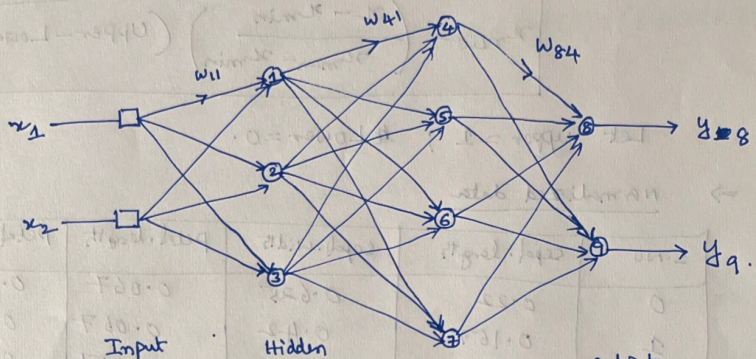
* Example - Back-Propagation Algorithm *



Input layer	Hidden layer-1	Hidden layer-2	Output layer
2-nodes	3-neurons	4-neurons	2- neurons
	$2 \times 3 = 6$ weights.	$3 \times 4 = 12$ weights	$4 \times 2 = 8$ neurons

① → w_{11}, w_{12}

② → w_{21}, w_{22}

③ → w_{31}, w_{32}

④ ⇒ w_{41}, w_{42}, w_{43}

⑤ ⇒ w_{51}, w_{52}, w_{53}

⑥ ⇒ w_{61}, w_{62}, w_{63}

⑦ ⇒ w_{71}, w_{72}, w_{73}

⑧ ⇒ $w_{84}, w_{85}, w_{86}, w_{87}$

⑨ ⇒ $w_{94}, w_{95}, w_{96}, w_{97}$.

Total no. of weights = $6 + 12 + 8 = 26$.

⇒ Iris data set :-

S.no	sepal.length	sepal.width	petal.length	petal.width
0	5.1	3.5	1.4	0.2
1	4.9	3.0	1.4	0.2
2	4.7	3.2	1.3	0.2.
⋮				
149.				

⇒ Normalization.

$$x_{new} = \left(\frac{x - x_{min}}{x_{max} - x_{min}}\right)(Upper - Lower)$$

Let upper = 1 ; Lower = 0.

⇒ Normalized data

S.NO	sepal.length	sepal.width	petal.length	petal.width
0	0.22	0.625	0.067	0.042
1	0.167	0.42	0.067	0.042
2	0.111	0.50	0.051	0.042
⋮	⋮	⋮	⋮	⋮
149.	⋮	⋮	⋮	⋮

(A) ~~Forward pass calculations~~ ,

⇒ Assumptions :-

Initial weight values

① ⇒ $w_{11} = 0.11$; $w_{12} = 0.12$

② ⇒ $w_{21} = 0.21$; $w_{22} = 0.22$

③ ⇒ $w_{31} = 0.31$; $w_{32} = 0.32$

④ ⇒ $w_{41} = 0.41$; $w_{42} = 0.42$; $w_{43} = 0.43$.

⑤ ⇒ $w_{51} = 0.51$; $w_{52} = 0.52$; $w_{53} = 0.53$

⑥ ⇒ $w_{61} = 0.61$; $w_{62} = 0.62$; $w_{63} = 0.63$

⑦ ⇒ $w_{71} = 0.71$; $w_{72} = 0.72$; $w_{73} = 0.73$

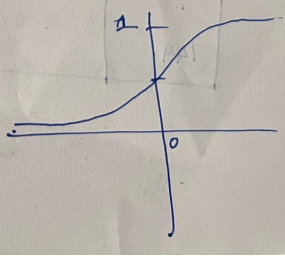
⑧ ⇒ $w_{84} = 0.84$; $w_{85} = 0.85$; $w_{86} = 0.86$; $w_{87} = 0.87$

⑨ ⇒ $w_{94} = 0.94$; $w_{95} = 0.95$; $w_{96} = 0.96$; $w_{97} = 0.97$

⇒ Activation functions :-

① Sigmoid / Logistic :-

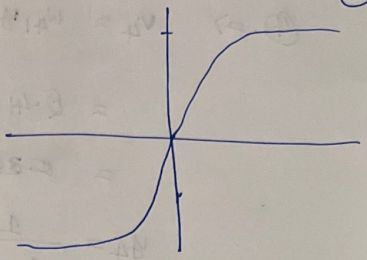
$$\phi(x) = \frac{1}{1 + e^{-x}}$$



(2) tanh :-

$$\phi(x) = \frac{(e^x - e^{-x})}{(e^x + e^{-x})}$$

(3)



