$$net^i = z = g(x) = \sum_{i=1}^{n} x_i w_i + b$$

$$f(g(x)) = \frac{1}{1+e^{-z}}$$

Activation function

$$x = [0.8,\ 0.6,\ 0.4]$$

$$w = [0.1,\ 0.3,\ -0.2]$$

$$net^i = z = g(x) = [0.8 \times (0.1) + (0.6) \times (0.3) + (0.4)(-0.2)]$$

$$g(x) = 0.18$$

$$f'(z) = \frac{1}{1+e^{-0.18}}$$

$$\boxed{O_i = \underline{0.544}}$$
$$1$$

$t =$
$d =$ 1

delta Rule

$$O_i \neq t_i =$$

Delta Rule

$$\Delta w = \eta (t_i - o_i) \times x$$

$$\Delta b = \eta (t_i - o_i)$$

new weight = oldwgt + Δw_i

new bais = old bais + Δb_i

$$W = \begin{bmatrix} 1 \\ -1 \\ 0 \\ 0.5 \end{bmatrix} \quad X_1 = \begin{bmatrix} 1 \\ -2 \\ 0 \\ -1 \end{bmatrix} \quad X_2 = \begin{bmatrix} 0 \\ 1.5 \\ -0.5 \\ -1 \end{bmatrix} \quad X_3 = \begin{bmatrix} -1 \\ 1 \\ 0.5 \\ -1 \end{bmatrix}$$

$c = 0.1$

$d_1 = -1$ ✓

$d_2 = -1$

$d_3 = 1$

if $z < 0 = -1$
else 1

$$\Rightarrow \quad g(x) = \sum_{i=1}^{n} x_i w_i$$

$$= \begin{bmatrix} 1 \\ -2 \\ 0 \\ -1 \end{bmatrix} \times \begin{bmatrix} 1 \\ -1 \\ 0 \\ 0.5 \end{bmatrix}$$

$$z = 2.5$$

$$\underline{O_i = f'(z) = 1} \qquad O_i \neq d_i$$

As $O_1 \neq d_1$ update weights.

$$\Delta w_1 = c(d_i - o_i) \times x$$

$$= \underline{0.1(-1-1)} \times \begin{bmatrix} 1 \\ -2 \\ 0 \\ -1 \end{bmatrix}$$

$$= -0.2 \begin{bmatrix} 1 \\ -2 \\ 0 \\ -1 \end{bmatrix} = \begin{bmatrix} -0.2 \\ 0.4 \\ 0 \\ 0.2 \end{bmatrix}$$

New wt = old wt + Δw

$$= \begin{bmatrix} 1 \\ -1 \\ 0 \\ 0.5 \end{bmatrix} + \begin{bmatrix} -0.2 \\ 0.4 \\ 0 \\ 0.2 \end{bmatrix} = \begin{bmatrix} 0.8 \\ -0.6 \\ 0 \\ 0.7 \end{bmatrix}$$

10 marks

for x_2

$$z = \begin{bmatrix} 0 \\ 1.5 \\ -0.5 \\ -1 \end{bmatrix} \times \begin{bmatrix} 0.8 \\ -0.6 \\ 0 \\ 0.7 \end{bmatrix}$$

$g(x) = z = -1.6$

$f'(z) = -1$

$d = -1$ & $O_i = -1$

As $d_i = O_i$

the weight will remain same for next input.

for x_3

x

$$z = \begin{bmatrix} -1 \\ 1 \\ 0.5 \\ -1 \end{bmatrix} \times \begin{bmatrix} 0.8 \\ -0.6 \\ 0 \\ 0.7 \end{bmatrix}$$

$z = -2.1$

$\Delta w = 0.1(1(-1))+$

$f'(z) = -1$

$O_i = -1$

$d = 1$

& $d_i \neq O_i$ update the weights

$\Delta w =$

$$\text{new weight} = \begin{bmatrix} 0.6 \\ -0.4 \\ 0.1 \\ 0.5 \end{bmatrix}$$