20F-1040

Question #1:

Activation Function $= \frac{1}{1+e^{-x}}$

$w_1 = w_2 = w_3 = w_4 = w_5 = w_6 = 0.1$

$b_0 = w_0 x_0$, $b_1 = w_{01} x_{01} \Rightarrow (0.1)(1) = 0.1$

$b_2 = 0.1$, $b_3 = 0.1$.

→ forward feed propagation:-

(0,0,1), (1,0,0), (0,1,0), (1,1,1)

$n_1 = \theta[(x_1 w_1 + x_2 w_2 + b_1)] \xrightarrow{(0,0,1)} n_1 = \theta(0.1)$

By applying sigmoid function

$\boxed{n_1 = 0.524979}$

(1,0,0)
$n_1 = \theta(0.2) \Rightarrow \boxed{n_1 = 0.54979}$

(0,1,0)
$n_1 = \theta(0.2) \Rightarrow \boxed{n_1 = 0.54979}$

(1,1,1)
$n_1 = \theta(0.3) \Rightarrow \boxed{n_1 = 0.5744}$

$n_2 = \theta[x_1 w_3 + x_2 w_4 + b_2]$

(0,0,1)
$n_2 = \theta(0.1) \rightarrow \boxed{n_2 = 0.524974}$

(0,1,0)
$n_2 = \theta(0.2) \rightarrow \boxed{n_2 = 0.549791}$

(1,0,0)
$n_2 = \theta(0.2) \rightarrow \boxed{n_2 = 0.54979}$

(1,1,1)
$n_2 = \theta(0.3) \rightarrow \boxed{n_2 = 0.5744}$

for y^{Hat}_{HAT}
$y^{Hat} = \theta[n_1 w_5 + n_2 w_5 + b_3]$.

(0,0,1)
$yHAT = \theta[0.2049950] \Rightarrow \boxed{yHAT = 0.55107}$

(1,0,0)
$yHAT = \theta[0.20996] \Rightarrow \boxed{yHAT = 0.552298}$.

~~yHAT = G~~

(0,1,0) yHAT = G(0.20996) ⇒ **yHAT = 0.552298**

(1,1,1) yHAT = G(0.21488) ⇒ **yHAT = 0.5535**

Now error computation. formula is $= \frac{1}{2} \Sigma (t_d - O_d)^2$.

(0,0,1)
$= \frac{1}{2}(1-0.55107)^2$.
$= 0.100769$.

(1,0,0)
$= \frac{1}{2}(0-0.552298)^2$.
$= 0.152516$.

(0,1,0)
$= \frac{1}{2}(0-0.552298)^2$.
$= 0.152516$.

(1,1,1)
$= \frac{1}{2}(1-0.5535)^2$.
$= 0.09968$.

⇒ update weight $\Delta w_{ji} = \eta \delta_i o_i$

(0,0,1)

output unit:

$\delta y_{HAT} = y_{HAT}(1-y_{HAT})(t_{y_{HAT}} - o_{y_{HAT}})$.

for (0,0,1).

$\delta y_{HAT} = 0.1110616$.

Hidden units:-

$\delta n_1 = n_1(1-n_1)\, w_5 * \delta y_{HAT}$.

$\delta n_2 = 0.0027696126$

$\delta n_2 = n_2(1-n_2)\, w_6 * \delta y_{HAT}$.

$\delta n_2 = 0.0027696126$.

$w_1 = w_1 + \Delta w_1$

$\Delta w_1 = \eta \delta n_1 x_1$

$\eta = 0.5$

$\Delta w_1 = (0.5)(0.0027696126)(0)$

$= 0$

$w_1 = 0.1 + 0 \Rightarrow \boxed{0.1 = w_1}$

$w_2 = w_2 + \Delta w_2$.

$\Delta w_2 = \eta \delta n_2 x_1$

$\Delta w_2 = (0.5)(0.0027696126)(0) = 0$

$w_2 = 0.1 + 0 \Rightarrow \boxed{w_2 = 0.1}$.

$w_3 = w_3 + \Delta w_3$.

$\Delta w_3 = \eta \delta n_1 x_2 = 0$

$\boxed{w_3 = 0.1}$.

$w_4 = w_4 + \Delta w_4$.

$\Delta w_4 = \eta \delta n_2 x_2 = 0$.

$w_4 = 0.1 + 0 \Rightarrow \boxed{w_4 = 0.1}$.

$w_5 = w_5 + \Delta w_5$

$\Delta w_5 = \eta \delta y HAT\ n_1$

$= (0.5)(0.1110616)(0.524976)$

$= 0.0291525$

$\boxed{w_5 = 0.0291525}$

$w_6 = w_6 + \Delta w_6$.

$\Delta w_6 = \eta \delta y HAT\ n_2$.

$\Delta w_6 = (0.5)(0.1110616)(0.524976)$.

$= 0.291524$.

$\boxed{w_6 = 0.291524}$.

Iteration #2.

$n_1 = \sigma(x_1 w_1 + x_2 w_3 + b_1)$

(0,0,1)

$n_1 = \sigma[(0)(0.1) + (0)(0.1) + (0.1)] \Rightarrow \sigma(0.1)$.

