Intelligent Control – Interactive Session on Neural Networks

March 7, 2018

Problem 1:

You are going to use a neural network to approximate a sine function.

(a) Create your training data set. Create a data set of noisy data taken from a sine wave. Have the inputs x range from 0 to 4π and the outputs $y = \sin(x) + \mathcal{N}(0, \sigma^2)$. Pick whatever σ^2 you want.

(b) Build your neural network. Draw a picture of a neural network with one input, three hidden units, and one output. Write a Matlab function that takes x and the weights of connections of the network as inputs and y as the output. Use a sigmoid

$$z(a) = \frac{1}{1 + e^{-a}}$$

as the activation function for the hidden units.

(c) Train your network. Use backpropagation to train your neural network. This means you need to do gradient descent to compute the weights of connections in the network. Use all the training data.

(d) Make predictions. Pick inputs between 0 and 4π that were not in your training data set and see how well your trained neural network predicts the outputs of a sine wave.