CMPSC 497 - Deep Learning for Computer Vision
Professor: Huijuan Xu
Homework 2
Due: February 15, 2023 @ 11:59 EST

1 Assignment Details

Homework 2 consists of three sections, each having their own notebook. In this assignment we will look at vanishing gradients, a PyTorch introduction, and creating/training/testing a network on a standard image classification benchmark (we will also look at some of the network's properties). We allow for the homework to be completed locally (with Jupyter), or through Google Colab, though we recommend colab as it provides GPU which speeds up the training significantly.

2 Activation and Vanishing Gradients (33%)

This exercise will explore how using different activation functions can impact your learning algorithm. We will also get to see vanishing gradients, a problematic property of some neural networks.

3 PyTorch Introduction (17%) and Image Classification + Visualizing Features (50%)

The PyTorch part of this assignment includes two notebooks. The first gives an introduction to PyTorch and its various properties (tensors, autograd, etc.) along with some of the features it has to offer. The last notebook covers training a classifier, CNN in this case, on an image classification benchmark. It will also demonstrate how users can interact with their network and visualize certain properties of it.

4 Rubric for assignment grading

Activation and Vanishing Gradient(33%) :

Activation Functions	5%
Neural Network	17%
Training	5%
Vanishing Gradient Issue	3%
Plot the classifiers	3%

PyTorch Introduction (17%) :

Operations on Tensors	3%
Iterating and Visualizing the Dataset	3%
Tensors, Functions and Computational graph, and Computing Gradients	2%
Disabling Gradient Tracking	3%
Train Loop	6%

Image Classification + Visualizing Features (50%)

Transform	5%
Loss function and optimizer	5%
Training and Testing	10%
Pretrained Network	20%
Feature Visualization	10%

4 Getting Started + Submission

We suggest students complete the networks in Google Colab, particularly the image classifier. If you'd like to complete the assignments in colab, you can visit the colab website and upload each of the notebooks individually. To use a GPU, set your runtime to include a hardware accelerator.

For submitting the assignment, simply upload the completed ipynb files. Be sure the cells have output from running your code. You do not need to include any other files (checkpoints, images, or h5py).