Logistic Regression

Classification => It is a technique concerned with separating distinct sets of objects (or observations) and with allocating new objects (observations) to previously defined groups (labeled classes)

Rashmikan.

~~Neural Ne~~

Artificial Neural Networks (ANN)

$$a_j^{(2)} = \sum_{i=0}^{d} w_{ji}^{(1)} x_i^{(1)}$$

$$z_j^{(2)} = h(a_j^{(2)})$$

} in each layer

$w_{ji}^{(k)}$ ⇒ refers to weight corresponding to jth neuron in layer 1 to ith neuron in layer 2. (w_{j0} ⇒ is the bias)

$a_j^{(k)}$ ⇒ Summation output of jth neuron in layer 2

$z_j^{(k)}$ ⇒ is the activation output from layer $k+1$

$$z_1^{(2)} = h(a_1^{(2)})$$

$$a_1^{(2)} = \sum_{i=0}^{d} w_{1i}^{(1)} x_i$$

$$z_2^{(2)} = h(a_2^{(2)})$$

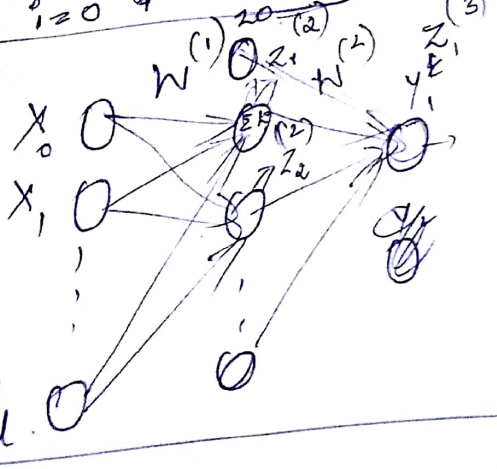
$$a_2^{(2)} = \sum_{i=0}^{d} w_{2i}^{(1)} x_i$$

$$y_1 = z_1^{(3)}$$

$$y_1 = h$$

$$z_1^{(3)} = h(a_1^{(3)})$$

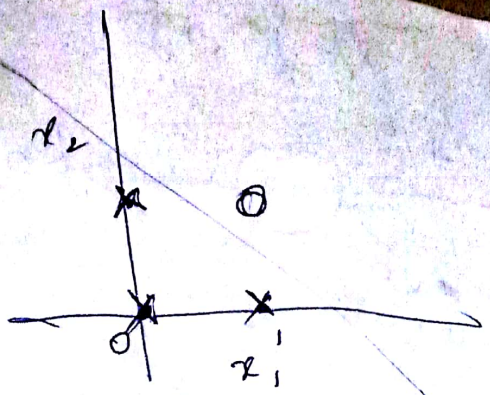
$$a_1^{(3)} = \sum_{i=0}^{d} w_{1i}^{(2)} z_i^{(2)}$$