⇒ Forward pass calculations :-

Let $n = 1$ & ⇒ $x_1 = 0.22$, $x_2 = 0.625$, $d_g = 0.067$, $d_{g_1} = 0.042$

bias = 1

$$V_j = \sum_{i=0}^{n} w_{ji} x_i + b \quad ; \quad y_j = \phi(V_j)$$

→ Use sigmoid in Hidden neurons
→ Use tanh in output neurons.

(1) ⇒ $V_1 = w_{11} x_1 + w_{12} x_2 + b$

$= (0.11 \times 0.22) + (0.12 \times 0.625) + 1$

$= 0.0242 + 0.075 + 1$

$= 1.0992$

$$y_1 = \frac{1}{1 + e^{-1.0992}} = 0.75$$

(2) ⇒ $V_2 = w_{21} x_1 + w_{22} x_2 + b$

$= (0.021 \times 0.22) + (0.22 \times 0.625) + 1$

$= 0.0462 + 0.1375 + 1$

$= 1.1837$

$$y_2 = \frac{1}{1 + e^{-1.1837}} = 0.766$$

(3) ⇒ $V_3 = w_{31} x_1 + w_{32} x_2 + b$

$= (0.31 \times 0.22) + (0.32 \times 0.625) + 1$

$= 0.0682 + 0.2 + 1$

$= 1.2682$

$$y_3 = \frac{1}{1 + e^{-1.2682}} = 0.78.$$

④. ⇒ $v_4 = w_{41}y_1 + w_{42}y_2 + w_{43}y_3 + b$ ④

$= (0.41 \times 0.75) + (0.42 \times 0.766) + (0.43 \times 0.78) + 1$

$= 1.9642.$

$y_4 = \frac{1}{1+e^{-1.9642}} = 0.877.$

⑤. ⇒ $v_5 = w_{51}y_1 + w_{52}y_2 + w_{53}y_3 + b$

$= (0.51 \times 0.75) + (0.52 \times 0.766) + (0.53 \times 0.78) + 1$

$= 2.1942.$

$y_5 = \frac{1}{1+e^{-2.1942}} = 0.899.$

⑥ ⇒ $v_6 = w_{61}y_1 + w_{62}y_2 + w_{63}y_3 + b$

$= (0.61 \times 0.75) + (0.62 \times 0.766) + (0.63 \times 0.78) + 1$

$= 2.4238$

$y_6 = \frac{1}{1+e^{-2.4238}} = 0.9186$

⑦ ⇒ $v_7 = w_{71}y_1 + w_{72}y_2 + w_{73}y_3 + b.$

$= (0.71 \times 0.75) + (0.72 \times 0.766) + (0.73 \times 0.78) + 1$

$= 2.6534$

$y_7 = \frac{1}{1+e^{-2.6534}} = 0.9342$

⑧. $v_8 = w_{84}y_4 + w_{85}y_5 + w_{86}y_6 + w_{87}y_7 + b$

$= (0.84 \times 0.877) + (0.85 \times 0.899) + (0.86 \times 0.9186)$
$+ (0.87 \times 0.9342) + 1$

$= 4.10358$

$$y_8 = \frac{(e^{+4.10358} - e^{-4.10358})}{(e^{4.10358} + e^{-4.10358})}$$

$$= \frac{(60.55 - 0.0165)}{(60.55 + 0.0165)}$$

$$= 0.999.$$

(9) $\Rightarrow$ $V_9 = w_{94} y_4 + w_{95} y_5 + w_{96} y_6 + w_{97} y_7 + b$

$= (0.94 \times 0.877) + (0.95 \times 0.899) +$
$(0.96 \times 0.9186) + (0.97 \times 0.9342) + 1$

