

# Deep Learning

## Department of Computer Science

### Homework 1

**Due: Feb 20th, Tuesday at 4:00 pm**

**Grades : 100 Points**

Given CIFAR-10 (<https://www.cs.toronto.edu/~kriz/cifar.html>) datasets, you are supposed to build a Neural Network Classifier that classifies images into one of the classes. There is a lot of code online so it could be tempting to copy code from online. Please do not copy code. We have a library of code from online resources that we will match your code against. Please do not copy somebody else's work.

You are allowed to do this as a group project with groups of 2 students.

#### **Part 1. Neural Network (100 points)**

- Write all the relevant functions to build your own mini Neural Network library. Divide the training data into 80% training set and 20% validation set. Implement following functions to that can train your network. Your code should take network structure, training data, hyperparameters, outputmodel file (weights), outputaccuracy file through commandline. Your code should have following functions and additional relevant functions.
  - Feedforward() – 10 points
  - Backprop() – 40 points
  - Train() – 10 points
- Add additional commandline parameters that can take the input weight file, network structure file and validation set and test set to spit out predictions or accuracy on validation set. Validation set has output labels to compute accuracy while Test set has only unlabeled data.
  - Validate() – 5 points
  - Test() – 5 points
- Write an additional regularization function that add L2-norm regularization and report back accuracy.
  - Regularize() – 15 points
- Change the network structure to improve the system and report back result on improved accuracy – 15 points

**You will lose points if you fail to follow the instruction.**

You must compress the following files into a single ZIP file. The name of the zip archive must include “HW2” and all UNI's from your group (example:

HW1\_abc1234\_def5678\_ghi9012.zip). This file should be submitted to courseworks/canvas

## **Appendix:**

Creating a zip file:

windows: <http://windows.microsoft.com/en-us/windows-8/zip-unzip-files>

mac:

[http://macs.about.com/od/faq1/f/How-To-Zip-And-Unzip-Files-And-Folders-On-A-Mac  
.htm](http://macs.about.com/od/faq1/f/How-To-Zip-And-Unzip-Files-And-Folders-On-A-Mac.htm)