



deeplearning.ai

Deep Neural Networks

Forward and backward
propagation

Forward propagation for layer l



$$z^{[l]} = W^{[l]} \cdot a^{[l-1]} + b^{[l]}$$

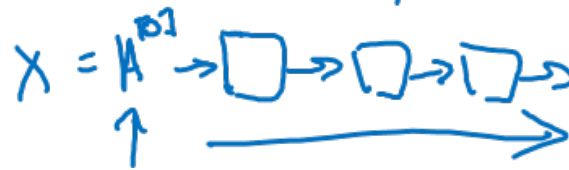
$$a^{[l]} = g^{[l]}(z^{[l]})$$

Vectorized:

$$Z^{[l]} = W^{[l]} \cdot A^{[l-1]} + b^{[l]}$$

$$A^{[l]} = g^{[l]}(Z^{[l]})$$


$a^{[0]}$
 $A^{[0]}$



Backward propagation for layer l

→

→



$$\underline{dz^{[l]}} = \underline{da^{[l]}} * g^{[l]'}(z^{[l]})$$

$$\underline{dw^{[l]}} = \underline{dz^{[l]}} \cdot \underline{a^{[l-1]}}$$

$$\underline{db^{[l]}} = \underline{dz^{[l]}}$$

$$\underline{da^{[l-1]}} = W^{[l]T} \cdot \underline{dz^{[l]}}$$

$$\underline{dz^{[l+1]}} = W^{[l+1]T} \underline{dz^{[l+1]}} * g^{[l+1]'}(z^{[l+1]})$$

$$\underline{dz^{[l]}} = \underline{dA^{[l]}} * g^{[l]'}(z^{[l]})$$

$$\underline{dw^{[l]}} = \frac{1}{n} \underline{dz^{[l]}} \cdot A^{[l-1]T}$$

$$\underline{db^{[l]}} = \frac{1}{n} \text{np.sum}(\underline{dz^{[l]}}, \text{axis}=1, \text{keepdims}=\text{True})$$

$$\underline{dA^{[l-1]}} = W^{[l]T} \cdot \underline{dz^{[l]}}$$

Summary

