Homework 3

CS 436/58DL : Introduction to Machine learning

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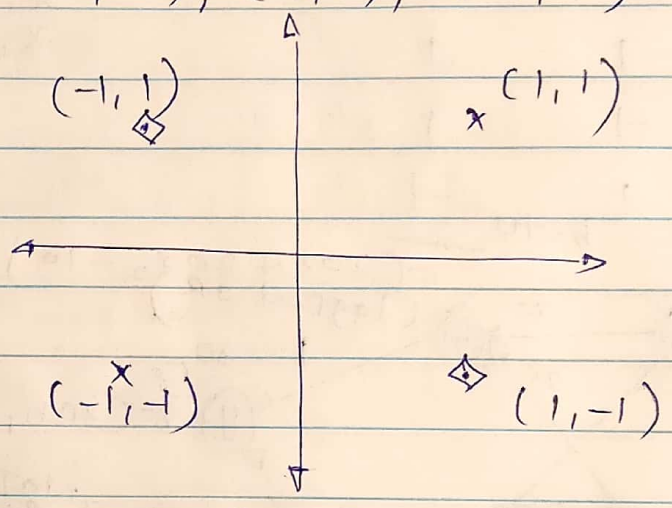
Given co-ordinates of points are

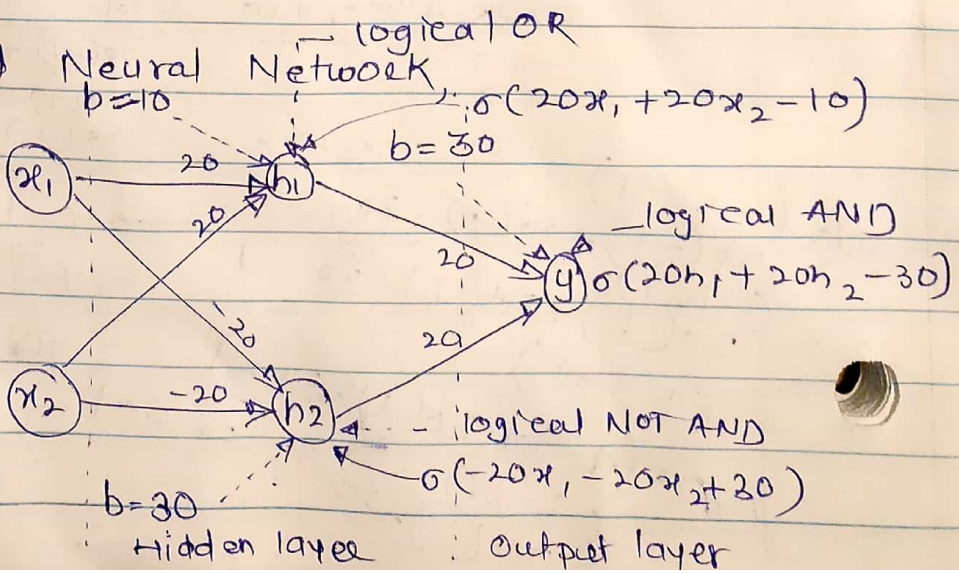
$(1,1), (1,-1), (-1,1), (-1,-1)$



Desired output (Based on XOR property)

x_1	x_2	output y
-1	-1	-1
-1	1	1
1	-1	1
1	1	-1

Constructed Neural Network



If sum >= 0 then output = 1

If sum < 0 then output = -1

Let, $x_1 = -1$, $x_2 = -1$

$h1 = \sigma(20(-1) + 20(-1) + 10) \approx -1$

$h2 = \sigma(-20(-1) - 20(-1) + 30) \approx 1$

$y = \sigma(20(-1) + 20(1) - 30) \approx -1$

Let $x_1 = 1$, $x_2 = 1$

$h1 = \sigma(20(1) + 20(1) + 10) \approx 1$

$h2 = \sigma(-20(1) - 20(1) + 30) \approx -1$

$y = \sigma(20(1) + 20(-1) - 30) \approx -1$

Let $x_1 = -1$, $x_2 = 1$

$h1 = \sigma(20(-1) + 20(1) + 10) \approx 1$

$h2 = \sigma(-20(-1) - 20(1) + 30) \approx 1$

$y = \sigma(20(+1) + 20(1) - 30) \approx 1$

Let $x_1 = 1$, $x_2 = -1$

$h1 = \sigma(20(1) + 20(-1) + 10) \approx 1$

$h2 = \sigma(-20(1) - 20(-1) + 30) \approx 1$

$y = \sigma(20(1) + 20(1) - 30) \approx 1$

The solution to this problem is to expand beyond the single-layer architecture by adding an additional hidden layer of units.

This architecture gave non-linear separation for given neural network.

With right set of weight values, it ~~has provided~~ can provide the necessary separation to accurately classify the XOR inputs.