EE258 PROJECT
FALL 2017 DUE: Nov 12th, 2017
CLASSIFICATION OF HANDWRITTEN DIGITS

In this project we are going to implement neural networks to classify handwritten digits.

IMPLEMENT and COMPARE the performance of the following different classifiers and implement it on a handwritten digits dataset[2]:

- Linear classifier
- K-nearest neighbor classifier
- Radial Basis Function (RBF) neural network
- One-hidden layer fully connected multilayer neural network
- Two-hidden layer fully connected multilayer neural network

Sone of these classifiers are explained and used in the LeCun 98 [1]. Going over reference [1] first even if you do not understand all the details is a good idea. Use the data set in [2]. All the programming should be done in Python. **If you are working with a team member, each student should write their own report even though plots and code might be the same.**

TO BE SUBMITTED:

1. Code [20% of the Grade]: Well documented code with a ReadMe file. I should be able to run the code, and obtain the results provided in the report.

2. Report (4-5 pages) [80% of the Grade]:

- Methodology (describe classifiers used, cross-validation method used etc).
- Data (describe the dataset)
- Simulations (change parameters (number of epochs, activation functions, training set size etc) and observe the effect on the performance, provide plots & tables for both test and training classification errors , confusion matrices, etc)
- Results (Discuss your observations, do performance comparison of different classifiers)

REFERENCES:

[1] http://yann.lecun.com/exdb/publis/pdf/lecun-98.pdf
Y. LeCun, L. Bottou, Y. Bengio, and P. Haffner, "Gradient-Based Learning Applied to Document Recognition," Proc. of the IEEE, vol. 86, no. 11, pp. 2278-2324, Nov. 1998.
[2] http://yann.lecun.com/exdb/mnist/
[3] Chapter 3 in Hands-On Machine Learning with Scikit-Learn and TensorFlow Concepts, Tools, and Techniques to Build Intelligent Systems By Aurélien Géron
[4] https://www.tensorflow.org/get_started/mnist/beginners
[5] https://www.youtube.com/watch?v=Gj0iyo265bc