In this assignment you will practice writing backpropagation code and training 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**

Setup

Make sure your machine is set up with the assignment dependencies.

[Option 1] Use Google Colab (Recommended): The preferred approach to do this assignment is to use [Google Colab](#).

[Option 2] Use a local Conda environment: Another approach for installing all the assignment dependencies is to use [Anaconda](#), which is a Python distribution that includes many of the most popular Python packages for science, math, engineering and data analysis. Once you install it you can skip all mentions of requirements and you are ready to go directly to working on the assignment.

```
conda create -n cs182hw1 python=3.8 jupyter
conda activate cs182hw1
python -m pip install numpy==1.21.6 imageio==2.9.0 matplotlib==3.2.2
```

Download data: Once you have the starter code, you will need to download the CIFAR-10 dataset.

```
cd deeplearning/datasets
./get_datasets.sh
cd ../..
```

If you are on Mac, this script may not work if you do not have the wget command installed, but you can use curl instead with the alternative script.
`bash cd deeplearning/datasets ./get_datasets_curl.sh cd ../..`

Start Jupyter: After you have the CIFAR-10 data, you should start the IPython notebook server from this directory. `bash jupyter notebook`

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.

If you use Colab for this notebook, make sure to manually download the completed notebook and place it in the assignment directory before submitting. Also remember to download required output file and place it into submission_logs/ directory.