**Assignment 4**

In this assignment you will install a deep learning framework and test a pretrained AlexNet network on different images.

**Setup for Assignment 4:**

These are instructions for installing Anaconda3 (Python 3.6) and TensorFlow on Windows. Anaconda is a useful Python package manager which will aid in the installing of TensorFlow. TensorFlow is an open source Machine Learning library which is a very popular deep learning tool.

Both Anaconda and TensorFlow are available on Mac OS X and Linux operating systems too, but these steps might be somewhat different. If you are not working on Windows, then follow the installation instructions for your operating system on the given websites. It should be pretty straightforward to install them on Linux and might be a little harder for Mac OS X.

1) First, download the Anaconda 5.0.0 (Python 3.6 version) for Windows Installer at <https://www.anaconda.com/download/>

Run the installer and when prompted, check “Add Anaconda to my PATH environment variable”.

2) Now we will download TensorFlow using the instructions found at <https://www.tensorflow.org/install/>

We will use the installation with Anaconda.

In the Command Prompt type:

**conda create -n tensorflow python=3.5**

this will prompt you to install new packages, so type **y** and install the packages.

Now activate the conda environment by typing

**activate tensorflow**

Now your prompt should change to something like:

(tensorflow) C:\Users\Name>

In this new prompt type:

**pip install --ignore-installed --upgrade tensorflow**

Now tensorflow is installed in a conda environment. You can exit the conda environment by typing **deactivate** in the command line. Then, to reactivate the environment, just type **activate tensorflow** in the windows command line.

3) Lastly, to read in images in python, we need the packages scipy and Pillow. In the tensorflow conda environment type **conda install -c anaconda scipy** to install scipy and type **conda install -c anaconda pillow** to install PIL.

Now the conda environment has all the python packages and libraries needed to run our CNN.

4) We will run a pretrained AlexNet implemented by Michael Guerzhoy from the University of Toronto. Download the following files from <http://www.cs.toronto.edu/~guerzhoy/tf_alexnet/>:

myalexnet\_forward.py (For Python 3) – This contains the TensorFlow implementation of AlexNet

bvlc\_alexnet.npy – This contains the weights for the CNN

caffe\_classes.py – This file contains the object classes, which is used to make the network outputs easier to read

Ensure to save these in the same directory.

5) To run myalexnet\_forward.py, we will first modify the code.

First comment out the line (23) **import matplotlib.image as mpimg** by adding a **#** to the left of the line.

Next, you can remove the lines (44-49)

**im1 = (imread(image\_name1)[:,:,:3]).astype(float32)**

**im1 = im1 - mean(im1)**

**im1[:, :, 0], im1[:, :, 2] = im1[:, :, 2], im1[:, :, 0]**

**im2 = (imread(image\_name2)[:,:,:3]).astype(float32)**

**im2[:, :, 0], im2[:, :, 2] = im2[:, :, 2], im2[:, :, 0]**

and replace them with

**name\_list = []**

**im\_list = []**

**for image\_name in name\_list:**

**im = (imread(image\_name)[:,:,:3]).astype(float32)**

**im = im - mean(im)**

**im[:, :, 0], im[:, :, 2] = im[:, :, 2], im[:, :, 0]**

**im\_list.append(im)**

This code is used to easily test images which will be used. In the list **name\_list** you can add the names of the images which you want to test (i.e. **name\_list = [“1.png”, “2.png”]**).

Lastly, at the end of the file, replace

**for input\_im\_ind in range(output.shape[0]):**

**inds = argsort(output)[input\_im\_ind,:]**

**print("Image", input\_im\_ind)**

**for i in range(5):**

**print(class\_names[inds[-1-i]], output[input\_im\_ind, inds[-1-i]])**

with

**for input\_im\_ind in range(output.shape[0]):**

**inds = argsort(output)[input\_im\_ind,:]**

**print("Image", name\_list[input\_im\_ind])**

**for i in range(5):**

**print(class\_names[inds[-1-i]], output[input\_im\_ind, inds[-1-i]])**

**print("")**

This is to make the output easier to read.

6) The images we will use to test AlexNet are in the file “Images” that was in the zip file with this document. Move all the image files to the same directory as the python code.

7) Now run myalexnet\_forward.py in the tensorflow conda environment. To do this, in the Command line move to the directory with the code.

Ensure you are working in the conda environment, and type **python myalexnet\_forward.py**. This will test AlexNet on the images that you put in the **name\_list** list.

The output is the top five classification results of AlexNet for each of the images.

**Testing AlexNet**

You have been given 3 different image sets: 10 test images, 5 images with perturbations, and 5 other images.

Run AlexNet using the 10 test images and note the results.

The images with perturbations are 5 of the test images that have been modified such that the AlexNet should fail its classification prediction. Run AlexNet using these 5 images and note the results.

The last 5 images do not belong to any of the 1000 classes of ILSVRC. Run AlexNet using these 5 images and note the results.

**Deliverables**

For this assignment, turn in a document with the top-5 classification results (AlexNet outputs) for each of the 20 images.