The goal of this assignment is to assess the impact of depth in neural network. You need to implement the following for MNIST digit classification.

1. Implement a fully connected neural network with one hidden layer in keras/tensorflow. Set the number of neurons in the hidden layer to 100.
2. Implement a deep neural network that has 10 hidden layers and each layer has 10 neurons. Now compare the performance of this network with the previous net.
3. Write another program which will assess the quality of the features generated by the 10 layer deep net (in item 2) in its different layers. For this, train the deep net first. Then generate the features from the hidden layer 5, 7 and 10 separately and use it in k-nearest neighbour to classify the images and compare the performances of the features generated from layers 5, 7 and 10. The features from a layer mean the activation values of the neurons in that particular layer.

**All performance comparison must be done based on the test set only.**

**The dataset can be downloaded from here:** [**http://yann.lecun.com/exdb/mnist/**](http://yann.lecun.com/exdb/mnist/)

**All codes should be written in python. Upload your ipython notebook in moodle. You must ensure that the notebook has been executed successfully before you upload it.**