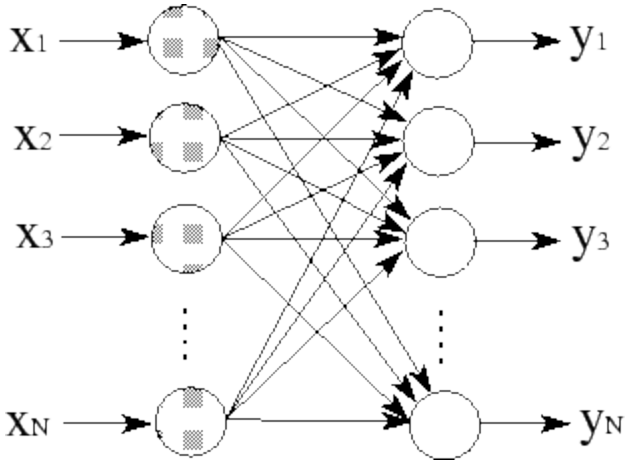
Mechatronics Engineering and Automation Program
CSE488: Computational Intelligence
Project #02: Neural Networks
Due Date: 20/04/2019
Students are encouraged to work in groups of two students.

The aim of this project is to create and train a Neural Network to classify an image into 10 numeral classes at {0, 1, 2, 3, 4, 5, 6, 7, 8, and 9}. You must use the following well-known image data sets in training (60,000 examples) and testing (10,000 examples): **(http://yann.lecun.com/exdb/mnist/)**

1- Download and read the testing and training images. You must visualizes these images in your report.

2- Train and test a single layer neural network using your downloaded data set. Note that the network in this case has 10 neurons fully connected to the inputs as shown below. The inputs are the image intensities where N is the image resolution. For example if the image size is 20 X 20, N will be 400. In your report, you need to record the training times as well as the training and testing accuracy versus the iteration number.



3- Repeat the experiment in (2) using:-

   a. A hidden layer of 300 neurons.

   b. Two hidden layers of 300 neurons each.

   c. Three hidden layers of 300 neurons each.

Compare and comments on the results.

In the above experiments, you may use ready-made MATLAB toolbox functions.

4- Implement the back propagation algorithm for training a neural network with a single hidden layer. Use your implementation to repeat the experiment 3 (a).

Important:-

(1) You need to write a neat report with the following contents:

- Problem definition and importance (1 Page).
- Methods and Algorithms (1-2 Page).
- Data set description (1 Page)
- Experimental Results and discussions.
- Appendix with codes.

(2) Each group is required to make a presentation for the project achievements and findings.

Warning: Plagiarism is prohibited. Assignments with no reports will not be graded.