Homework 5

ComS 474 - Gavin Monroe

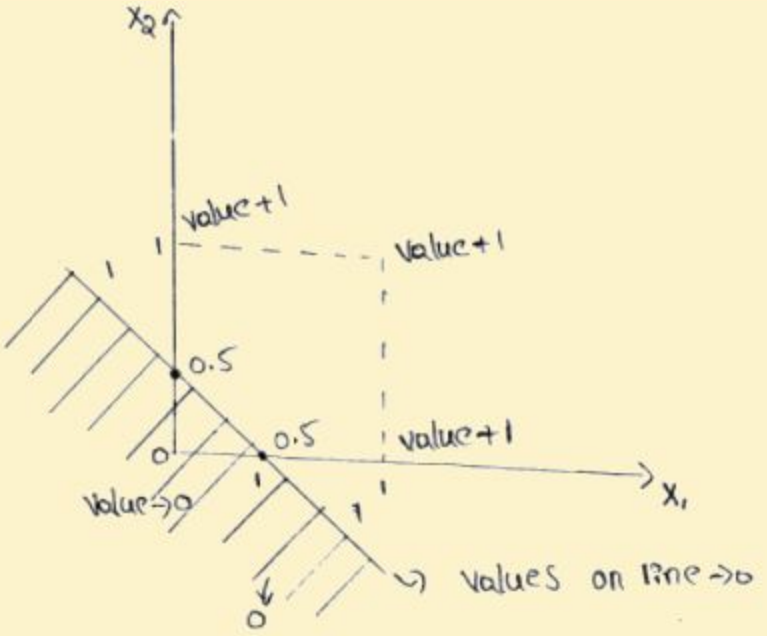
1) **Working backwards from Y to X1 and X2 we get the equations = -3**
2) **Then using X1 and X2 and the ReLU as the g function to solve for Y= 7**

X1 = 2, X2 = -3, Z1 = 4, Z2 = 0, Z1 = ReLu(3) = 3, Y = 7

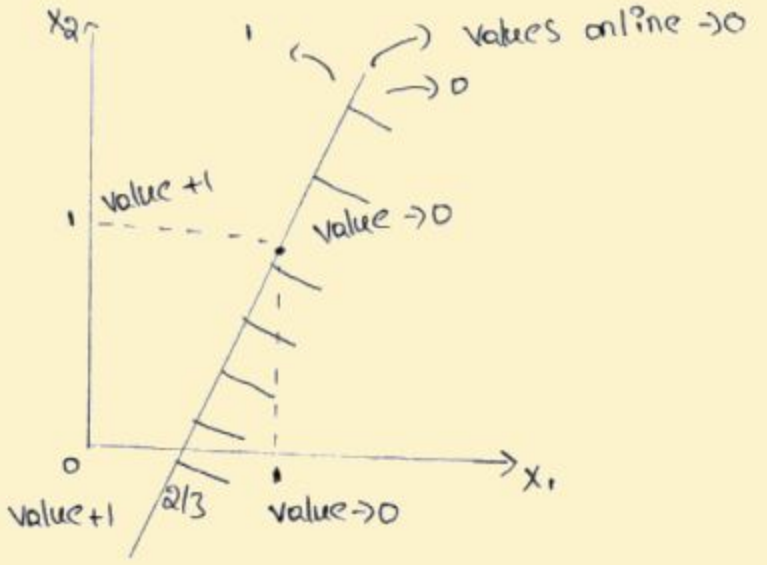
2) Simplified Answer a) 48 edges, b) 60 edges, c) 28 edges, d) 15 edges

a) 3 Inputs edges x 12 nodes + 1 output edges x 12 nodes => 3x12 + 1 * 12 = 36 + 12 = 48 edges
b) 3 inputs edges x 6 nodes + 6 input edges x 6 nodes + 6 input edges x 6 nodes + 1 output edges x 6 nodes = 18 + 36 + 6 = 60 edges
c) 3 in * 2 nodes = 6, 2 in edges * 2 nodes = 4 (this is from b to F), finally Y 2 input edges * 1 nodes = 2 = 28 edges
d) 3 input edges + 12 input edges = 15 edges

