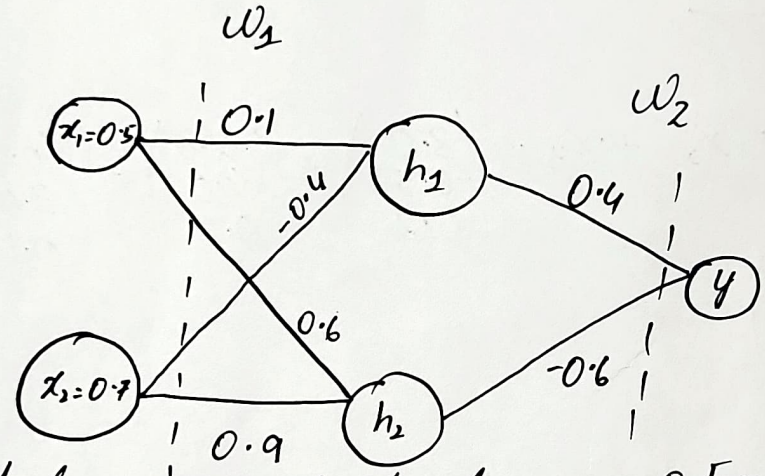
Intro to UMs

Activity 3 (solution)

Q1)(a)



Input layer | hidden layer | output layer

(b) $h_{1,2} = w_1 x = \begin{bmatrix} 0.1 & -0.4 \\ 0.6 & 0.9 \end{bmatrix} \begin{bmatrix} 0.5 \\ 0.7 \end{bmatrix}$

$= \begin{bmatrix} 0.05 - 0.28 \\ 0.3 + 0.63 \end{bmatrix}$

$h_{1,2} = \begin{bmatrix} -0.23 \\ 0.93 \end{bmatrix}$

Applying ReLU activation function on both the hidden layers.

ReLU

if $x \geq 0 \rightarrow x$

else $x < 0 \rightarrow 0$

$a_{1,2} = \text{ReLU}[h_{1,2}]$

$= \text{ReLU}\left(\begin{bmatrix} -0.23 \\ 0.93 \end{bmatrix}\right)$

$= \begin{bmatrix} 0 \\ 0.93 \end{bmatrix}$

$$y = W_2 a_{1,2}$$

$$y = [0.4 \quad -0.6] \begin{bmatrix} 0 \\ 0.93 \end{bmatrix}$$

$$\boxed{y = -0.558}$$

Q2) (a)

$$x = x_1 + x_2 + x_3 = \begin{pmatrix} 3.0 \\ -6.5 \\ 0.2 \end{pmatrix} + \begin{pmatrix} -2.0 \\ 4.0 \\ 0.1 \end{pmatrix} + \begin{pmatrix} 0.0 \\ 3.0 \\ 0.1 \end{pmatrix}$$

$$x = \begin{pmatrix} 1.0 \\ 0.5 \\ 0.4 \end{pmatrix}$$

(b) Prediction probability = Wx

$$= \begin{bmatrix} 2.0 & 0.5 & 0.1 \\ 0.3 & 1.5 & 0.2 \\ 0.4 & 0.2 & 1.8 \end{bmatrix} \begin{bmatrix} 1.0 \\ 0.5 \\ 0.4 \end{bmatrix}$$

$$= \begin{bmatrix} 2 + 0.25 + 0.04 \\ 0.3 + 0.75 + 0.08 \\ 0.4 + 0.1 + 0.72 \end{bmatrix}$$

$$= \begin{bmatrix} \boxed{2.29} \\ 1.13 \\ 1.22 \end{bmatrix}$$

Since the models assigns the highest probability to the word "brilliant", it will be the word predicted next by the model.

"Habib University is brilliant"