INC 691 Linear and Nonlinear System Identification **Homework 6**
Assign: Mon 30 April 2012 **Due: Wed 9 May 2012**

Instruction: Hand in your work in the mail box labeled INC691 by 4 pm. or submit it via email. DO NOT copy homework from your classmates or lend it to others. Anyone who violates this regulation will be given zero for the homework.

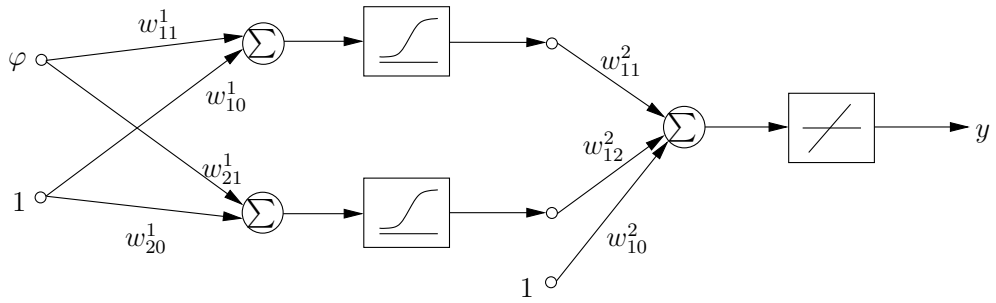

Figure 1: Single-input MLP

Consider the single-input MLP network in Figure 1. Find the weights W^1, W^2 and bias values w_0^1, w_0^2 required to approximate the function shown in Figure 2. Use the `nntool` of the *Neural Network Toolbox* for MATLAB to create a single-input sig-lin network, and check whether your weights really produce the output in Figure 2. The MATLAB data file `approx.mat` can be downloaded from the web site of this homework, which contains the input vector `phi` and the output vector `g_phi` representing the function in Figure 2.

1. Type `nntool` in the MATLAB workspace.
2. Import the vector `phi` as *inputs* and the vector `g_phi` as *target*.
3. Click *New Network* and choose *Feed-forward backprop* as network type. Get the input range from the input. Ignore *training/learning/performance* options, choose 2 layers with the appropriate activation functions and number of neurons. Click *Create*.
4. Click on your network in the *Networks* field of the *Network/Data Manager*. View the network, and choose *Weights* in the Network window. Set the weights to the values required to approximate the given function.
5. Choose *Train*, specify `phi` as your input and `g_phi` as your output and train the network.
6. Choose *Simulate*, specify `phi` as input and simulate the network.

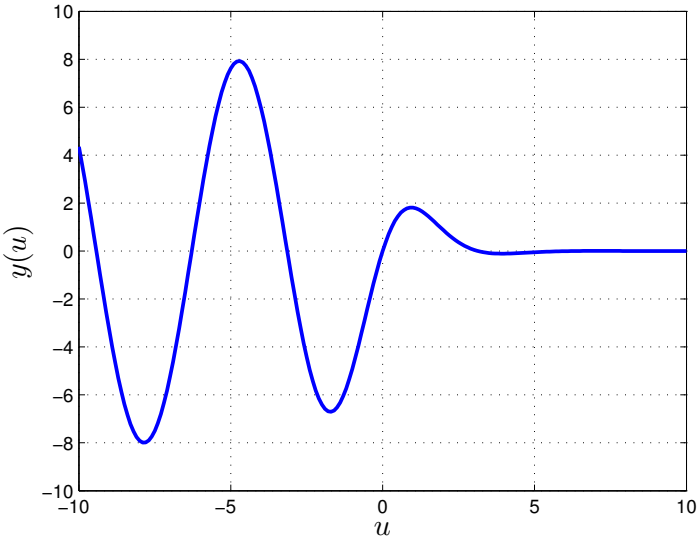

Figure 2: nonlinear function

7. Export the simulated output to the workspace and compare it with the given function.

8. Repeat all steps but use 2 as a number of neurons. Discuss the results.