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Deep Neural Networks

Forward and backward
propagation

Forward propagation for layer l



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

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

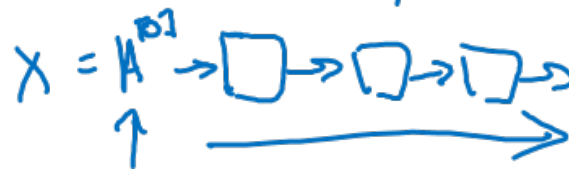
$$a^{(l)}$$

$$A^{(l)}$$

Vectorized:

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


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



Backward propagation for layer l

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

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

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

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

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

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

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

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

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

Summary

