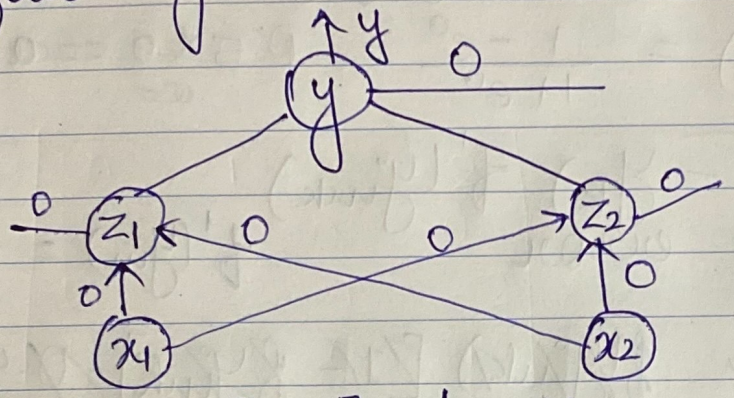
Task 3: Machine Learning

Name: Ventrapragada Sai Shravani
PRN: 17070123120
Batch: G3

Q. Find the new weights using Back propogation for the following:



input pattern [-1, 1]; $t = 01$ $\alpha = 0.25$

activation $f = \frac{1 - e^{x}}{1 + e^{x}}$

$[V_{11} \quad V_{21} \quad V_{01}] = [0 \quad 0 \quad 0]$

$[V_{12} \quad V_{22} \quad V_{02}] = [0 \quad 0 \quad 0]$

$[W_1 \quad W_2 \quad W_0] = [0 \quad 0 \quad 0]$

Calculate net i/p for z_1

$z_1 = V_{01} + x_1 V_{11} + x_2 V_{21}$

$= 0 + -1 \times 0 + 1 \times 0 = 0$

$z_2 = 0 + -1 \times 0 + 1 \times 0 = 0$

$(z_2 = V_{02} + V_{12} \times x_1 + V_{22} \times x_2)$

Apply activation f^n

$z_1 = f(z_{in1})$

$z_2 = f(z_{in2})$

$$z_1 = \frac{1-e^0}{1+e^0} = 0$$

$$z_2 = \frac{1-e^0}{1+e^0} = 0$$

Calculate net input entering o/p layer

$$y_{in} = w_0 + w_1 z_1 + w_2 z_2 = 0 + 0 \times 0 + 0 \times 0 = 0$$

$$f(y_{in}) = \frac{1-e^0}{1+e^0} = 0$$

Calculating error $\delta_k = (t_k - y_k) f'(y_{in})$

$f'(y_{in}) = \frac{2e^x}{e^{2x} + 2e^x + 1} = 0.5$

$\delta_1 = (1-0)\,0.5 = 0.5$

Weight update since $t_k \neq y_k$

$\Delta W_1 = \alpha\, \delta_1 z_1 = 0.25 \times 0.5 \times 0 = 0$

$\Delta W_2 = \alpha\, \delta_1 z_2 = 0.25 \times 0.5 \times 0 = 0$

$\Delta W_0 = \alpha\, \delta_1 = 0.25 \times 0.5 = 0.125$

Calculate δ_j (The error portion) b/w hidden and input

$\delta_j = \delta_{inj} (f'(z_{inj})$

$\delta_{inj} = \sum_{k=1}^{m} \delta_k w_{jk}$

$\delta_{in1} = \delta_1 \times W_1 = 0.5 \times 0 = 0$

$\delta_{in2} = \delta_1 \times W_2 = 0.5 \times 0 = 0$

$f'(z_{inj}) = \frac{2e^x}{e^{2x} + 2e^x + 1} = 0.5$ (same for both z_1 & z_2)

$\delta_1 = \delta_{in1} \times f'(z_{inj})$

$\delta_2 = \delta_{in2} \times f'(z_{inj})$

$\delta_1 = 0 \times 0.25 = 0$ $\delta_2 = 0 \times 0.25 = 0$.