$= 4.467$

$$y_9 = \frac{(e^{4.467} - e^{-4.467})}{(e^{4.467} + e^{-4.467})}$$

$$= \frac{(87.095 - 0.1148)}{(87.095 + 0.1148)}$$

$= 0.997.$

$\Rightarrow$ Backward-pass calculations :-

$$w_{ji}(n+1)_{new} = w_{ji}(n)_{old} + \Delta w_{ji}(n)$$

$$\Delta w_{ji}(n) = \eta \, \delta_j(n) \, y_i(n)$$

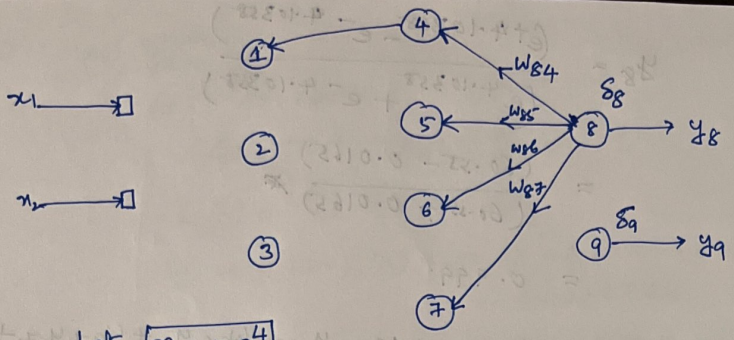
$$e_j(n) = d_j(n) - y_j(n)$$

where

Local gradient $\delta_j(n) = \begin{cases} e_j(n) \, \phi'(V_j(n)) & \text{where } j \text{ is output neuron.} \\ \phi_j'(V_j(n)) \sum \delta_k(n) w_{kj}(n) & \text{where } j \text{ is Hidden neuron} \end{cases}$

Local gradiat of right side layered neurons

Weights of right side layered neurons.



Let $\eta = 0.4$

$\Rightarrow w_{84}$ ~~⇒~~ updation $\Rightarrow$ $w_{84}(n+1) = w_{84}(n) + \Delta w_{84}(n)$ → ①

$\Delta w_{84}(n) = \eta\, \delta_8(n)\, y_4(n)$ → ②

$e_8(n) = d_8(n) - y_8(n)$

$= 0.067 - 0.999$

$= -0.932.$

② $\Rightarrow$ $\Delta w_{84}(n) = 0.4 \times -0.932 \times 0.877$

$= -0.327$

① $\Rightarrow$ $w_{84}(n+1) = 0.84 - 0.327 = 0.513.$

$w_{84}(n+1) = 0.513$

$\Rightarrow$ w_{85} updation :-

$\delta_j(n) = [d_j(n) - y_j(n)][(1 - y_j(n))(1 + y_j(n))]$

$\delta_8(n) = [d_8(n) - y_8(n)][(1 - y_8(n))(1 + y_8(n))]$

$= (0.067 - 0.999)[(1 - 0.999)(1 + 0.999)]$

$= (-0.932)[0.001 \times 1.999]$

$= -0.00187$

② $\Rightarrow$ $\Delta w_{84}(n) = 0.4 \times -0.00187 \times 0.877 = -0.000656$

