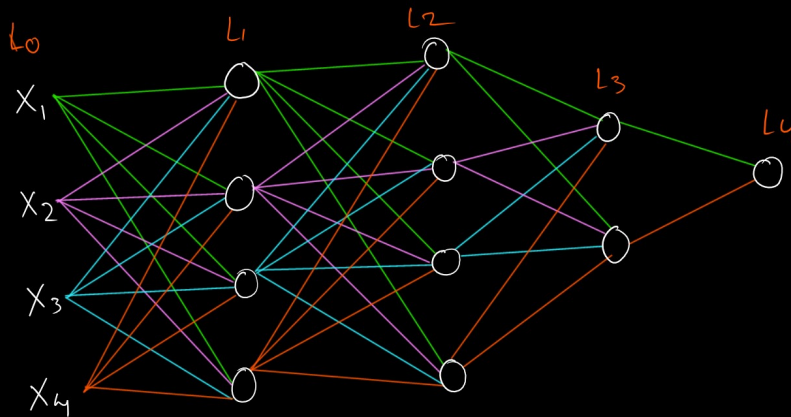


Today's Agenda

- 1) MLP Notations
- 2) Forward Propagation



CGPA	Research	SOP	12th Mark
x_1	x_2	x_3	x_4

Parameter Calculation

$$L_0 - L_1 \quad \begin{array}{l} \text{Weights} \leftarrow (4 \times 4) + 4 \text{ Bias} \\ = 20 \end{array}$$

$$L_1 - L_2 = (4 \times 4) + 4 = 20$$

$$L_2 - L_3 = (4 \times 2) + 2 = 10$$

$$L_3 - L_4 = (2 \times 1) + 1 = 3$$

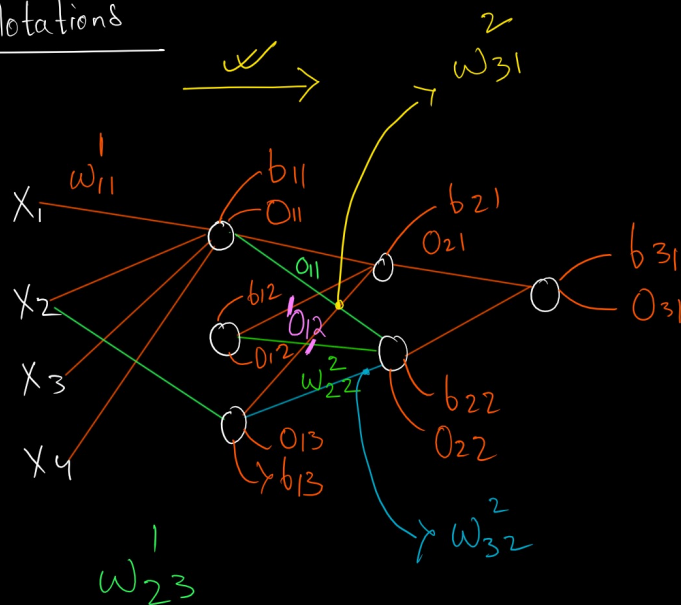
$$= 53$$

<u>Inputs</u>	<u>H1</u>	<u>H2</u>	<u>H3</u>	<u>Output</u>
0	16 nodes	32 nodes	8 nodes	1 node
0				
0				
0				
0				
0				

$$= \frac{\text{Input} - H1}{112} + \frac{H1 - H2}{544} + \frac{H2 - H3}{264} + \frac{H3 - \text{Output}}{9}$$

