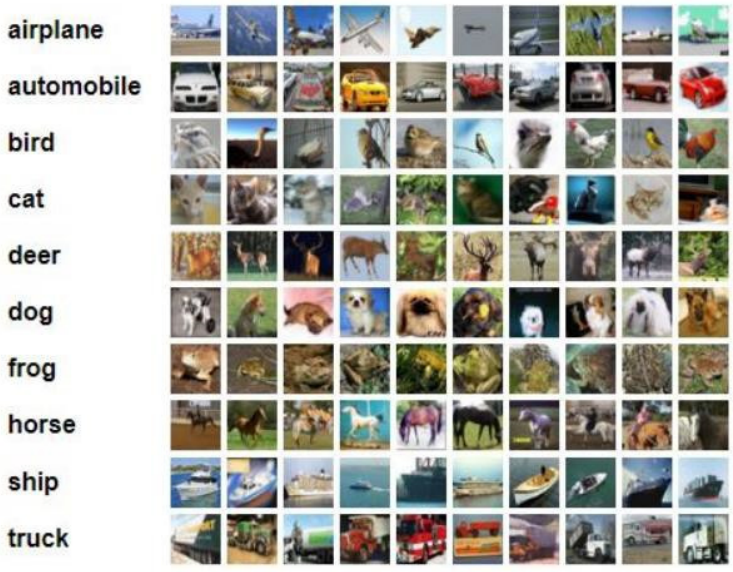

Figure 1: Here are the classes in the dataset, as well as 10 random images from each.

Tasks:

- Design your own architecture.
- Read about batch normalization. Summarize in one paragraph as what does it do. Now add batch normalization layers in your network and report your findings in the report. That is, its effect on your architecture.
- Mean subtract your images and normalize with the standard deviation. Now re-train your network. Did it have any effect?
- Explore initialization methods and experiment with different initialization methods and report your findings in the report.
- Add some dropout layer in your network and report the comparison of results with and without the dropout layer.
- Perform few experiments with different value of learning rate. Also, experiment with different optimizers, e.g. SGD with momentum, RMSprop, Adam and play with various options on a subset to see their effect. Use the selected options for the three optimizers, retrain the network on your training data and report performance while testing for all three.
- Try few appropriate batch sizes and report the best batch size.
- For all the above report the loss and accuracy curves. Do analysis and comment on the results.
