Homework 3

Start Assignment

Due Wednesday by 11:59pm **Points** 100 **Submitting** a file upload **Available** Feb 22 at 12am - Mar 9 at 11:59pm

Homework 3 (100 Points)

Homework instructions:

- You will submit: (1) a report (pdf file) that explains your answers for each problem. The report MUST contain the link to your Github repository to access the source code you have developed for this homework. Your report should contain your name, student ID, and homework number. (2) a second pdf file that contains both source codes, results, and plots you have developed and plotted for this homework. You can easily generate this pdf in Jupyter Lab or Jupyter Notebook (sample pdf provided on Canvas.). The pdf file name should contain your name, student ID, and homework number.
- In your report, provide separate and clear responses for each problem. Make reasonable assumptions where necessary and clearly state them! Be sure to show all the work involved in deriving your answers! If you just give a final answer without explanation, you may not receive credit for that question.
- You may discuss concepts with your classmates. This fosters group learning and improves the class' progress. However, make sure to submit your own independent and individual solutions.
- **Make sure to use Google Collab (with GPU addon option), or your personal GPU card for the training.**

Problem 1 (30pts)

For this homework, we will use CIFAR-10, which comes with all three RGB input channels. Here is the link for loading CIFAR-10:

https://www.datascienceweekly.org/tutorials/cifar10-pytorch-load-cifar10-dataset-from-torchvision (https://www.datascienceweekly.org/tutorials/cifar10-pytorch-load-cifar10-dataset-from-torchvision)

1. Train the based line VGG model we need for FashinMNIST on CIFAR-10 and report your classification accuracy for validation set, as well as training loss and training accuracy. For this training resize the network input to 64*64 resolution.
2. Use Table 1 in the VGG paper (Simonyan and Zisserman, 2014) to construct other common models, such as VGG-16 or VGG-19. Train them on CIFAR-10, compare the accuracies, computational complexity and model size.

Problem 2 (30pts)

1. Use the CIFAR-10 to train a baseline classifier based on the GoogleNet model we did in lectures for 64*64 input resolution. Report your classification accuracy for the validation set, as well as training loss and training accuracy.
2. Add batch normalization layer to GoogleNet (think about what is the best way of adding it). Train it again. Report your classification accuracy for the validation set, as well as training loss and training accuracy. Compare your accuracy against Problem2.1.

Problem 3 (40pts)

1. The baseline model we did in homework is called ResNet-18. Train that for CIFAR-10 and report and compare your validation accuracy against GoogleNet and VGGNet architectures you did. Can you compare the training time, model size and computation complexity across these three networks for CIFAR-10? Use 64*64 resolution across all training.
2. Build two new versions of ResNet (ResNet-26, and ResNet-32). Train them on CIFAR-10. Plot the training loss, training accuracy and validation accuracy. Compare the classification accuracy, computation complexity, and model size across these three versions of ResNet (18, 26, 32). How does the complexity grow as you increase the network depth?