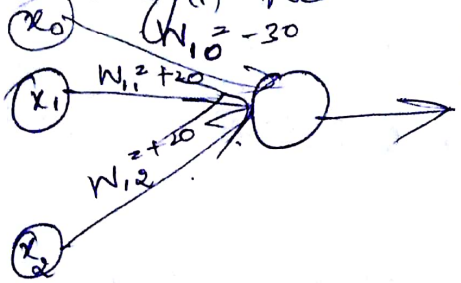
feed forward propagation

~~XOR~~ AND

x_1	x_2	AND
0	0	0
0	1	0
1	0	0
1	1	1



Randomly (1) we assign weights



$$W = [-30 \quad +20 \quad +20]$$

$$h_w(x) = y = \frac{1}{1+e^{-z}}$$

~~$z = -30$~~

$x_1 = 0, x_2 = 0$ $\quad z = -30 + 20 \times 0 + 20 \times 0 = -30$

$$y = \frac{1}{1+e^{+30}} = 0.000\ldots$$

$x_1 = 0, x_2 = 1$ $\quad z = -30 + 20 = -10$

$$y = \frac{1}{1+e^{+10}} = 0.0\ldots$$

$x_1 = 1, x_2 = 0$ $\quad z =$

$z = +10$ $\quad y = \frac{1}{1+e^{-10}} = 0.992$

$x_1 = 1, x_2 = 1$

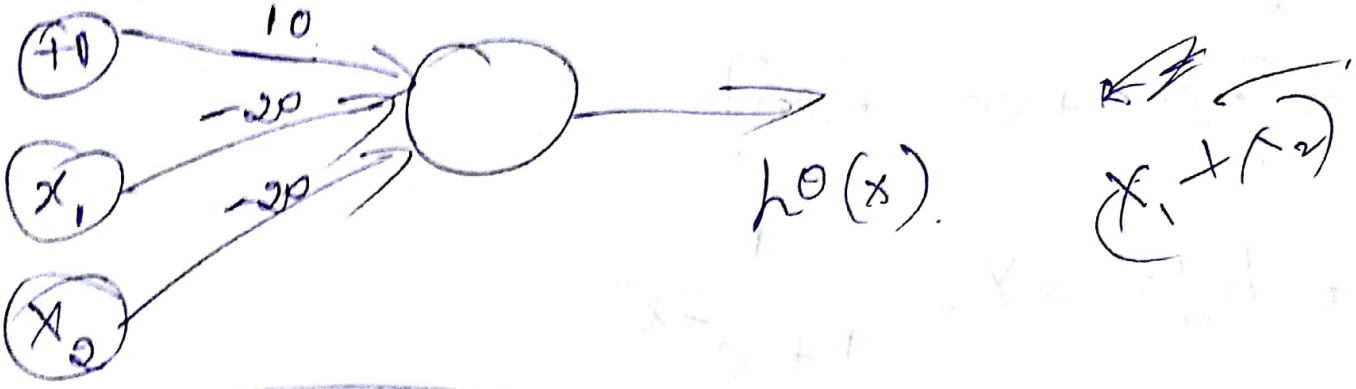
Not

$x_1 \in \{0, 1\}$

(NOT) AND (NOT) Neural Network

$\overline{x_1}\ \overline{x_2}$

$\overline{A}\ \overline{B} = (\overline{A + B})$ ⇒ NOR.



x_1	x_2	y
0	0	1
0	1	0
1	0	0
1	1	0

Non-linear Classification

XNOR

$A\bar{B} + \bar{A}B$

XOR

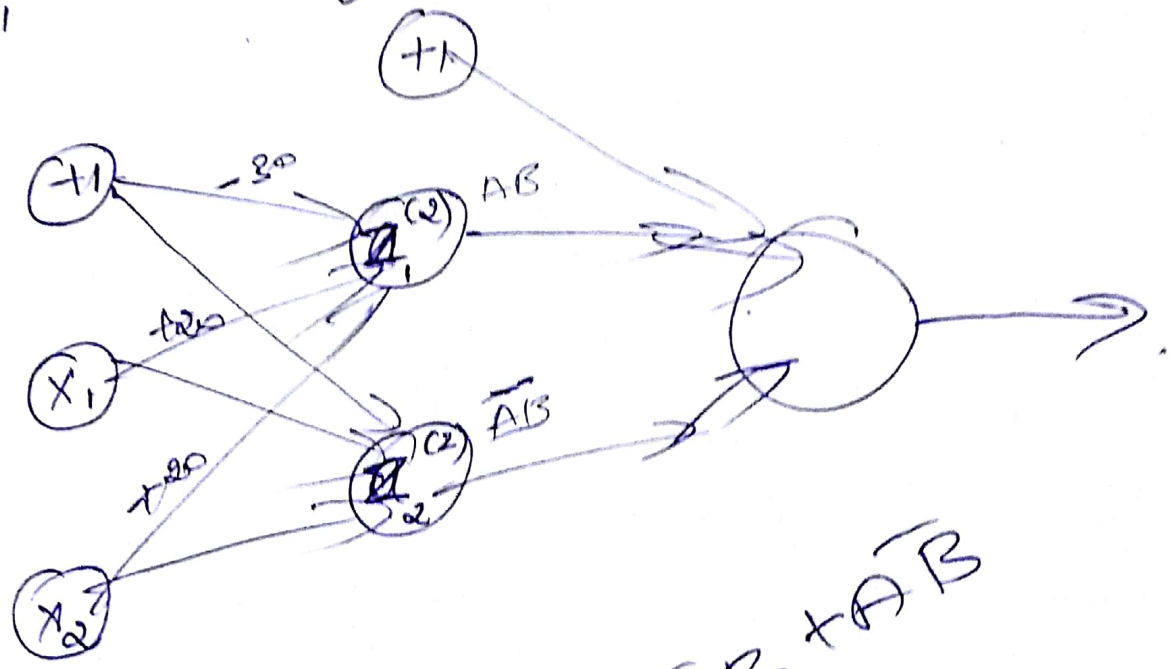
$A\bar{B} + \bar{A}B$

X_1 AND X_2

$\bar{X_1}$ AND $\bar{X_2}$

X_1 OR X_2

} combined,



$XOR = \bar{A}B + A\bar{B}$

$X_1 + X_2$