Bishop's University

CS 596 – Special Topics on Deep Learning

Assignment 3: Comparative experiments of different architectures of Convolution Neural Networks

1. Introduction

This assignment aims to help you to understand the difference the different architectures of Convolutional Neural Networks (CNN), and to become more familiar with scientific computing tools in Python and PyTorch. You will also get experience in hyper parameter tuning and using proper train/test/validation data splits. For that purpose, you will have to compare the performance of the fully connected neural networks with the one of the convolutional neural network by using the well-known CIFAR-10 image classification dataset. You will need to validate the performance of the following architectures of CNN:

- LeNet 5,
- SENet,
- VGG19,
- ResNet18,
- ResNeXt
- DenseNet,
- GoogLeNet,
- Dual Path Networks.

2. Recommendations

The code of the above architecture is already provided. Because the code is based on Pytorch, you are required to use Google Colaboratory to do this assignment; since it provides free access to a Tesla K80 (for running short jobs).

Here are two interesting links about Google Colaboratory with the instructions to install Pytorch:

https://towardsdatascience.com/getting-started-with-google-colab-f2fff97f594c

By this environment, you will be able to do GPU programming and to run your programs through the cloud computing provided by Google.

3. Data Setup (For Colaboratory)

If you are using Google Colaboratory for this assignment, you will need do some additional setup steps.

Download the assignment zip file and follow the steps above to download CIFAR-10 to your local machine. Next, you should make a folder in your Google Drive to hold all of your assignment files and upload the entire assignment folder (including the cifar10 dataset you downloaded) into this Google drive file.

You will now need to open the assignment 1 ipython notebook file from your Google Drive folder in Colaboratory and run a few setup commands. You can find a detailed tutorial on these steps here (no need to worry about setting up GPU for now).

4. Tasks

a. Extend the code of the assignment 1 by adding the implementation of the eight architectures of CNN. To facilitate your task, I provided you the implementation of the eight architectures of CNN,

b. Adjust the provided codes of eight architectures by putting the block of train and predict into functions,

c. Validation of the performances of the eight CNN architectures for the CIFAR-10 dataset by following the provided instructions in the word file template.

5. Submission

You will have to submit all the programmed solutions. Please, provide a pdf report following the format of the provided word template that highlights the team members, the contribution of each one of them, and the obtained accuracy for each classifier. In addition, the programmed solutions in Python must be submitted. The function that computes this

accuracy is already provided in the starting code. ***<u>Please, submit the whole code of the assignment 3 in a separate .zip file</u>***. *Thus, you have to submit a pdf file of the report based on the provided word template, and a .zip file containing the whole code of the assignment 2. Any error in submission implies the attribution of the grade zero.*

Good luck :)