① $\Rightarrow$ $w_{84}(n+1) = 0.84 - 0.000656 = 0.8393$

$w_{84}(n+1) = 0.8393$

⇒ W_{85} updation :-

$$W_{85}(n+1) = W_{85}(n) + \Delta W_{85}(n) \rightarrow (1)$$

$$\Delta W_{85}(n) = \eta\, \delta_8(n)\, y_5(n) \rightarrow (2)$$

$$\delta_8(n) = -0.00187$$

(2) ⇒ $\Delta W_{85}(n) = 0.4 \times -0.00187 \times 0.899$

$$= -0.0006724$$

(1) ⇒ $W_{85}(n+1) = 0.85 - 0.0006724 = +0.8493$

$$\boxed{W_{85}(n+1) = +0.8493}$$

⇒ W_{86} updation :-

$$W_{86}(n+1) = 0.86 + (0.4 \times -0.00187 \times 0.9186)$$

$$= 0.8593$$

$$\boxed{W_{86}(n+1) = 0.8593}$$

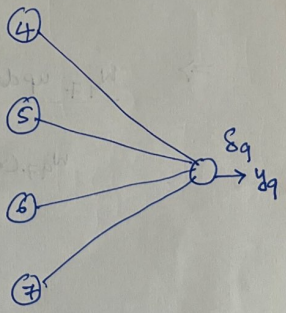
⇒ W_{87} updation :-

$$W_{87}(n+1) = 0.87 + (0.4 \times -0.00187 \times 0.9342)$$

$$= 0.8693.$$

$$\boxed{W_{87}(n+1) = 0.8693}$$

⇒ W_{94} updation :-



$$W_{94}(n+1) = W_{94}(n) + \Delta W_{94}(n) \rightarrow (1)$$

$$\Delta W_{94}(n) = \eta\, \delta_9(n)\, y_4(n). \rightarrow (2)$$

$$\delta_9(n) = [d_9(n) - y_9(n)]$$

$$[1 - y_9(n)][1 + y_9(n)]$$

$$= [0.042 - 0.997][(1 - 0.997)(1 + 0.997)]$$

$$= -0.005721$$

② ⇒ $\Delta w_{94}(n) = 0.4 \times -0.005721 \times 0.877$

$= -0.002006$

① ⇒ $w_{94}(n+1) = 0.94 - 0.002006 = 0.9379.$

$$\boxed{w_{94}(n+1) = 0.9379.}$$

⇒ w_{95} updation :-

$$w_{95}(n+1) = w_{95}(n) + \Delta w_{95}(n) \rightarrow ①$$

$$\Delta w_{95}(n) = \eta\, s_9(n)\, y_5(n) \rightarrow ②$$

$$= 0.4 \times -0.005721 \times 0.899.$$

$$= -0.002057$$

$$w_{95}(n+1) = 0.95 - 0.002057 = 0.9479$$

$$\boxed{w_{95}(n+1) = 0.9479.}$$

⇒ w_{96} updation :

$$w_{96}(n+1) = 0.96 + 0.4 \times -0.005721 \times 0.9186.$$

$$= 0.9578$$

$$\boxed{w_{96}(n+1) = 0.9578}$$

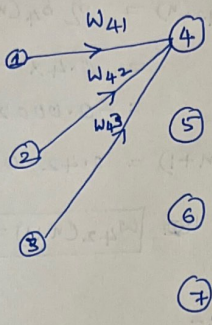
⇒ w_{97} updation :-

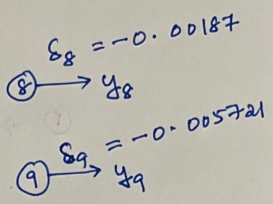
$$w_{97}(n+1) = 0.97 + 0.4 \times -0.005721 \times 0.9342$$

$$= 0.9678$$

$$\boxed{w_{97}(n+1) = 0.9678}$$

⇒ updating hidden layer-2 neurons





⇒ W_{41} updation :-

$$W_{41}(n+1) = W_{41}(n) + \Delta W_{41}(n) \longrightarrow (1)$$

$$\Delta W_{41} = \eta\, \delta_4(n)\, y_1(n) \longrightarrow (2)$$

$$\delta_4(n) = \phi_j'(v_j(n)) \sum \delta_k\, w_{kj}(n)$$

$$= \phi_4'(v_4(n)) \sum_{k=8}^{9} \delta_k\, w_{kj}(n)$$

$$\Rightarrow \delta_4(n) = y_4(n)\left[1 - y_4(n)\right]\left[\delta_8(n)\, w_{84}(n) + \delta_9(n)\, w_{94}(n)\right]$$

