University of Colorado at Colorado Springs

Artificial Neural Networks
Home Work Assignment 1
Due 10-05-2014

Character Recognition with a Simple Network

This assignment asks you to implement a neural network for character recognition. In other words, we need to recognize specific images as characters A, B, C, etc. Use the character representation as discussed in Chapter 3 of Fausett's book, pages 55-56, 71-76.

You will find the training and test set for this assignment on my class Web page at http://www.cs.uccs.edu/~kalita/work/cs587/2014/LetterTrainingHW1.dat. The test data is in the same place, but change the name of the file to LetterTestingHW1.dat. These are copied from Fausett's text.

In particular, the assignment asks you the following.

1. Use a single layer neural network with a hard threshold activation function and the Hebb learning rule to train the network. Use bi-polar representation for the characters and targets.
2. Use a single layer neural network with a soft threshold function and implement the (extended) Delta learning rule for training. Again, use a bi-polar representation and vary the learning rate in this experiment.
3. Now, design and implement a multiple layer feed forward neural network for the character recognition problem. Make any reasonable assumptions necessary.

Note that a *hard threshold* is used in a function where the output changes from *no* to *yes* at a particular point, and hence, there is a discontinuity in the function at this point. A *soft threshold* involves a sigmoid or hyperbolic function where there is no such discontinuity.

Please hand in a detailed report of your experiments and findings. Write it as a paper in the IEEE format, just like your proposal. Have sections and subsections like a paper. Describe the algorithms you use, the experiments you perform and the results you obtain. Organize your results in the form of tables and graphs. Compare hard and soft threshold learning. Investigate the influence of the magnitude of the learning parameter. Explain your observations.

Add a hard copy of your code as appendix.

Extra Credit

If you can find or create more extensive data sets for the character recognition problem, use such data to train and test your networks. One large dataset is at// https://archive.ics.uci.edu/ml/datasets/Letter+Recognition.