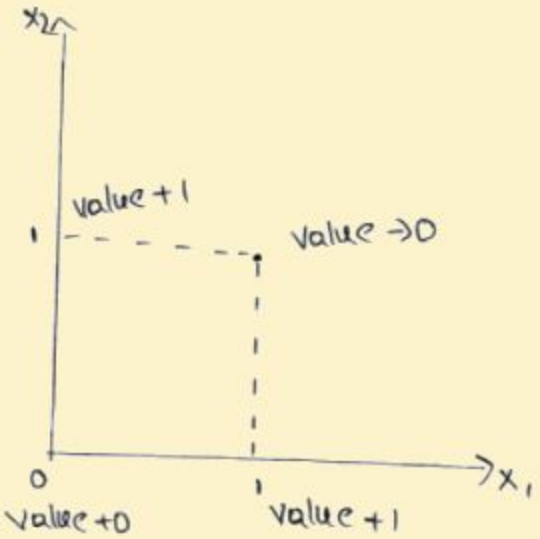
3)Dataset A:
W1 = 1, w2 = 1, w3 = -0.5
Dataset B:
W1 = -0.75, w2 = 0.25, w3=0.5
Dataset C:
This is not possible for any values of w1, w2, or w3. This is for the reason that the data is not linearly separable. That makes it not possible to separate data with the different values with just a single line, and a perception can only separate linearly separable data.


X2
value+1
1
value+1
1
0.5
0.5
value+1
0
value→0
1
1
X1
values on line→0
0

a)

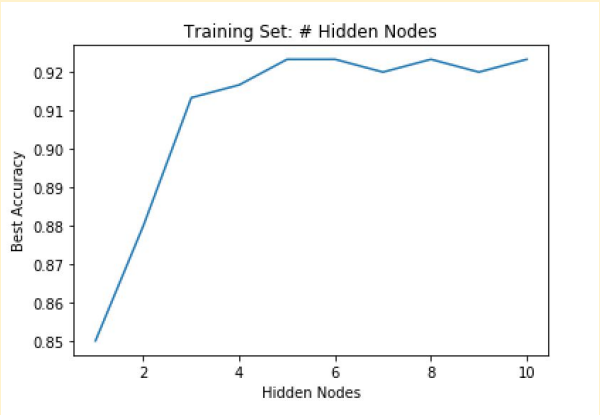

X2
1
values online →0
→0
value+1
1
value→0
0
X1
value+1
2/3
value→0

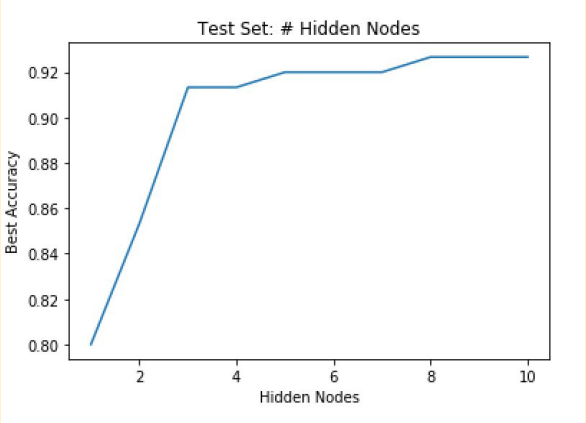
b)



c)

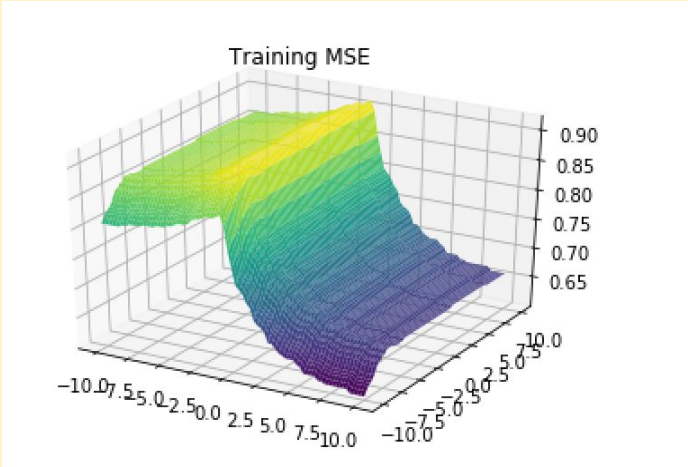
4)