$$= 0.877(1-0.877)\left[-0.00187 \times 0.84 - 0.005721 \times 0.94\right]$$

$$= -0.000749.$$

$$\boxed{\delta_4(n) = -0.000749.}$$

(2) ⇒ $\Delta W_{41} = 0.4 \times -0.000749 \times 0.75$

$$= -0.0002248$$

(1) ⇒ $W_{41}(n+1) = 0.41 - 0.0002248 = 0.4097$

$$\boxed{W_{41}(n+1) = 0.4097}$$

$\Rightarrow$ W_{42} updation :-

$$W_{42}(n+1) = W_{42}(n) + \Delta W_{42}(n) \rightarrow (1)$$

$$\Delta W_{42}(n) = \eta\, \delta_4(n)\, y_2(n)$$

$$= 0.4 \times -0.000749 \times 0.766$$

$$= -0.0002294$$

$(1) \Rightarrow W_{42}(n+1) = 0.42 - 0.0002294 = 0.4197$

$$\boxed{W_{42}(n+1) = 0.4197}$$

$\Rightarrow$ W_{43} updation :-

$$W_{43}(n+1) = W_{43}(n) + \Delta W_{43}(n) \rightarrow (1)$$

$$\Delta W_{43}(n) = \eta\, \delta_4(n)\, y_3(n)$$

$$= 0.4 \times -0.000749 \times 0.78$$

$$= -0.000233.$$

$(1) \Rightarrow W_{43}(n+1) = 0.43 - 0.000233 = 0.4297$

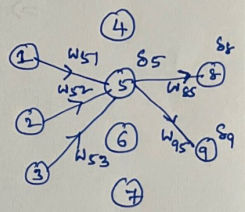
$$\boxed{W_{43}(n+1) = 0.4297}$$

$\Rightarrow$ W_{51} updation :-

$$W_{51}(n+1) = W_{51}(n) + \Delta W_{51}(n) \rightarrow (1)$$

$$\Delta W_{51}(n) = \eta\, \delta_5(n)\, y_1(n) \rightarrow (2)$$

$$\delta_5(n) = y_5(n)[1 - y_5(n)] \sum_{k=8}^{9} \delta_k\, W_{kj}\, 5(n)$$



$$= y_5(n)[1 - y_5(n)]\left[\delta_8(n)\, W_{85}(n) + \delta_9(n)\, W_{95}(n)\right]$$

$$= 0.899(1 - 0.899)\left[-0.00187 \times 0.85 - 0.005781 \times 0.95\right]$$

$$= -0.0006378 \Rightarrow \boxed{\delta_5(n) = -0.0006378}$$

$(2) \Rightarrow \Delta W_{51}(n) = 0.4 \times -0.0006378 \times 0.75 = -0.0001913$

$(1) \Rightarrow W_{51}(n+1) = 0.51 - 0.0001913 = 0.5098$

$$\boxed{W_{51}(n+1) = 0.5098}$$

$\Rightarrow$ W_{52} updation :-

$$W_{52}(n+1) = W_{52}(n) + \Delta W_{52}(n) \rightarrow (1)$$

$$\Delta W_{52}(n) = 0.4 \times -0.0006378 \times 0.766$$

$$= -0.0001954$$

$(1) \Rightarrow W_{52}(n+1) = 0.52 - 0.0001954 = 0.5198$

$$\boxed{W_{52}(n+1) = 0.5198}$$

$\Rightarrow$ W_{53} updation :-

$$W_{53}(n+1) = W_{53}(n) + \Delta W_{53}(n) \longrightarrow (1)$$

$$\Delta W_{53}(n) = 0.4 \times -0.0006378 \times 0.78$$

$$= -0.0001989$$

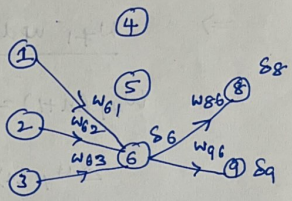
$(1) \Rightarrow W_{53}(n+1) = 0.53 - 0.0001989 = 0.5298$

$$\boxed{W_{53}(n+1) = 0.5298}$$

$\Rightarrow$ W_{61} updation :-

$$W_{61}(n+1) = W_{61}(n) + \Delta W_{61}(n) \longrightarrow (1)$$

$$\Delta W_{61}(n) = \eta\, \delta_6(n)\, y_1(n) \rightarrow (2)$$



$$\delta_6(n) = y_6(n)[1 - y_6(n)] \sum_{k=8}^{9} \delta_k w_{k6}(n) \quad (7)$$

$$= y_6(n)[1 - y_6(n)][\delta_8(n) w_{86}(n) + \delta_9(n) w_{96}(n)]$$

$$= 0.9186(1 - 0.9186)[-0.00187 \times 0.86 - 0.005721 \times 0.96]$$

$$= -0.0005309$$

$$\boxed{\delta_6(n) = -0.0005309}$$

$(2) \Rightarrow \Delta W_{61}(n) = 0.4 \times -0.0005309 \times 0.75 = -0.0001592$

