

# Forward Propagation

03 March 2022 06:07

cgpa iq 10th m 12th m placed  $\rightarrow$  # of trainable parameters

cgpa	iq	10th m	12th m	placed
7.2	72	69	81	1
8.1	92	75	76	0

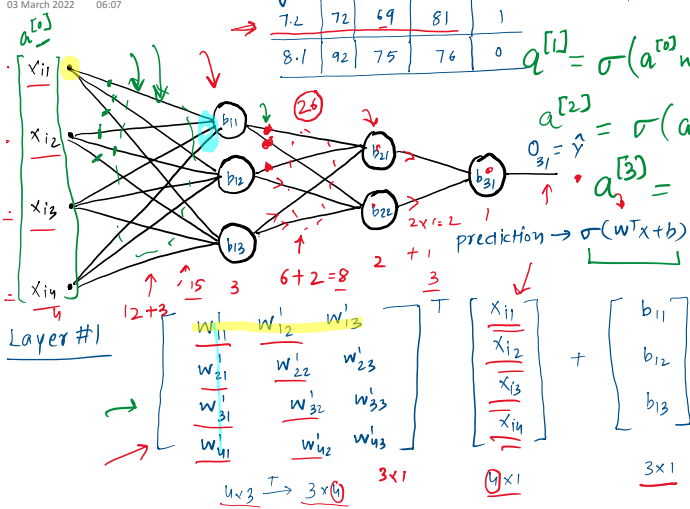
$$a^{[1]} = \sigma(a^{[0]} w^{[1]} + b^{[1]})$$

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

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

$$\text{prediction} \rightarrow \sigma(w^T x + b) \rightarrow$$

$$\sigma(\sigma(\sigma(a^{[0]} w^{[1]} + b^{[1]})) w^{[2]} + b^{[2]}) w^{[3]} + b^{[3]})$$



$$= \begin{bmatrix} w_{11}^1 x_{i1} + w_{21}^1 x_{i2} + w_{31}^1 x_{i3} + w_{41}^1 x_{i4} \\ w_{12}^1 x_{i1} + w_{22}^1 x_{i2} + w_{32}^1 x_{i3} + w_{42}^1 x_{i4} \\ w_{13}^1 x_{i1} + w_{23}^1 x_{i2} + w_{33}^1 x_{i3} + w_{43}^1 x_{i4} \end{bmatrix} + \begin{bmatrix} b_{11} \\ b_{12} \\ b_{13} \end{bmatrix}$$

$$= \sigma \left( \begin{bmatrix} w_{11}^1 x_{i1} + w_{21}^1 x_{i2} + w_{31}^1 x_{i3} + w_{41}^1 x_{i4} + b_{11} \\ w_{12}^1 x_{i1} + w_{22}^1 x_{i2} + w_{32}^1 x_{i3} + w_{42}^1 x_{i4} + b_{12} \\ w_{13}^1 x_{i1} + w_{23}^1 x_{i2} + w_{33}^1 x_{i3} + w_{43}^1 x_{i4} + b_{13} \end{bmatrix} \right)$$

$$= \begin{bmatrix} 0.11 \\ 0.12 \\ 0.13 \end{bmatrix} \rightarrow a^{[1]}$$

## Layer #2

$$\begin{bmatrix} w_{11}^2 & w_{12}^2 \\ w_{21}^2 & w_{22}^2 \\ w_{31}^2 & w_{32}^2 \end{bmatrix}^T \begin{bmatrix} 0.11 \\ 0.12 \\ 0.13 \end{bmatrix} + \begin{bmatrix} b_{21} \\ b_{22} \end{bmatrix}$$

$$= \sigma \left( \begin{bmatrix} w_{11}^2 0.11 + w_{21}^2 0.12 + w_{31}^2 0.13 + b_{21} \\ w_{12}^2 0.11 + w_{22}^2 0.12 + w_{32}^2 0.13 + b_{22} \end{bmatrix} \right) = \begin{bmatrix} 0.21 \\ 0.22 \end{bmatrix} \leftarrow a^{[2]}$$

## Layer #3

$$\begin{bmatrix} w_{11}^3 \\ w_{21}^3 \end{bmatrix}^T \begin{bmatrix} 0.21 \\ 0.22 \end{bmatrix} + \begin{bmatrix} b_{31} \end{bmatrix}$$

$$= \sigma \left( \begin{bmatrix} w_{11}^3 0.21 + w_{21}^3 0.22 + b_{31} \end{bmatrix} \right) = \hat{y}_1 = [0.31] \leftarrow a^{[3]}$$