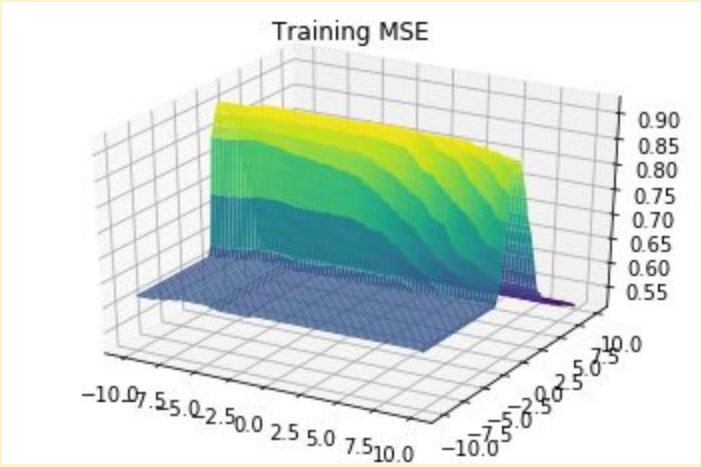


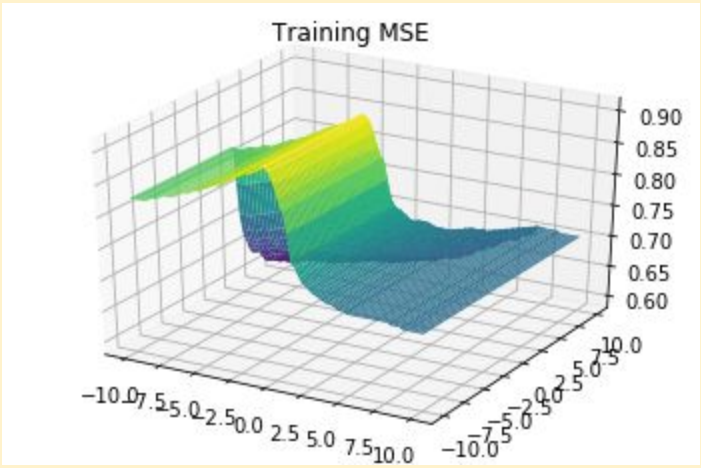


The best test accuracy 0.9266666666666666with an alpha value pf 3.1622776601683795e-05, a learning rate of 0.1, and 8 nodes

For homeworks 3 and 4 along with 5 where we compare the accuracies, and all of them tended to lean toward 82% to 90%. On HW3 no doubt we had the least accuracy, while the HW4 was the second most accurate around 85% to 90%. As of Hw3 and Hw4, the values increased on the decision boundaries. In HW3 though, the decision boundaries are very similar when looking at the random forest classifier.