$(1) \Rightarrow W_{16}(n+1) = 0.61 - 0.0001592 = 0.6098$

$$\boxed{W_{16}(n+1) = 0.6098}$$

$\Rightarrow$ w_{62} updation :-

$$w_{62}(n+1) = w_{62}(n) + \Delta w_{62}(n) \rightarrow (1)$$

$$\Delta w_{62}(n) = 0.4 \times -0.000 \overset{5309}{\cancel{4441}} \times 0.766$$

$$= -0.000 \cancel{4468} 1626$$

$$(1) \Rightarrow w_{62}(n+1) = 0.62 - 0.000 \overset{1626}{\cancel{4468}} = 0.\cancel{6199}6098$$

$$\boxed{w_{62}(n+1) = 0.6\cancel{2}98}$$

$\Rightarrow$ w_{63} updation :-

$$w_{63}(n+1) = w_{63}(n) + \Delta w_{63}(n) \rightarrow (1)$$

$$\Delta w_{63}(n) = 0.4 \times -0.000 \overset{5309}{\cancel{4441}} \times 0.78.$$

$$= -0.000 \cancel{4668} 1656$$

$$(1) \Rightarrow w_{63}(n+1) = 0.63 - 0.000 \overset{1656}{\cancel{4668}} = 0.63004$$

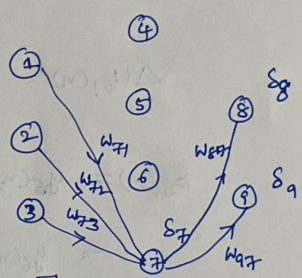
$$\boxed{w_{63}(n+1) = 0.6\cancel{3}984}$$

$\Rightarrow$ w_{71} updation :-

$$w_{71}(n+1) = w_{71}(n) + \Delta w_{71}(n) \rightarrow (1)$$

$$\Delta w_{71}(n) = \eta \delta_7(n) y_1(n) \rightarrow (2)$$

$$\delta_7(n) = \cancel{\phi} y_7(n)[1 - y_7(n)] \cdot [\delta_8(n) w_{87}(n) + \delta_9(n) w_{97}(n)]$$



$$= 0.9342(1-9342) \cdot [-0.00187 \times 0.87 + -0.005721 \times 0.97]$$

$$= -0.0004411 \Rightarrow \boxed{\delta_7(n) = -0.0004411}$$

$$(2) \Rightarrow \Delta w_{71}(n) = 0.4 \times -0.0004411 \times 0.75$$

$$= -0.0001323$$

$$(1) \Rightarrow w_{71}(n+1) = 0.71 - 0.0001323$$

$$= 0.\cancel{0}7098$$

$$\boxed{w_{71}(n+1) = 0.7098}$$

$\Rightarrow$ w_{72} updation :-

$$w_{72}(n+1) = w_{72}(n) + \Delta w_{72}(n) \rightarrow (1)$$

$$\Delta w_{72}(n) = 0.4 \times -0.0004411 \times 0.766$$
$$= -0.0001351$$

$$(1) \Rightarrow w_{72}(n+1) = 0.72 - 0.0001351 = 0.7198$$

$$\boxed{w_{72}(n+1) = 0.7198}$$

$\Rightarrow$ w_{73} updation :-

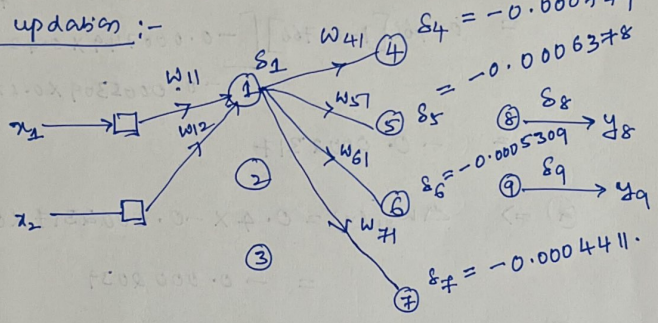
$$w_{73}(n+1) = w_{73}(n) + \Delta w_{73}(n) \rightarrow (1)$$

