

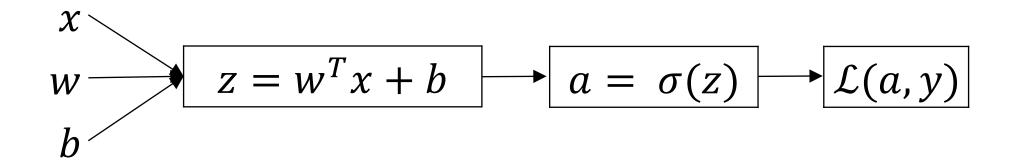
deeplearning.ai

## One hidden layer Neural Network

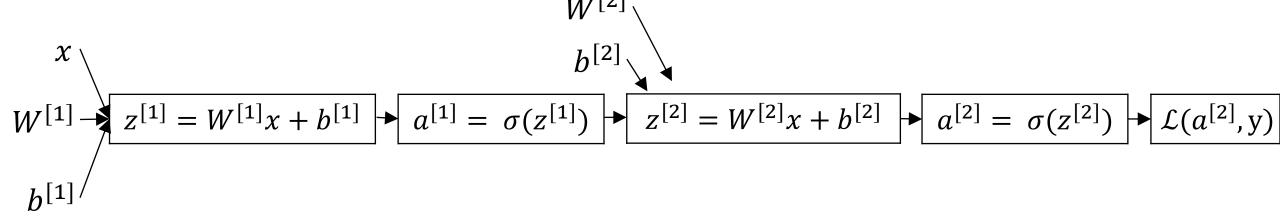
Backpropagation intuition (Optional)

#### Computing gradients

Logistic regression



# Neural network gradients $W^{[2]}$



### Summary of gradient descent

$$dz^{[2]} = a^{[2]} - y$$
 $dW^{[2]} = dz^{[2]}a^{[1]^T}$ 
 $db^{[2]} = dz^{[2]}$ 
 $dz^{[1]} = W^{[2]T}dz^{[2]} * g^{[1]'}(z^{[1]})$ 
 $dW^{[1]} = dz^{[1]}x^T$ 
 $db^{[1]} = dz^{[1]}$ 

### Summary of gradient descent

$$\begin{aligned} dz^{[2]} &= a^{[2]} - y \\ dW^{[2]} &= dz^{[2]}a^{[1]^T} \\ db^{[2]} &= dz^{[2]} \end{aligned} \qquad \begin{aligned} dW^{[2]} &= \frac{1}{m}dZ^{[2]}A^{[1]^T} \\ db^{[2]} &= dz^{[2]} \\ dz^{[1]} &= W^{[2]T}dz^{[2]} * g^{[1]'}(z^{[1]}) \end{aligned} \qquad \begin{aligned} dZ^{[1]} &= W^{[2]T}dZ^{[2]} * g^{[1]'}(Z^{[1]}) \\ dW^{[1]} &= dz^{[1]}x^T \end{aligned} \qquad \begin{aligned} dW^{[1]} &= \frac{1}{m}dZ^{[1]}X^T \\ db^{[1]} &= dz^{[1]} \end{aligned} \qquad \end{aligned}$$

$$\begin{split} dZ^{[2]} &= A^{[2]} - Y \\ dW^{[2]} &= \frac{1}{m} dZ^{[2]} A^{[1]^T} \\ db^{[2]} &= \frac{1}{m} np. sum(dZ^{[2]}, axis = 1, keepdims = True) \\ dZ^{[1]} &= W^{[2]T} dZ^{[2]} * g^{[1]'}(Z^{[1]}) \\ dW^{[1]} &= \frac{1}{m} dZ^{[1]} X^T \\ db^{[1]} &= \frac{1}{m} np. sum(dZ^{[1]}, axis = 1, keepdims = True) \end{split}$$