Neural Networks II Spring, 2009
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Problem Assignment 2: given on Wed., May 20, 2009; Due Mon., June 1, 2009.

This problem is based on a data set generated via a dynamical system that I created on NeuralWorks. Your task will be to use the data and determine the structure of an NN equivalent to the one I used to generate the data.

I am providing you with a set of data in a file named nn2prob2.dat, available on the course Web page. Depending on how you set up your NN, this may be used directly as a .nna file simply by changing the .dat to .nna.

The data comes from a process that has a single input and single output, and your task is to build a NN model of the process.

The first column of the data set is a listing of a time signal, represented as a sequence of values at equal increments of time -- there are 10,000 of these in the first column of the data set. This data was used as a test signal to the process to be identified. The second column represents the output of the process at the corresponding time instants.

You are here given the hint that the process may be approximated well via a model similar to those shown in Figures 5.10, 5.11 and 5.12 in the Narendra Chapter 5 you read earlier this term. For this problem, the g(.) and f(.) **may be about as simple as you can contrive**. One of the key aspects for you to discover is the number of delay units to include in each of the indicated paths.

Remember, since the data is a time series (in this case, a test signal for the "black box" you are to "identify"), you must train via **sequential** access to the data file, **not** random access.

Because the input file is so large, it is impractical to do any kind of counting-type assessment of how your NN does its job. The RMS error criterion provided by NWorks might serve as an *initial guide*, but is not sufficient for the assignment. For this assignment, it has been found useful to graph a relatively small number of (say 100-200) points several places in the string of 10,000 -- and compare the actual output of your net with the desired output [MATLAB and spreadsheet programs have useful plotting facilities appropriate for this task]. In addition to any other explanatory mechanism you choose, please submit such plots for different NN configurations you arrive at, and use this as a way to show your experimental path (thought process) to selecting the NN you propose as the solution.

Your write-up is to include a description of the key thoughts you had in coming up with the solution, including dead-ends you may have experienced. Include a description of the NN you ended up with, and the measure of quality you used. If you used different NN structures, etc., in your experiments, then include your measures of quality for each one, so comparisons can be made. Include any observations you wish to submit for evaluation.