$$= 929$$

Notations



$W \quad O \quad B$

Bias

$b_{ij} \rightarrow$ node no
layer no

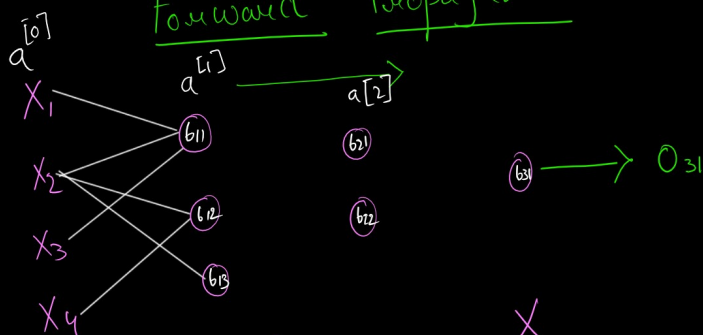
Output

O_{ij}

Weights
 w_{ij}^k

k = which layer going
 i = previous layer node no
 j = next layer node no

Forward Propagation



$$= \underline{W \cdot X + B}$$

What's version
 $= \sigma(W \cdot X + B)$

$$a^{[1]} = \sigma(a^{[0]} \cdot w^{[1]} + b^{[1]})$$

$$a^{[2]} = \sigma(a^{[1]} \cdot w^{[2]} + b^{[2]})$$

$$a^{[3]} = \sigma(a^{[2]} \cdot w^{[3]} + b^{[3]})$$

Layer 1

$$= \begin{bmatrix} w_{11} & w_{12} & w_{13} \\ w_{21} & w_{22} & w_{23} \\ w_{31} & w_{32} & w_{33} \\ w_{41} & w_{42} & w_{43} \end{bmatrix} \begin{bmatrix} X_{11} \\ X_{12} \\ X_{13} \\ X_{14} \end{bmatrix} + \begin{bmatrix} b_{11} \\ b_{12} \\ b_{13} \end{bmatrix}$$

$$= \begin{matrix} 4 \times 3 & 3 \times 4 & 4 \times 1 \\ & 3 \times 1 & + 3 \times 1 \end{matrix}$$

$$= \begin{bmatrix} w_{11} X_{11} + w_{21} X_{12} + w_{31} X_{13} + w_{41} X_{14} \\ w_{12} X_{11} + w_{22} X_{12} + w_{32} X_{13} + w_{42} X_{14} \\ w_{13} X_{11} + w_{23} X_{12} + w_{33} X_{13} + w_{43} X_{14} \end{bmatrix} + \begin{bmatrix} b_{11} \\ b_{12} \\ b_{13} \end{bmatrix}$$

$$= \begin{bmatrix} 0_{11} \\ 0_{12} \\ 0_{13} \end{bmatrix}$$

Layer 2

$$= \begin{bmatrix} w_{11}^2 & w_{12}^2 \\ w_{21}^2 & w_{22}^2 \\ w_{31}^2 & w_{32}^2 \end{bmatrix} \begin{bmatrix} 0_{11} \\ 0_{12} \\ 0_{13} \end{bmatrix} + \begin{bmatrix} b_{21} \\ b_{22} \end{bmatrix}$$

$$3 \times 2 \xrightarrow{T} 2 \times 3 \quad 3 \times 1$$

$$= 2 \times 1 + 2 \times 1$$

$$= \begin{bmatrix} 0_{21} \\ 0_{22} \end{bmatrix}$$

Layer 3

$$= \begin{bmatrix} w_{11}^3 \\ w_{12}^3 \end{bmatrix} \cdot \begin{bmatrix} 0_{21} \\ 0_{22} \end{bmatrix} + \begin{bmatrix} b_{31} \end{bmatrix}$$

$$= 2 \times 1 \xrightarrow{T} 1 \times 2$$

$$1 \times 2 \quad 2 \times 1$$

$$= 1 \times 1 + 1 \times 1$$

$$= \begin{bmatrix} 0_{31} \end{bmatrix} \rightarrow \underline{\text{Final output}}$$

Neural Network

$$= \sigma(w^T x + b)$$

$$a^{[1]} = \sigma(a^{[0]} \cdot w^{[1]} + b^{[1]}) \quad \checkmark$$

$$a^{[2]} = \sigma(a^{[1]} \cdot w^{[2]} + b^{[2]}) \quad \checkmark$$

$$a^{[3]} = \sigma(a^{[2]} \cdot w^{[3]} + b^{[3]}) \quad \checkmark$$

$$= \sigma \left(\sigma \left(a^{[0]} \cdot \omega^{[1]} + b^{[1]} \right) \omega^{[2]} + b^{[2]} \right) \omega^{[3]} + b^{[3]} \Big)$$