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Deep Neural Networks

Forward and backward
propagation

Forward propagation for layer l

$$\rightarrow \quad \quad \quad \leftarrow w^{[l]}, b^{[l]}$$

$$\rightarrow \quad \quad \quad \text{---} \text{---} \text{---}$$

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

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

$$a^{[l-1]}$$

$$A^{[l-1]}$$

$$x = w^{[l]} \rightarrow \square \rightarrow \square \rightarrow \square \rightarrow \square$$

Vorgang:


$$z^{[l]} = w^{[l]} \cdot A^{[l-1]} + b^{[l]}$$

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

Backward propagation for layer l

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

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

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

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

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

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

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

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

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

Summary

