IW-04 Computer Vision and Deep Learning

In this assignment you will practice writing backpropagation code, and training Neural Networks and Convolutional Neural Networks. The goals of this assignment are as follows:

- understand **Neural Networks** and how they are arranged in layered architectures
- understand and be able to implement (vectorized) **backpropagation**
- implement various **update rules** used to optimize Neural Networks
- implement **Batch Normalization** for training deep networks
- understand the architecture of **Convolutional Neural Networks** and get practice with training these models on data
- gain experience with a major deep learning framework, **PyTorch**.

Setup

You can follow the setup instructions in `Setup Instructions.pdf`.

Download data:

Once you have the starter code, you will need to download the CIFAR-10 dataset. Run the following from the `Assignment` directory:

```
cd cs231n/datasets
./get_datasets.sh
```

Start IPython:

After you have the CIFAR-10 data, you should start the IPython notebook server from the `Assignment` directory, with the `jupyter notebook` command.

If you are unfamiliar with IPython, you can also refer to `IPython tutorial.pdf`.

Some Notes

NOTE 1: The `Assignment` code has been tested to be compatible with python version `3.6` (it may work with other versions of `3.x`, but we won't be officially supporting them). You will need to make sure that during your virtual environment setup that the correct version of `python` is used. You can confirm your python version by (1) activating your virtualenv and (2) running `which python`.

NOTE 2: If you are working in a virtual environment on OSX, you may *potentially* encounter errors with matplotlib due to the issues described here. In our testing, it seems that this issue is no longer present with the most recent version of matplotlib, but if you do end up running into this issue you may have to use the `start_ipython_osx.sh` script from the `Assignment` directory (instead of `jupyter notebook` above) to launch your IPython notebook server. Note that you may have to modify some variables within the script to match your version of python/installation directory. The script assumes that your virtual environment is named `.env`.

Q1: Fully-connected Neural Network

The IPython notebook `FullyConnectedNets.ipynb` will introduce you to our modular layer design, and then use those layers to implement fully-connected networks of arbitrary depth. To optimize these models you will implement several popular update rules.

Q2: Batch Normalization

In the IPython notebook `BatchNormalization.ipynb` you will implement batch normalization, and use it to train deep fully-connected networks.

Q3: Convolutional Networks

In the IPython Notebook `ConvolutionalNetworks.ipynb` you will implement several new layers that are commonly used in convolutional networks.

Q4: PyTorch on CIFAR-10

For this last part, you will be working in PyTorch, a popular and powerful deep learning frameworks,

Open up `PyTorch.ipynb`. There, you will learn how the framework works, culminating in training a convolutional network of your own design on CIFAR-10 to get the best performance you can.

NOTE: The PyTorch notebook requires PyTorch version 0.4, which was released on 4/24/2018. You can install this version of PyTorch using conda or pip by following the instructions here: http://pytorch.org/

This assignment was taken from
http://cs231n.github.io