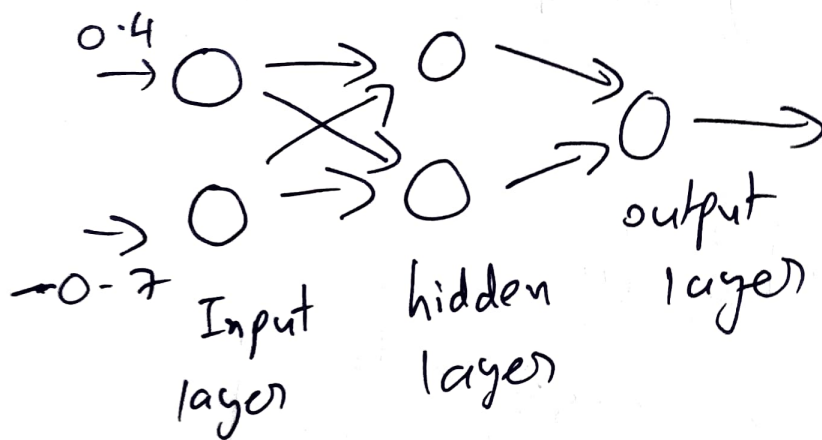


Assignment on Back Prop

Asutosh
Ghanta
18BCS014



MFNN architecture

step 1:-

$$\{O\} = \{I\} = \begin{Bmatrix} 0.4 \\ -0.7 \end{Bmatrix}_{2 \times 1}$$

(x)

step 2:-

Initialize weights

$$[V]^0 = \begin{bmatrix} 0.1 & 0.4 \\ -0.2 & 0.2 \end{bmatrix}$$

$$[W]^0 = \begin{bmatrix} 0.2 \\ -0.5 \end{bmatrix}$$

step 3:-

find

$$\{I\}_H = [V]^T [O]_I$$

$$[I]_H = \begin{bmatrix} 0.1 & -0.2 \\ -0.4 & 0.2 \end{bmatrix} \begin{bmatrix} 0.4 \\ 0.7 \end{bmatrix} = \begin{bmatrix} 0.18 \\ 0.02 \end{bmatrix}$$

step 4:- $[O]_H = \begin{bmatrix} \text{sig}(0.18) \\ \text{sig}(0.32) \end{bmatrix} = \begin{bmatrix} 0.5448 \\ 0.505 \end{bmatrix}$

step 5:-

$$\begin{aligned} [I]_O &= [W]^T [O]_H \\ &= (0.2 - 0.5) \begin{bmatrix} 0.5448 \\ 0.505 \end{bmatrix} \\ &= -0.14354 \end{aligned}$$

step 6:-

$$[O]_O = [\text{sig}(-0.14)] = 0.4642$$

step 7:-

$$\begin{aligned} \text{error} &= (T_O - O_{O1})^2 \\ &= (0.1 - 0.4642)^2 = 0.13264 \end{aligned}$$

step 8:-

$$\begin{aligned} d &= (T_O - O_{O1})(O_{O1})(1 - O_{O1}) \\ &= (0.1 - 0.4642)(0.4642)(0.5358) \\ &= -0.09058 \\ [Y] &= [O]_H(d) = \begin{bmatrix} 0.5448 \\ 0.505 \end{bmatrix} [-0.09058] \\ &= \begin{bmatrix} -0.0493 \\ -0.0457 \end{bmatrix} \end{aligned}$$

step 9:-

$$[\Delta w]' = \alpha [\Delta w^0] + \eta [y] \quad \eta = 0.6$$
$$= \begin{bmatrix} -0.029 \\ -0.027 \end{bmatrix}$$

step 10:-

$$[e] = [w][d] = \begin{bmatrix} 0.2 \\ -0.5 \end{bmatrix} (-0.69058)$$
$$= \begin{bmatrix} -0.0181106 \\ -0.04529 \end{bmatrix}$$

step 11:-

$$[d^*] = \begin{bmatrix} (-0.018116)(0.5448)(1-0.5448) \\ (0.04529)(0.505)(1-0.505) \end{bmatrix}$$
$$= \begin{bmatrix} -0.00449 \\ -0.01132 \end{bmatrix}$$

step 12:-

$$[x] = [0]_T [d^*]^T = \begin{bmatrix} 0.4 \\ -0.7 \end{bmatrix} \begin{bmatrix} -0.0049 \\ 0.01132 \end{bmatrix}$$
$$= \begin{bmatrix} -0.001796 & 0.004528 \\ 0.003143 & -0.007924 \end{bmatrix}$$

step 13:-

$$[\Delta v]^1 = \lambda [\Delta v]^0 + \eta [x]$$

$$= \begin{bmatrix} -0.001077 & 0.002716 \\ 0.001885 & -0.004754 \end{bmatrix}$$

step 14:-

$$[V]^1 = \begin{bmatrix} 0.1 & 0.4 \\ -0.2 & 0.2 \end{bmatrix} + \begin{bmatrix} -0.001077 & 0.002716 \\ 0.001885 & -0.004754 \end{bmatrix}$$

$$= \begin{bmatrix} -0.0989 & 0.04027 \\ 0.1981 & -0.19524 \end{bmatrix}$$

$$[w]^1 = \begin{bmatrix} 0.2 \\ -0.5 \end{bmatrix} + \begin{bmatrix} -0.02958 \\ -0.02742 \end{bmatrix}$$

$$= \begin{bmatrix} 0.17042 \\ -0.52742 \end{bmatrix}$$

step 15:- with the updated weights $[V]$ and $[w]$, error is calculated again and next training set is taken and adjusted. untill the error less than tolerance is reached.