

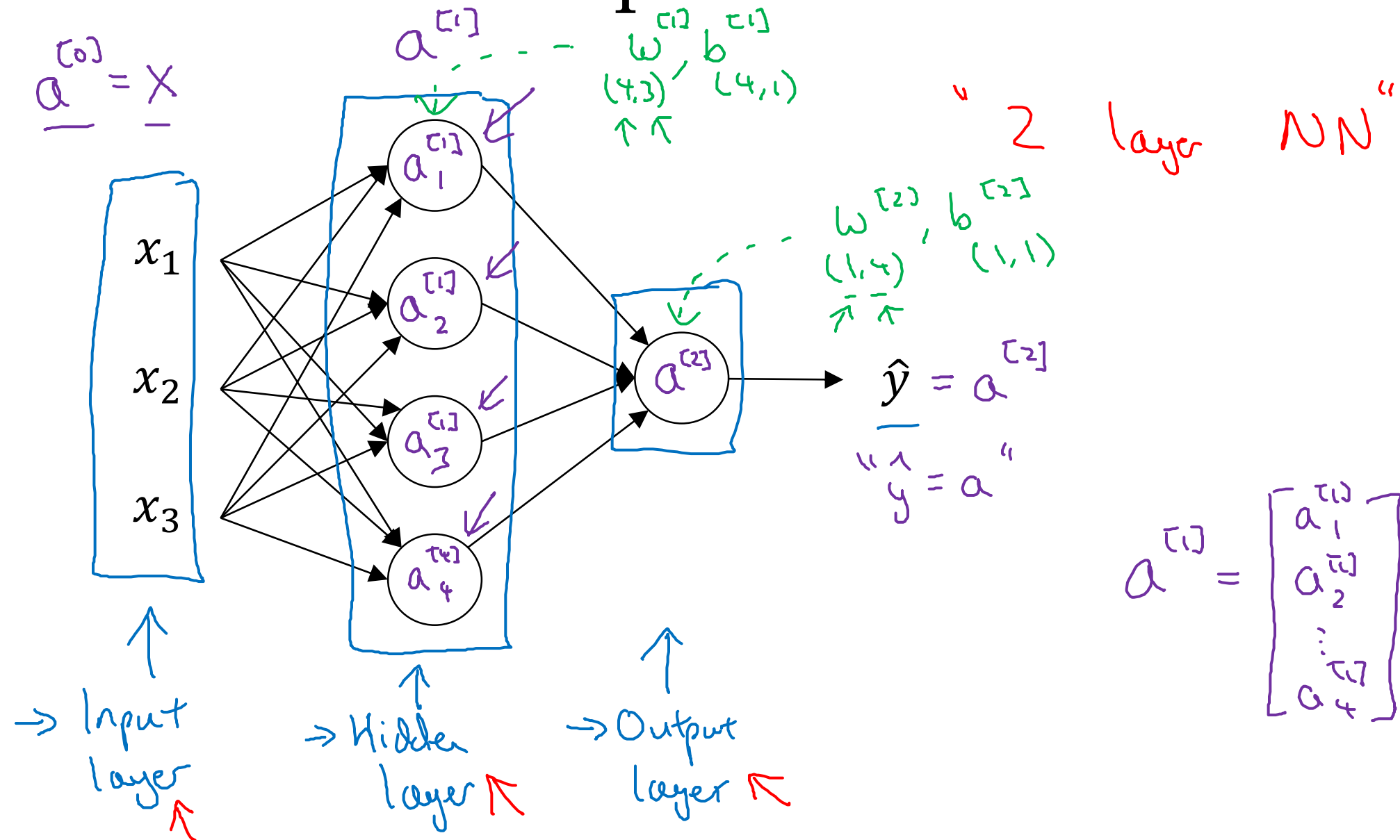


deeplearning.ai

One hidden layer
Neural Network

Neural Network
Representation

Neural Network Representation



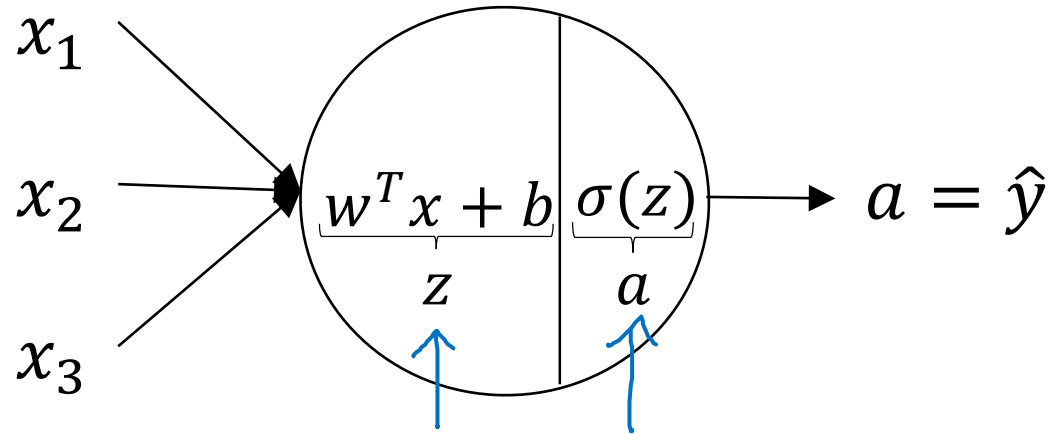


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One hidden layer Neural Network

