Assignment 03

Q NO: 01

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① $S^k_n = f\left(\sum_{i=1}^{M} w^k_i a_i + w^k_i\right)$

for $S^1_1 \longrightarrow w^1_1 = w^k_f = -2$

$W_1 = [0.2, 0.4, 0.6]$

$a = [3, 5, 2]$

$S^1_1 = f([0.2 \times 3 + 0.4 \times 5 + 0.6 \times 2] - 2)$

$S^1_1 = f([3.8] - 2)$

$S^1_1 = f(1.8)$

$S^1_1 = 1/(1+e^{-1.8}) = \boxed{0.858}$

for $S^1_2 \longrightarrow w^1_2 = w^k_b = 2$

$W_2 = [0.1, 0.9, 0.7]$

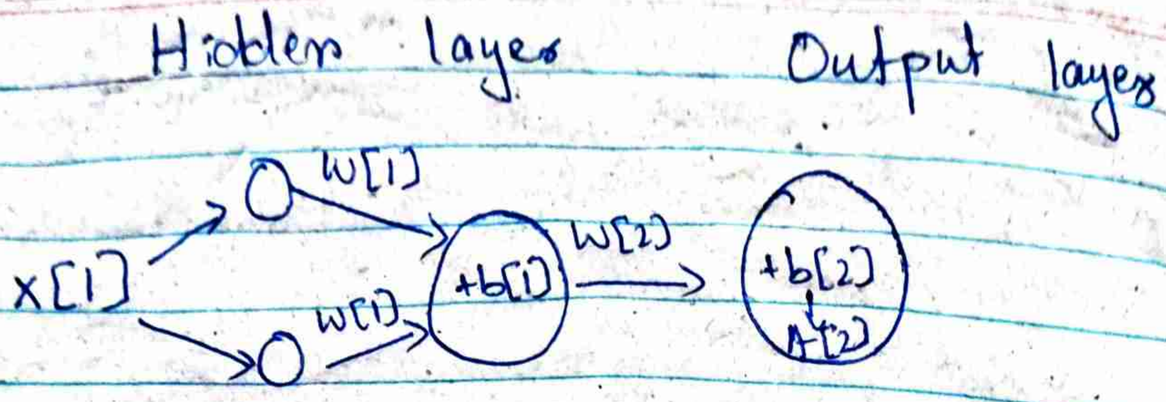
$a = [3, 5, 2]$

$S^1_2 = f([0.1 \times 3 + 0.9 \times 5 + 0.7 \times 2] + 2)$

$S^1_2 = f([6.2] + 2)$

$S^1_2 = f(8.2)$

$S^1_2 = 1/(1+e^{-8.2}) = \boxed{0.998}$



- where $x[1]$ is input matrix of size $(n \times m)$
- $w[1]$ \$ $w[2]$ are weights associated with inputs
- $b[1]$ \$ $b[2]$ represents bias on $Z[1]$ \$ $Z[2]$
- $A[2]$ is activation energy on layer $Z[2]$
- $Z[1]$ hidden layers having p no of neutrons
- $Z[2]$ output layers having q no of neutrons.

$\partial L / \partial B[1]$

Chain Rule $\Rightarrow \frac{dz}{dx} = \frac{dz}{dy} \cdot \frac{dy}{dx}$

- The loss (L) depends on Z[2] which depends on A[2] and A[2] depends on Z[1] which itself depends on B[1]

$$\therefore \frac{\partial L}{\partial B[1]} = \frac{\partial L}{\partial B[2]} \frac{\partial L}{\partial Z[2]} \frac{\partial Z[2]}{\partial A[2]}$$

$$\frac{\partial A[2]}{\partial Z[1]} \frac{Z[1]}{\partial B[1]}$$

- In the above ~~equation~~ equation we replace the symbols with exact function which are missing.

- Back propogation allows updation of weights and biases based on error rate in forward pass.

- Back propogation reduces computational and memory cost for neural training.

Q no: 02

Initial Matrix

Q Matrix

$$\begin{array}{c|cccccc} & A & B & C & D & E & F \\ \hline A & 0 & 0 & 0 & 0 & 0 & 0 \\ B & 0 & 0 & 0 & 0 & 0 & 0 \\ C & 0 & 0 & 0 & 0 & 0 & 0 \\ D & 0 & 0 & 0 & 0 & 0 & 0 \\ E & 0 & 0 & 0 & 0 & 0 & 0 \\ F & 0 & 0 & 0 & 0 & 0 & 0 \end{array}$$

Starting Pos ⇒ B
Next Step ⇒ F
Exploration rate = 0.8
reward = 100

Q (state, action) = R (state, action) ~~+ γ Max~~
+ γ. Max [Q (nextstate, allocation)]

$Q(B,F) = R(B,F) + \gamma \cdot Max\,[Q(F,B) + Q(F,E) + Q(F,F)]$

$Q(B,F) = R(B,F) + 0.8\, Max\,(0,0,0)$

$Q(B,F) = 100 + 0.8(0) = 100$

Updated Matrix Q

$$\begin{array}{c|cccccc} & A & B & C & D & E & F \\ \hline A & 0 & 0 & 0 & 0 & 0 & 0 \\ B & 0 & 0 & 0 & 0 & 0 & 100 \\ C & 0 & 0 & 0 & 0 & 0 & 0 \\ D & 0 & 0 & 0 & 0 & 0 & 0 \\ E & 0 & 0 & 0 & 0 & 0 & 0 \\ F & 0 & 0 & 0 & 0 & 0 & 0 \end{array}$$