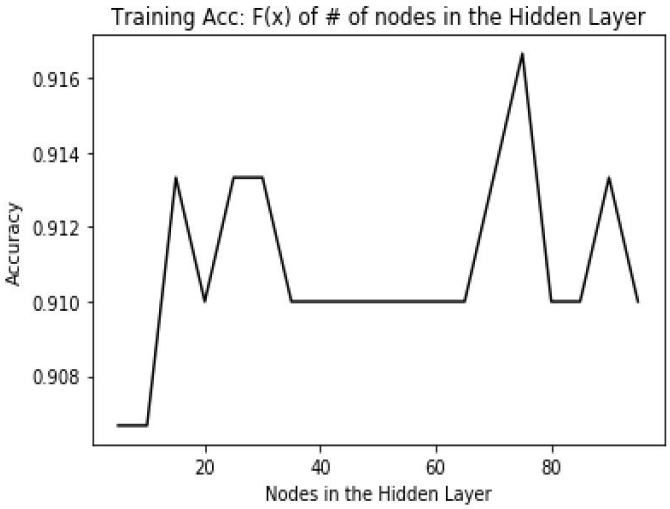


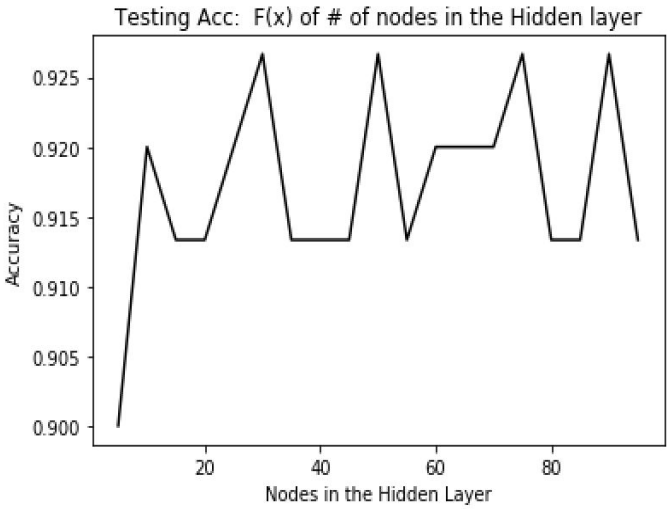


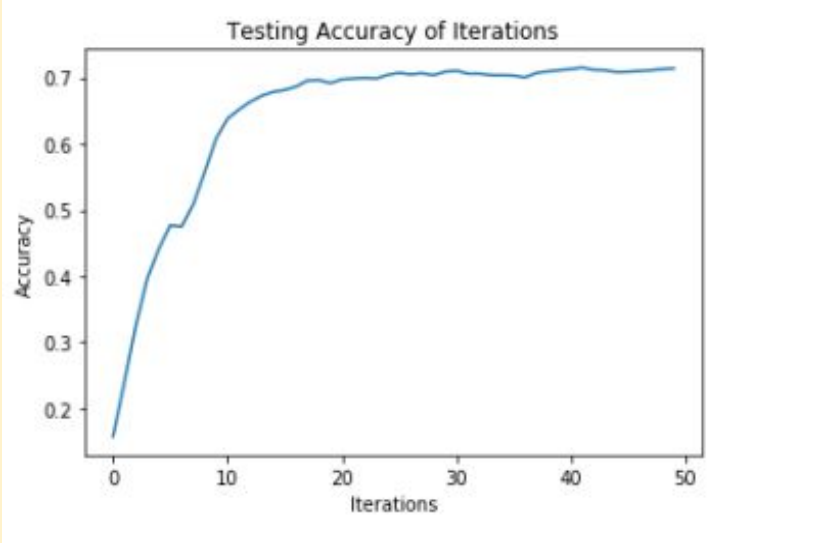


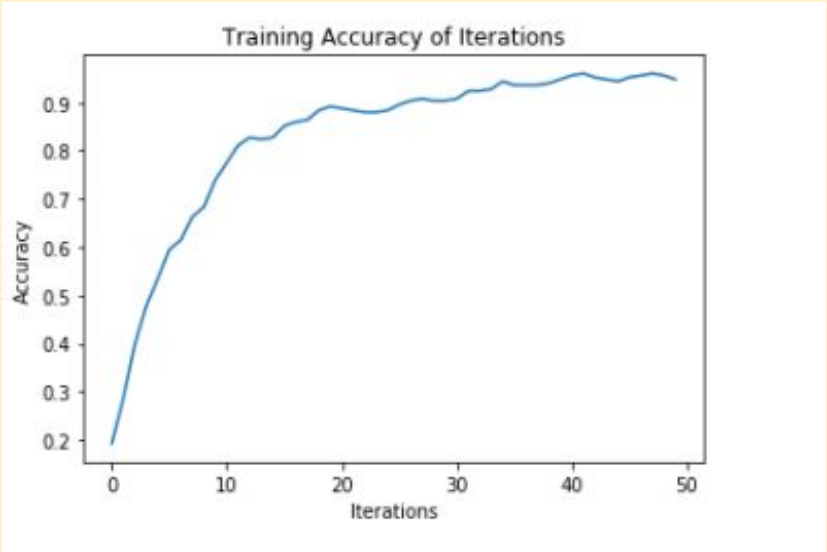
Yes there are steep changes when you start looking at the 3D snapshot above, in particular the steep can be found around(1st Graph): -5.0,0.90. This is due to the settings that were talked about in Problem 3. Evolutionary Solver is not as likely to get stuck at a local optimum. Y space is the w21 and w12 which is the accuracy, which is the steep. Looking at the second graph the same could be said but the depth would be the main focus for the steep instead of using just the x and y.

5) Yes, it flattens off at the end






Testing Accuracy of Iterations
Accuracy
Iterations
0.2
0.3
0.4
0.5
0.6
0.7
0
10
20
30
40
50


Training Accuracy of Iterations
Accuracy
Iterations
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
10
20
30
40
50