ME 537
Learning Based Control
Fall 2010
HW #1: Neural Networks
Due: 10/8/2010 at noon

Use your favorite programming language to implement a one hidden-layer feed forward neural network.

Directory ***Homework/hw1.data*** contains four data files. Each file has the number of data points listed on the first line, followed by one data point on each line where the data points have two input (x1, x2) and two outputs (y1, y2):

x1, x2, y1, y2

d1.train contains 200 training patterns
d1.test, d2.test, d3.test contain 100 test patterns each.

Use the gradient descent algorithm to train a two input, two output (one for each class) neural network using file *d1.train*. Write a report addressing the following questions (you should run experiments to support each of your answers):

1- Describe the training performance of the network:
   a. How does the number of hidden units impact the results?
   b. How does the training time impact the results?
   c. How does the learning rate impact the results?
   d. What other critical parameters impacted the results?

   Note, this is a classification problem, meaning that each data pattern (x1, x2) belongs to one of two classes (y1 or y2). Consequently, use correct classification percentage (instead of MSE) to report your results. You will still use MSE to train the neural networks; you will simply report the classification percentage (or classification error) to assess the performance of the neural networks.

2- Use *d1.test* to test the performance of the trained neural network. Answer question a-d from above for the test set. What conclusions can you draw from your results?

3- Use *d2.test* to test the performance of the trained neural network. Answer question a-d from above for the test set. What conclusions can you draw from your results?

4- Use *d3.test* to test the performance of the trained neural network. Answer question a-d from above for the test set. What conclusions can you draw from your results?