the input to h1 is Z_1

$Z_1 = W1X1 + W2X2 + b1$

$Z_1 = 0.15 * 0.05 + 0.20 * 0.10 + 0.35 = 0.3775$

the output of h1 => we make sigmoid on Z_1 => $g(Z_1) = a_1$

$$a_1 = \frac{1}{1+e^{-Z_1}} = \frac{1}{1+e^{-(0.3775)}} = 0.5932699921$$

the input to h2 is Z_2

$Z_2 = W3X1 + W4X2 + b1$

$Z_2 = 0.25 * 0.05 + 0.30 * 0.10 + 0.35 = 0.3925$

the output of h2 => we make sigmoid on Z_2 => $g(Z_2) = a2$

$$a_2 = \frac{1}{1+e^{-Z_2}} = \frac{1}{1+e^{-(0.3925)}} = 0.5968843783$$

the input to O1 is a_1 & a2

$Z3 = W_5a1 + W6\,a2 + b2 = 0.40 * 0.5932699921 + 0.45 * 0.5968843783$
$+ 0.60 = 1.105905967$

$$O1 = \frac{1}{1+e^{-Z3}} = 0.7513650695$$

the input to O2 is a1 & a2

$Z4 = W7\,a1 + W8\,a2 + b2 = 0.50 * 0.5932699921 + 0.55 * 0.5968843783$
$+ 0.60$
$= 1.224921404$

$$O2 = \frac{1}{1+e^{-Z4}} = 0.7729284653$$

square error $[E] = \frac{1}{2n} \sum_{i=1}^{n} \left[y^i(\text{actual}) - a^i(\text{predict})\right]^2$ & $n = 1$

$E_{O1} = \frac{1}{2}[0.01 - 0.7513650695]^2 = 0.2748110831$

$E_{O2} = \frac{1}{2}[0.99 - 0.7729284653]^2 = 0.02356002559$

Total error $(E_{total}) = E_{O1} + E_{O2}$

$= 0.2748110831 + 0.02356002559$

$= 0.2983711087$

$\frac{\partial E_{total}}{\partial W5} = dW5 = dZ_3 * a1$

$dZ_3 = a1 * g'(Z3)$

$= 0.5932699921 * \left[\frac{1}{1+e^{-Z3}}\left(1 - \frac{1}{1+e^{-Z3}}\right)\right]$

$= 0.1108320906$

$dW5 = 0.1108320906 * 0.5932699921 = 0.06575335351$

$W5 = W5 - \alpha dW5 = 0.40 - (0.5)(0.06575335351)$

$= 0.3671233232 \simeq 0.3$

$\frac{\partial E_{total}}{\partial W6} = dW6 = dW5$

$W6 = W6 - \alpha dW6 = 0.45 - 0.5 * 0.06575335351$

$= 0.4171233232 \simeq 0.4$

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$$\frac{\partial E_{total}}{\partial W7} = dW7 = dZ_4 * a2$$

$$dZ_4 = a1 * g'(Z4)$$

$$= 0.5932699921 * \left[\frac{1}{1+e^{-Z4}}\left(1 - \frac{1}{1+e^{-Z4}}\right)\right]$$

$$= 0.1041248477$$

$$dW7 = 0.1041248477 * 0.5968843783$$
$$= 0.06215049496$$

$$W7 = W7 - \alpha dW7 = 0.50 - 0.5 * 0.06215049496$$
$$= 0.4689247525 \simeq 0.5$$

$$dW8 = dW7$$

$$W8 = W8 - \alpha dW8 = 0.55 - 0.5 * 0.06215049496$$
$$= 0.5189247525 \simeq 0.5$$

$$\frac{\partial E_{total}}{\partial W1} = dW1 = dZ1 * i1$$

$$dZ1 = i1 * g'(Z1)$$
$$= 0.05 * \left[\frac{1}{1+e^{-Z1}}\left(1 - \frac{1}{1+e^{-Z1}}\right)\right]$$

$$= 0.01206503543$$

$$dW1 = 0.01206503543 * 0.05 = 6.032517714 * 10^{-4}$$

$$W1 = W1 - \alpha dW1 = 0.15 - 0.5 * dW1 = 0.1496983741 \simeq 0.149$$

Scanned with CamScanner

$$\frac{\partial E_{total}}{\partial W2} = dW2 = dW1$$

$$W2 = W2 - \alpha dW2 = 0.20 - 0.5 * 6.032517714 * 10^{-4}$$
$$= 0.1996983741 \simeq 0.199$$

$$\frac{\partial E_{total}}{\partial W_3} = dW3 = dZ2 * X_2$$

$$dZ2 = X2\, g'(Z2)$$
$$= 0.1 * \left[\frac{1}{1+e^{-Z2}}\left(1 - \frac{1}{1+e^{-Z2}}\right)\right]$$

$$= 0$$

$$\therefore dW3 = 0$$

$$W3 = W3 - 0.5 * 0 = 0.25$$

$$dW3 = dW4 = 0$$

$$\therefore W4 = W4 - \alpha dW4 = 0.30$$

$\Rightarrow$ After this round of back propagation the total error is down so is now $= 0.291027924$