Assignment 3: Image Classification using ANN

For this assignment, you have to classify image data using Artificial Neural Network (ANN). For dataset go to [[link](http://yann.lecun.com/exdb/mnist/)].

**Constraints:**

1. Your code MUST have to be generic so that the number of nodes and layers can be changed at any time.
2. You must have to reserve some of the training data for validation to determine the appropriate number of nodes in the hidden layer.
3. Use softmax function as the activation function.
4. Tune the learning rate to get the best one.
5. The neural network should be fully connected, that means every node in the previous layer will be connected with all the nodes in the next layer.
6. The backpropagation algorithm has to be efficient (shorter running time).
7. You have to write the code from the scratch. But matrix library functions can be used.
8. Don’t take all the data from the dataset. Take some of these as training, validation and test purpose.

**Instructions for Report Writing**

Answer the following Question:

1. Why may the validation help to determine appropriate number of nodes in the hidden layer?
2. How have you ensured efficient implementation of backpropagation algorithm?
3. Compare ANN with Decision tree.

**Special Instructions**

1. Don't Copy anything! If you do copy from internet or from any other person or from any other

source, you will be severely punished and it is obvious. More than that, we expect Fairness and

honesty from you. Don't disappoint us!

1. The report should be in .docx/.pdf (No hard copy is required). Write precisely in your own

Language and keep it as simple as possible.

1. Upload the final submission in moodle within 6 P.M. of 21th October, 2016(Friday).
2. For python and matlab, you may not get supporting softwares in the lab. If you do program in

These languages, bring your computer in the sessional.

1. You are allowed to show the assignment in your own laptop during the final submission. But

In that case, ensure an internet connection as you have to instantly download your code from the moodle and show it.

**Instructions for moodle upload**

1. If you write code in a single file ,then rename it as <Student id1>\_<Student id2>\_<code>.

<extension>. For example, if your student ids are 1105123 and 11050124, and you have done in java, t hen your filename should be "1105123\_110512\_ code.java".

1. If you write code in multiple files, then put all the necessary files in a folder and rename it as <Student id1>\_<Student id2>\_<code>. For example, if your student ids are 1105123 and 1105124, and you have done in java, then your folder name should be "1105123\_1105124\_code".
2. The report name should be <Student id1>\_<Student id2>\_<report>.<extension>. For

example, if your student ids are1105123 and 1105124, and it is in pdf format, then the report name should be "1105123\_1105124\_report.pdf".

1. Finally make a main folder, put the code (whether file or folder) and report in it, and rename the main folder as your <Student id1>\_<Student id2>\_<Programming language>. For example, "1105123\_1105124\_Java". Then zip and upload it anyone between you two.

**Material link**

<http://neuralnetworksanddeeplearning.com/>