$$\Delta w_{73}(n) = 0.4 \times -0.0004411 \times 0.78$$
$$= -0.0001376.$$

$$(1) \Rightarrow w_{73}(n+1) = 0.73 - 0.0001376 = 0.7298$$

$$\boxed{w_{73}(n+1) = +0.7298}$$

$\Rightarrow$ w_{11} updation :-



$$w_{11}(n+1) = w_{11}(n) + \Delta w_{11}(n) \rightarrow (1)$$

$$\Delta w_{11}(n) = \eta\, \delta_1(n)\, x_1(n) \rightarrow (2)$$

$$\delta_1(n) = y_1(n)[1 - y_1(n)]\left[\delta_4(n) w_{41}(n) + \delta_5(n) w_{51}(n) + \delta_6(n) w_{61}(n) + \delta_7(n) w_{71}(n)\right]$$

$$= 0.75(1-0.75)\left[-0.000749 \times 0.41 - 0.000637 \times 0.51 - 0.000539 \times 0.61 - 0.000441 \times 0.71\right]$$

$$= -0.0002380 \qquad \boxed{\delta_1(n) = -0.0002380}$$

$$(2) \Rightarrow \Delta w_{11}(n) = 0.4 \times -0.0002380 \times 0.22 = -0.0002094$$

$$(1) \Rightarrow w_{11}(n) = 0.11 - 0.0002094 = 0.1099 \qquad \boxed{w_{11}(n+1) = 0.1099}$$

$\Rightarrow$ w_{12} updation :-

$$w_{12}(n+1) = w_{12}(n) + \Delta w_{12}(n) \rightarrow (1)$$

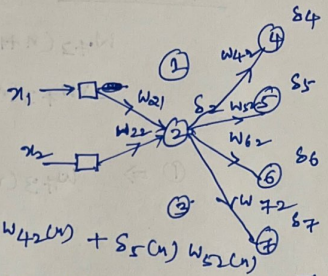
$$\Delta w_{12}(n) = 0.4 \times -0.00023850 \times 0.625 \quad (\rightarrow x_2(n))$$

$$= -0.000595$$

$(1) \Rightarrow$ $w_{12}(n+1) = 0.12 - 0.000595 = 0.12005$

$$\boxed{w_{12}(n+1) = 0.12005}$$

$\Rightarrow$ w_{21} updation :-



$$w_{21}(n+1) = w_{21}(n) + \Delta w_{21}(n) \rightarrow (1)$$

$$\Delta w_{21}(n) = \eta \delta_2(n) x_1(n) \rightarrow (2)$$

$$\delta_2(n) = y_2(n)[1 - y_2(n)][\delta_4(n) w_{42}(n) + \delta_5(n) w_{52}(n) + \delta_6(n) w_{62}(n) + \delta_7(n) w_{72}(n)]$$

$$= 0.766[1-0.766][-0.000749 \times 0.42 - 0.000637 \times 0.5 - 0.0005309 \times 0.62 - 0.000441 \times 0.72]$$

$$= -0.0002317$$

$(2) \Rightarrow$ $\Delta w_{21}(n) = 0.4 \times -0.0002317 \times 0.22$

$$= -0.0002039$$

$(1) \Rightarrow$ $w_{21}(n+1) = 0.21 - 0.0002039 = 0.2099$

$$\boxed{w_{21}(n+1) = 0.2099}$$

$\Rightarrow$ w_{22} updation :-

$$w_{22}(n+1) = w_{22}(n) + \Delta w_{22}(n) \rightarrow (1)$$

$$\Delta w_{22}(n) = 0.4 \times -0.0002317 \times 0.625 \quad (\rightarrow x_2(n))$$

$$= -0.0005793$$

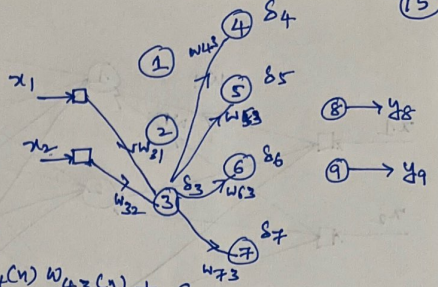
$(1) \Rightarrow$ $w_{22}(n+1) = 0.22 - 0.0005793 = 0.2199$

$$\boxed{w_{22}(n+1) = 0.2199.}$$

$\Rightarrow$ w_{31} updation :-

$$w_{31}(n+1) = w_{31}(n) + \Delta w_{31}(n) \rightarrow (1)$$

$$\Delta w_{31}(n) = \eta \delta_3(n) \cdot x_1(n) \rightarrow (2)$$



$$\delta_3(n) = y_3(n)[1-y_3(n)]\left[\delta_4(n) w_{43}(n) + \delta_5(n) w_{53}(n) + \delta_6(n) w_{63}(n) + \delta_7(n) w_{73}(n)\right]$$