$n_1 = 0.53498$

(1,0,0)

$n_1 = \sigma(1 \times 0.1 + 0 \times 0.1 + 0.1)$

$= \sigma(0.2)$

$n_1 = 0.5448$

(0,1,0)

$n_1 = \sigma(0.2)$

$n_1 = 0.5498$

(1,1,1)

$n_1 = \sigma(0.3)$

$n_1 = 0.5744$.

$n_2 = \sigma(x_1 w_1 + x_2 w_4 + b_2)$.

(0,0,1)

$n_2 = \sigma(0 \times 0.1 + 0 \times 0.1 + 0.1)$

$= \sigma(0.1)$

$n_2 = 0.5249$.

(1,0,0)

$n_2 = \sigma(1 \times 0.1 + 0 \times 0.1 + 0.1)$.

$= \sigma(0.2)$.

$n_2 = 0.5498$

(0,1,0)

$n_2 = \sigma(0 \times 0.1 + 1 \times 0.1 + 0.1)$

$= \sigma(0.2)$.

$n_2 = 0.5498$.

(1,1,1)

$n_2 = \sigma(1 \times 0.1 + 1 \times 0.1 + 0.1)$

$= \sigma(0.3)$

$n_2 = 0.5744$.

Error computation.

(0,0,1)

$= \frac{1}{2}(1 - 0.5586)^2$.

$= 0.0974$.

(1,0,0)

$= \frac{1}{2}(1 - 0.3601)^2$.

$= 0.156821$.

(0,1,0)

$= \frac{1}{2}(0 - 0.5601)^2$

$E = 0.1568$

(1,1,1)

$= \frac{1}{2}(1 - 0.5617)^2$

$E = 0.09601$.

Back Propagation.

(0,0,1)

$\delta yHAT = 0.5589\,(1 - 0.5589)(1 - 0.5589)$

$= 0.1087.$

$\delta n_1 = n_1(1 - n_1)\, w_5 * \delta yHAT.$

$= 0.5249\,(1 - 0.5249)(0.1291)(0.1087).$

$= 0.00342.$

update weights:-

$w_1 = 0.1$, $w_2 = 0.1$, $w_3 = 0.1$, $w_4 = 0.1$.

$w_5 = 0.1576$, $w_6 = 0.1576$.

Part #2:-

Forward Propagation:-

$n_1 = \sigma[x_1 w_1 + x_2 w_3 + b_1]$.

(0,0,1)

$= \sigma(0.1) = 0.099668$

(1,0,0)

$= \sigma(0.2) = 0.19737532.$

(0,1,0)

$= \sigma(0.2) = 0.19737532$

(1,1,1)

$= \sigma(0.3) = 0.29131126.$

$n_2 = \sigma[x_1 w_2 + x_2 w_4 + b_2]$.

(0,0,1)

$= \sigma(0.1) = 0.099668$

(1,0,0)

$= \sigma(0.2) = 0.19737532.$

(0,1,0)
$= \theta(0.2) = 0.19737532$

(1,1,1)
$= \theta(0.3) = 0.2913126$

$y^{HAT} = \theta[n_1 w_5 + n_2 w_5 + b_3]$.

(0,0,1)
$= \theta(0.1199336)$
$= 0.11936185$

(1,0,0)
$= \theta(0.13947506)$
$= 0.13857763$

(0,1,0)
$= \theta(0.13946)$
$= 0.3856286$

(1,1,1)
$= \theta(0.1582625)$
$= 0.1569543$

Error computation:-

(0,0,1)
$= \frac{1}{2}(1 - 0.11936185)^2$
$= 0.38776177$

(1,0,0)
$= \frac{1}{2}(1 - 0.13857763)^2$
$= 0.37102424$.

(0,1,0)
$= \frac{1}{2}(0 - 0.3856286)^2$
$= 0.07435470857$.

(1,1,1)
$= \frac{1}{2}(1 - 0.1569543)^2$
$= 0.35536302 61$.

$\delta y^{HAT} = y^{HAT}(1 - y^{HAT})(t_{y^{HAT}} - y^{HAT})$.
$= 0.11936185(1 - 0.11936185)(1 - 0.11936185)$.
$= 0.11936185(0.8806 3815)(0.8806 3815)$
$= 0.09 2567925$

$\delta n_1 = n_1(1-n_1) w_5 + \delta y^{HAT}$.
$= (0.099 668)(0.900332)(0.1) + 0.092567925$
$= 0.10154 1354$

$\delta n_2 = n_2(1-n_2) w_6 + \delta y^{HAT}$
$= (0.099668)(0.900332)(0.1) + 0.092567925$
$= 0.10154 1354$.

$w_1 = \Delta w_1 + w_1$
$\Delta w_1 = \eta \delta n_1 x_1 =$
$= (0.5)(0.10154 1354)(0)$
$= 0$
$w_1 = 0.1$

$w_2 = \Delta w_2 + w_2$
$\Delta w_2 = \eta \delta n_2 x_2 = 0$
$w_2 = 0 + 0.1$
$w_2 = 0.1$.

Back Propagation:-

$\delta y_{HAT} = 0.0930806872$

$\delta n_1 = 0.000835$

$\delta n_2 = 0.000835$.

updating weights:-

$w_1 = 0.1$, $w_2 = 0.1$.

$w_3 = 0.1$, $w_4 = 0.1$.

$w_5 = 0.10925161 29$, $w_6 = 0.10925161 29$.