# Assignment 4 – CMPUT 328

# Optimization Technique (SGD, Adam)

## Finding optimal hyper-parameters for Optimization [Worth 5.7% of the total weight]:

Implement Adaptive Moment Estimation (Adam Optimization, paper) and Stochastic Gradient Descent (SGD) with appropriate hyper-parameters in Pytorch.

1. Apply Adam Optimization with optimal hyper-parameter on the **CIFAR10** dataset
2. Apply SGD Optimization with optimal hyper-parameters on the **CIFAR10** dataset

You should perform grid search or random search for finding the optimal hyper-parameters using the accuracy on the validation set and select the best configuration. You can also go for some advance searching strategies like evolutionary search. But you are not allowed to use any automatic parameter search methods like *scorch.* You should not touch the test set during this process. The CIFAR10 images are RGB (color). From 50000 training samples, randomly select 5000 images as your validation set.
You only need to modify the function of ***tune_hyper_parameter()***. You can change in the parameters or return type of ***train()*** or ***validation()*** function. The model of the skeleton code follows the structure of multiple linear regression.

**NOTE:** A correct implementation and somewhat well-tuned version of this algorithm will have an accuracy of 34-40% on CIFAR10 for both test and validation sets.

**DUE DATE:** The due date is Friday, October 11 by 11:55 pm. The assignment is to be submitted online on eclass. For late submissions' rules please, check the course information on eclass

**COLLABORATION POLICY:** This must be your own work. Do not share or look at the code of other people (whether they are inside or outside the class). Do not search for or copy the code from the Internet. You can talk to others that are in the class about solution ideas (but not so detailed that you are verbally sharing or hearing about or seeing the code). You must cite whom you talked to in the comments of your programs.

**SUBMISSION:** You need to submit one file: ***Assignment_4_StudentID.ipynb***. Also, import any additional libraries you need in the file as well. Write down your student name and student id at the top of the file. You have to mainly implement the ***tune_hyper_parameter()*** function. **Keep the output block of the final section while submitting your solution. The last line of the output must contain the accuracy and best configuration information**

**MARKING:**

**25% Marks** Describe your program for TAs (Monday, Oct 7 – Friday, Oct 11)

TAs can select some random questions based on your code, results, and algorithms. The time to present will be in your lab section in the week when this lab is due. Note that you must present this part to your TA in your designated lab section. *You will not get any mark for this part if you don't present in your own lab section.*

**75% Marks** Your final score depends on the correct implementation, accuracy and the efficiency of algorithms and it must work on CIFAR10 datasets. There is no time constraint for this assignment. However, your code should run in a reasonable amount of time