Data-X Homework 10 Fall 2018:

You are now familiar with the architecture of and how to use Neural Networks. You also saw how we can create and visualize Artificial Neural Networks in Tensorflow (with Tensorboard). In this homework you will use the same MNIST dataset (with labelled images of digits), that we used in the class for training a vanilla Dense Neural Network with the following characteristics:

1. Input layer of size 784 (since each image is 28 X 28)
2. Three hidden layers of size 300,200,100
3. Output layer of size 10 (to classify digits 0-9)
4. Use Leaky Relu activation function in hidden layers (Ref: tf.nn.leaky_relu, wiki)
5. Use a dropout ratio of 10% on all hidden layers (Ref: tensorflow, dropout)
6. Use cross entropy loss (Ref:tensorflow)

Train this network for classification of images of digits using MNIST data, using stochastic mini batch gradient descent for 10 epochs and batch sizes of 50, report performance. **Submit a pdf file with the image of your neural net graph and the performance results on the MNIST test set.**

You can refer to the example at the very bottom of this notebook to see how implement a similar DNN from scratch in Tensorflow:
https://github.com/ikhlaqsidhu/data-x/blob/master/06b-tools-tensorflow/intro-to-tf_v2_afo.ipynb

EXTRA CREDIT:
Customize your Neural Network to however many layers and neurons you want, use batch normalization, the Adam Optimizer (instead of Gradient Descent), and try different regularization techniques to combat overfitting. Also, use as many iterations you want and plot your loss function in Tensorboard for every 10th iteration. Extra Credit given if you achieve more than 98.5% accuracy on the MNIST test set with these changes.
Submit a pdf file with the image of your neural net graph and details of the neural net setting that you used and the performance results.

If you cannot run TensorFlow locally, then run your notebook here:
http://datahub.berkeley.edu/hub/home