

CS440 Assignment, Fall 2015, Due December 2.

1. Construct a neural network by hand to implement the following function. This means determining the neurons and connections and weights. Attempt to minimize the number of hidden units that are used. You should also assume there is a "bias node" that is always on and supplying a signal. You can assume the transfer function is a hard step function (0 or 1). (The inputs represent 2 2bit numbers, and the output adds those numbers.)

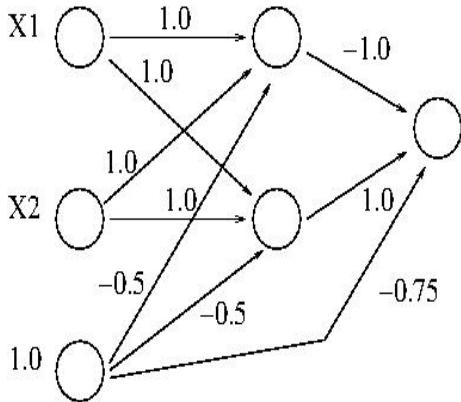
00 00 → 000
00 01 → 001
00 10 → 010
00 11 → 011

01 00 → 001
01 01 → 010
01 10 → 011
01 11 → 100

10 00 → 010
10 01 → 011
10 10 → 100
10 11 → 101

11 00 → 011
11 01 → 100
11 10 → 101
11 11 → 110

2. Do one iteration of back propagation for the following neural network by hand. Assume the transfer function, S , is the logistics function, which is approximated by table look-up given below.



Out_i	$S(Out_i)$
0.0	0.50
0.25	0.56
0.50	0.62
0.75	0.68
1.00	0.73
1.25	0.78
1.50	0.82
1.75	0.85
2.00	0.88

The input is (1,1) and the target output is 0.1. Assume the step size is one, and there is no momentum. What is the activation (Sigmoid value) in each neuron? Give the change in weight for each connection in the network assuming the step size is 1.0 and there is no momentum.

Using the same network, assume the input is (1,0) and the target output is 0.9. Assume the step size is one, and there is no momentum. What is the activation (Sigmoid value) in each neuron? Give the change in weight for each connection in the network assuming the step size is 1.0 and there is no momentum.