$$= 0.78(1-0.78)\left[-0.000749 \times 0.43 - 0.0006378 \times 0.53 - 0.0005309 \times 0.63 - 0.0004411 \times 0.73\right]$$

$$= -0.0002259.$$

(2) $\Rightarrow$ $\Delta w_{31}(n) = 0.4 \times -0.0002259 \times 0.22$

$$= -0.0001988$$

(1) $\Rightarrow$ $w_{31}(n+1) = 0.31 - 0.0001988 = 0.3099$

$$\boxed{w_{31}(n+1) = 0.3099}$$

$\Rightarrow$ w_{32} updation :-

$$w_{32}(n+1) = w_{32}(n) + \Delta w_{32}(n) \rightarrow (1)$$

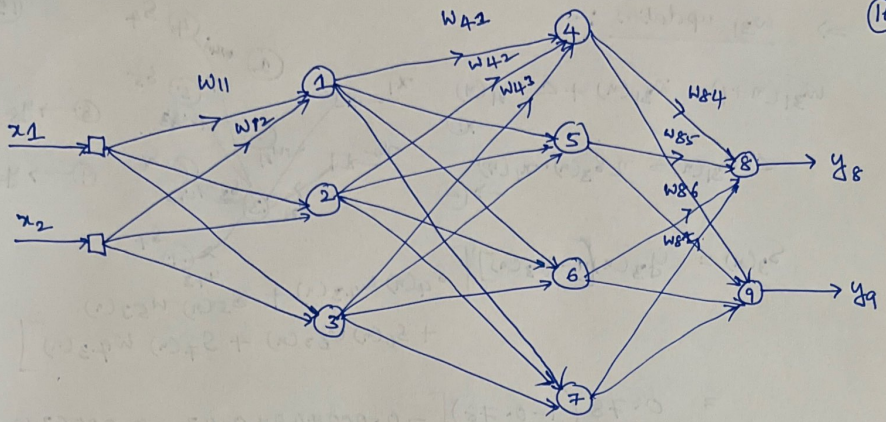
$$\Delta w_{32}(n) = 0.4 \times -0.0002259 \times 0.625$$

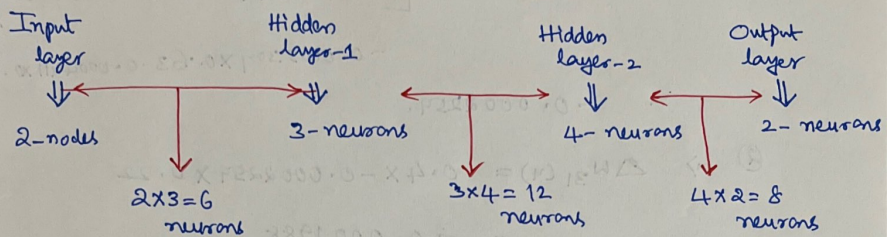
$$= -0.0005648$$

(1) $\Rightarrow$ $w_{32}(n+1) = 0.32 - 0.0005648$

$$= 0.3199.$$

$$\boxed{w_{32}(n+1) = 0.3199.}$$





W	n	n+1
w_{11}	0.11	0.1099
w_{12}	0.12	0.12005
w_{21}	0.21	0.2099
w_{22}	0.22	0.2199
w_{31}	0.31	0.3099
w_{32}	0.32	0.3199

W	n	n+1
w_{41}	0.41	0.4097
w_{42}	0.42	0.4197
w_{43}	0.43	0.4297
w_{51}	0.51	0.5098
w_{52}	0.52	0.5198
w_{53}	0.53	0.5298
w_{61}	0.61	0.6098
w_{62}	0.62	0.6198
w_{63}	0.63	0.6298
w_{71}	0.71	0.7098
w_{72}	0.72	0.7198
w_{73}	0.73	0.7298

W	n	n+1
w_{84}	0.84	0.8393
w_{85}	0.85	0.8493
w_{86}	0.86	0.8593
w_{87}	0.87	0.8693
w_{94}	0.94	0.9379
w_{95}	0.95	0.9479
w_{96}	0.96	0.9578
w_{97}	0.97	0.9678