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Deep Neural Networks

Forward and backward
propagation

Forward propagation for layer l



$$z^{(l)} = W^{(l)} \cdot a^{(l-1)} + b^{(l)}$$

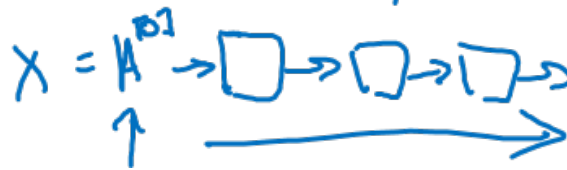
$$a^{(l)} = g^{(l)}(z^{(l)})$$

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

→

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

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

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

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

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

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

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

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

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

Summary