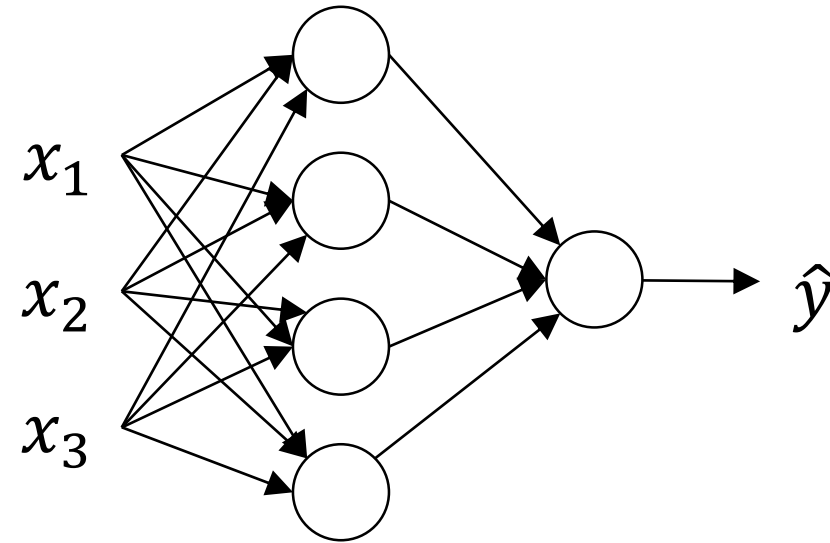
Computing a
Neural Network's
Output

Neural Network Representation

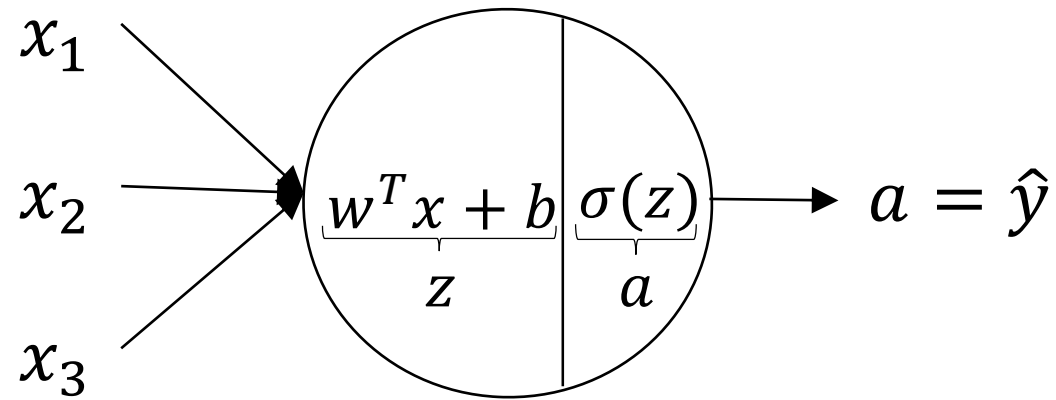


$$z = w^T x + b$$

$$a = \sigma(z)$$

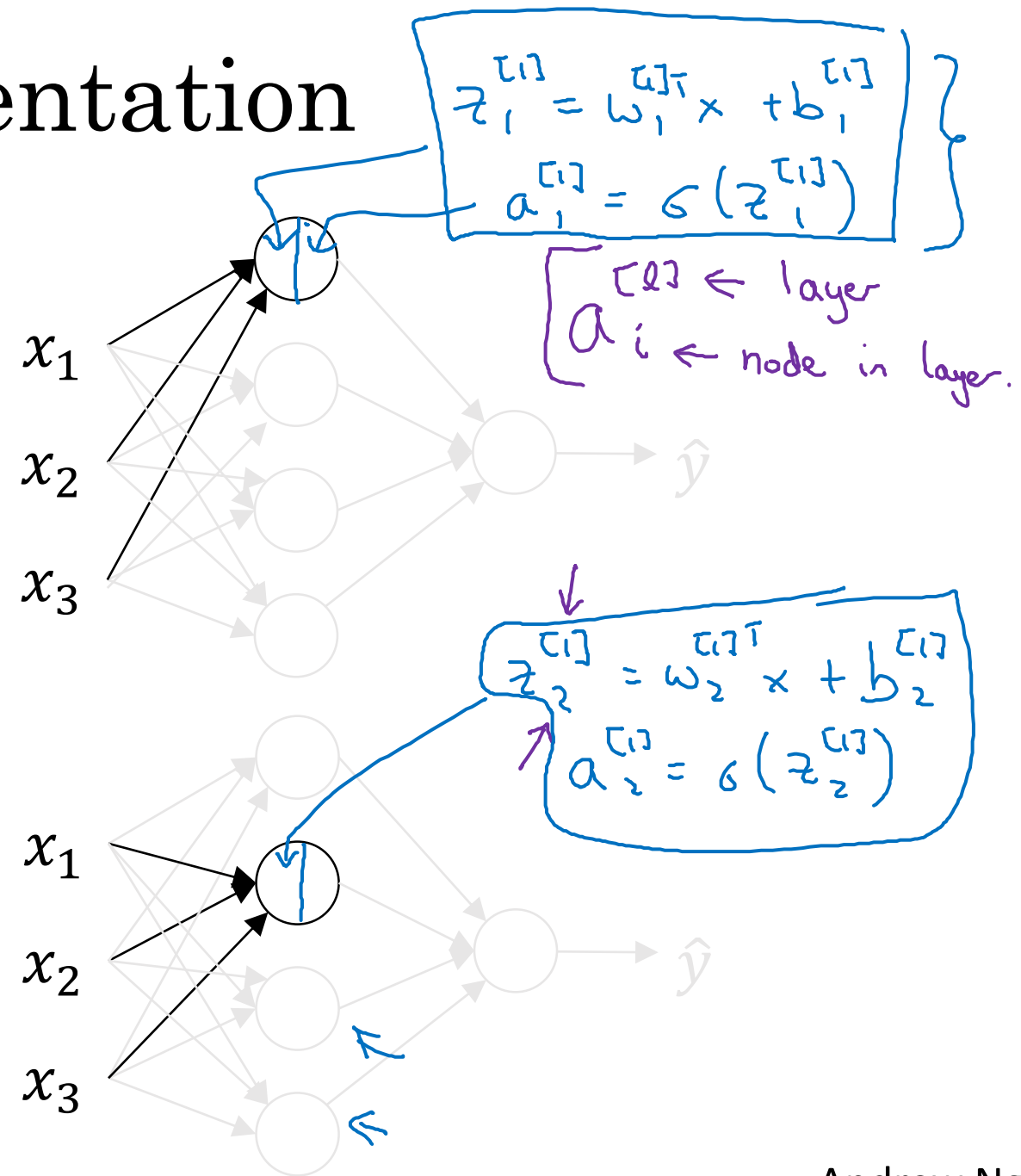


Neural Network Representation

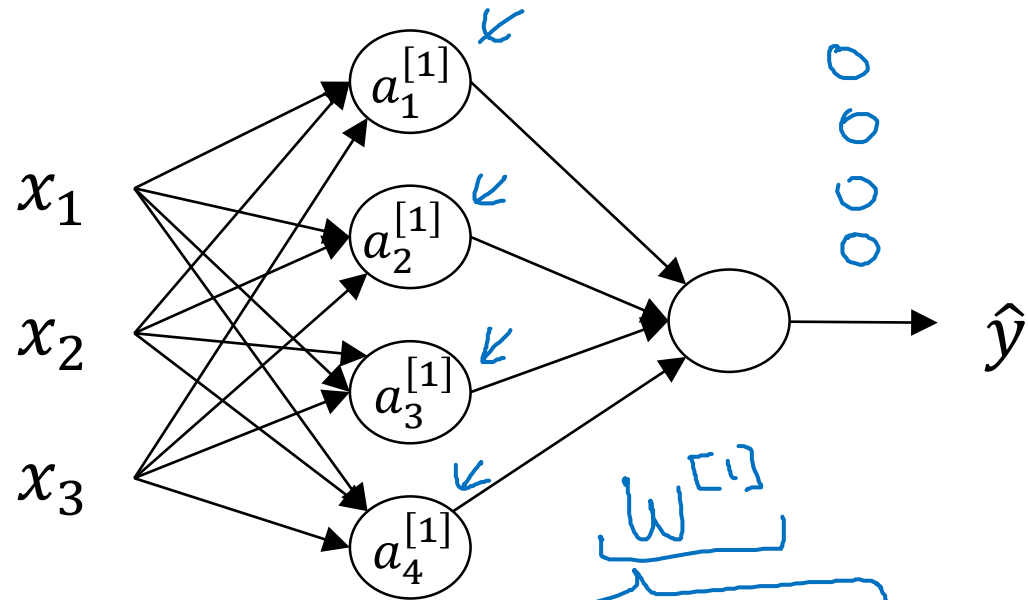


$$z = w^T x + b$$

$$a = \sigma(z)$$



Neural Network Representation



$$z_1^{[1]} = w_1^{[1]T} x + b_1^{[1]}, \quad a_1^{[1]} = \sigma(z_1^{[1]})$$