Find W vector

$\Delta V_{11} = \alpha \cdot \delta_1 \cdot x_1 = 0.25 \times 0 \times (-1) = 0$

$\Delta V_{21} = \alpha \delta_1 \cdot x_2 = 0.25 \times 0 \times 1 = 0$

$\Delta V_{01} = \alpha \delta_1 = 0.25 \times 0 = 0$

$\Delta V_{12} = \alpha \delta_2 \cdot x_1 = 0.25 \times 0 \times (-1) = 0$

$\Delta V_{22} = \alpha \delta_2 x_2 = 0.25 \times 0 \times (+1) = 0$

$\Delta V_{02} = \alpha \delta_2 = 0 \times 0.25 = 0$

When there is no change in ~~ver~~ weight vector hence x_1 and x_2 have no error.

calculate final weight vector

$V_{1(new)} = V_{old} + \Delta V_1$

$W_1 = 0 + 0 = 0$

$V_{11} = 0 + 0 = 0$ $V_{12} = 0 + 0 = 0$

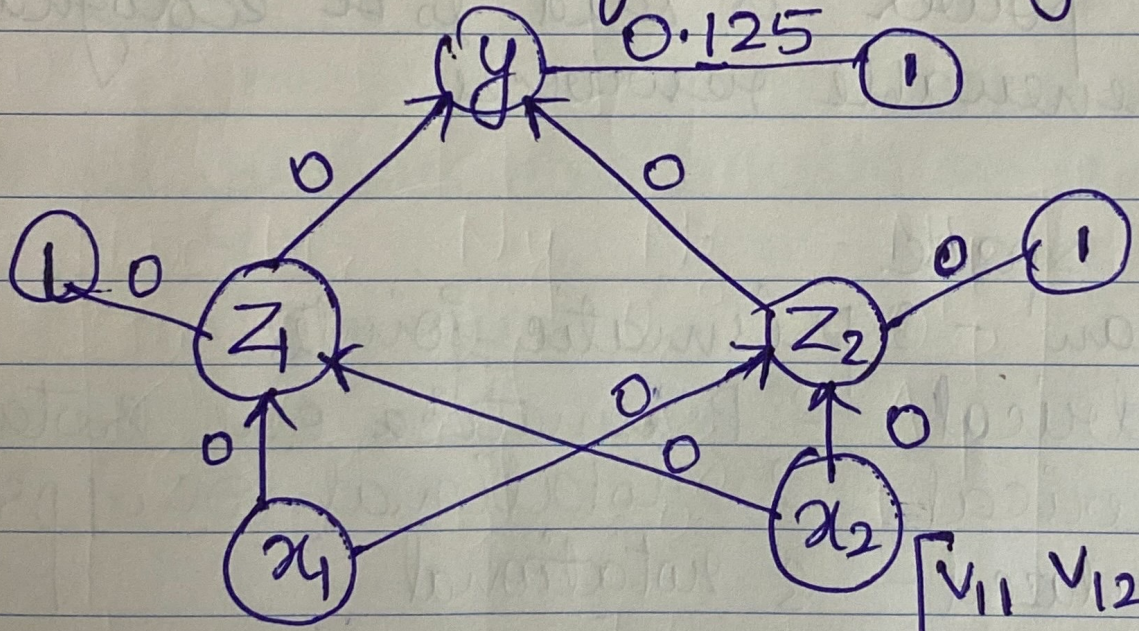
$V_{21} = 0 + 0 = 0$ $V_{22} = 0 + 0 = 0$

$V_{01} = 0 + 0 = 0$ $V_{02} = 0 + 0 = 0$

$W_0 = 0 + 0.125 = 0.125$

$W_2 = 0 + 0 = 0$

Network After final weight upgradation



$$\begin{bmatrix} v_{11} & v_{12} & v_{01} \\ v_{21} & v_{22} & v_{02} \\ w_1 & w_2 & w_3 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0.125 \end{bmatrix}$$