

Assignment 4

24788 - Introduction to Deep Learning (Spring 2023)

Out Date: 2023/2/07 (Tue)

Due Date: 2023/2/15 (Wed) @ 11:59 pm EST

All exercises should be submitted to [Gradescope](#).

You can refer to [Python3 tutorial](#), [Numpy documentation](#) and [PyTorch documentation](#) while working on this assignment. Please follow the programming template provided in the assignment. Please use [Pizza](#) for any questions on the assignment. You should submit the assignment as:

Submission file structure

```
andrewID-HW4
  p1
    andrewID_p1.py
    andrewID_p1_report.pdf
```

- Submit the zip file in Homework 4 Programming section of Gradescope
- Submit the PDF of Python notebook in Homework 4 section of Gradescope

Please make sure you run all the cells and your submission clearly shows all the outputs with visible cell numbers. Any deviations from the submission structure would attract penalty to the assignment score.

Coding Exercise (30 points)

PROBLEM

Object Classification using CNN (30 points)

In this question, you will apply Convolution Neural Networks (CNN) to classify different flowers. Specifically, you will use Pytorch to build CNN models and evaluate the accuracy. The dataset is included in Image.zip, and sample code is also provided for you to help develop the model. Follow the instructions in the sample code and answer the questions below

a) Data Preprocessing and visualization - 10 points: Firstly, you need to load the dataset and plot it to make sure you are using the dataset correctly. The data is stored in a file called Image.zip. The zip file needs to be unzipped first. We recommend using Colab in this question for faster training. Colab provides a free GPU for you to train a CNN model. You can either mount this zip file on Google Drive and extract data or you can mount the zip file on Google Colab. Although mounting on Google Colab is a temporary solution as you may have to mount it everytime you work on the homework, we recommend mounting it on Google Colab itself for faster training time. You can load the data using the built-in Pytorch dataset called ImageFolder and visualize the image using the code provided in the template. Each RGB image has (3,224,224) pixels, and the label denotes the type of flowers for this image. There are 4317 images in total and five types of flowers. You should have a similar image to this



Fig. 1: Training example from Dataset

Please design your own image augmentation method and visualize one image. Print the type of flower for this image.

b) Training the CNN model with Cross Entropy Loss - 20 points: With the data loaded above, follow the instructions provided in the sample code to build your own CNN model. A sample CNN model is built in the python script for reference. You should refer to the python file for more detail.

You should build your own model and achieve at least 65% accuracy to get a full mark. The estimated training time for a shallow CNN model (two convolution layers) is around 10 mins using a Colab GPU. You need to do the following:

- Plot your accuracy versus iterations
- Plot your loss versus iterations