$$z_2^{[1]} = w_2^{[1]T} x + b_2^{[1]}, \quad a_2^{[1]} = \sigma(z_2^{[1]})$$

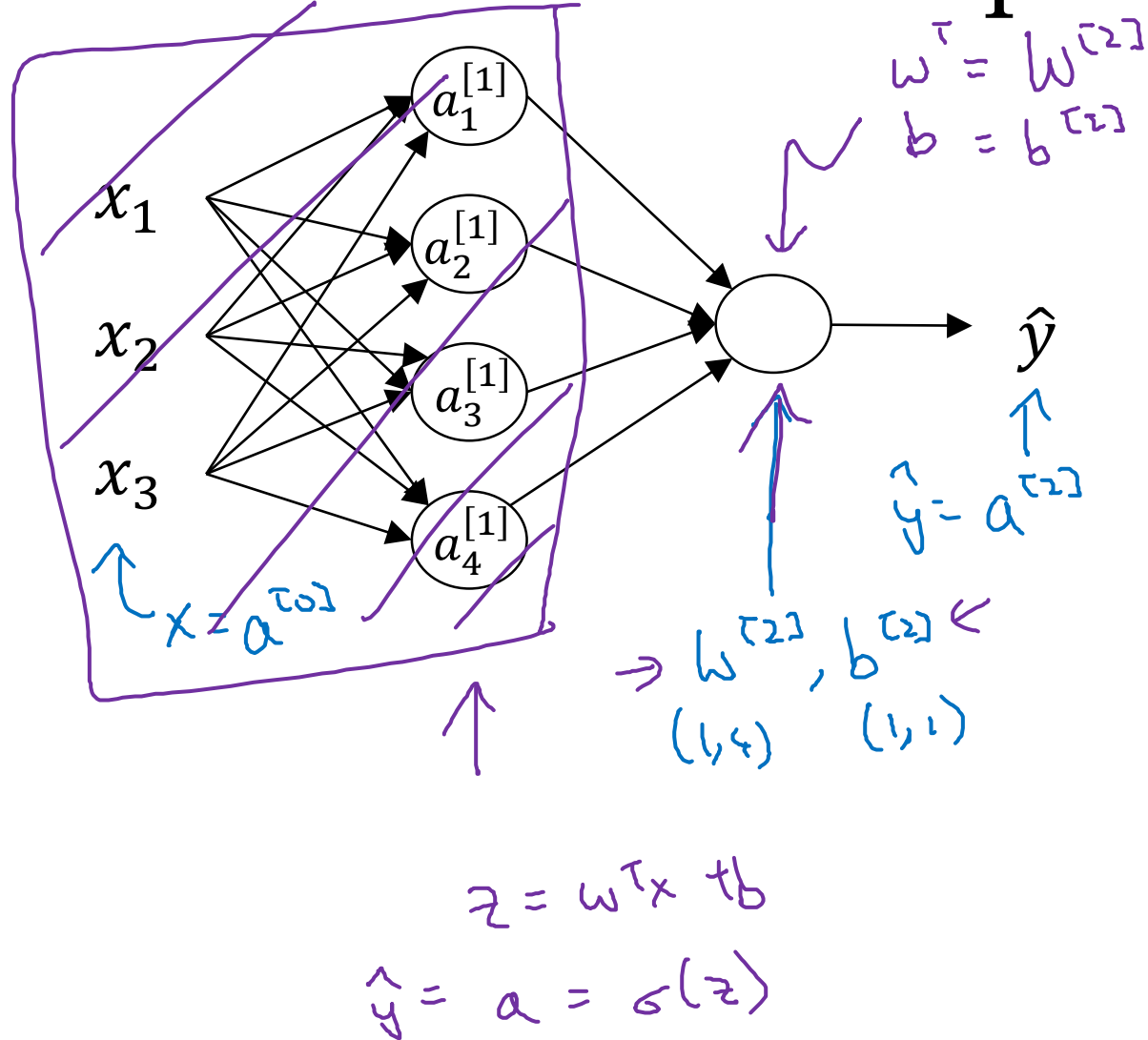
$$z_3^{[1]} = w_3^{[1]T} x + b_3^{[1]}, \quad a_3^{[1]} = \sigma(z_3^{[1]})$$

$$z_4^{[1]} = w_4^{[1]T} x + b_4^{[1]}, \quad a_4^{[1]} = \sigma(z_4^{[1]})$$

$$\begin{aligned} \rightarrow z^{[1]} &= \begin{bmatrix} -w_1^{[1]T} \\ -w_2^{[1]T} \\ -w_3^{[1]T} \\ -w_4^{[1]T} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} b_1^{[1]} \\ b_2^{[1]} \\ b_3^{[1]} \\ b_4^{[1]} \end{bmatrix} = \begin{bmatrix} \rightarrow w_1^{[1]T} x + b_1^{[1]} \\ \rightarrow w_2^{[1]T} x + b_2^{[1]} \\ \rightarrow w_3^{[1]T} x + b_3^{[1]} \\ \rightarrow w_4^{[1]T} x + b_4^{[1]} \end{bmatrix} = \begin{bmatrix} z_1^{[1]} \\ z_2^{[1]} \\ z_3^{[1]} \\ z_4^{[1]} \end{bmatrix} \\ \rightarrow a^{[1]} &= \begin{bmatrix} a_1^{[1]} \\ \vdots \\ a_4^{[1]} \end{bmatrix} = \sigma(z^{[1]}) \end{aligned}$$

Dimensions: $(4, 3)$ for $W^{[1]}$, $(4, 1)$ for $b^{[1]}$, and $(4, 1)$ for $z^{[1]}$ and $a^{[1]}$.

Neural Network Representation learning



Given input x :

$$\begin{aligned} \rightarrow z^{[1]} &= W^{[1]} a^{[0]} + b^{[1]} \\ &\quad (4,1) \quad (4,3) \quad (3,1) \quad (4,1) \\ \rightarrow a^{[1]} &= \sigma(z^{[1]}) \\ &\quad (4,1) \quad (4,1) \\ \rightarrow z^{[2]} &= W^{[2]} a^{[1]} + b^{[2]} \\ &\quad (1,1) \quad (1,4) \quad (4,1) \quad (1,1) \\ \rightarrow a^{[2]} &= \sigma(z^{[2]}) \\ &\quad (1,1) \quad (1,1) \end{aligned}$$