

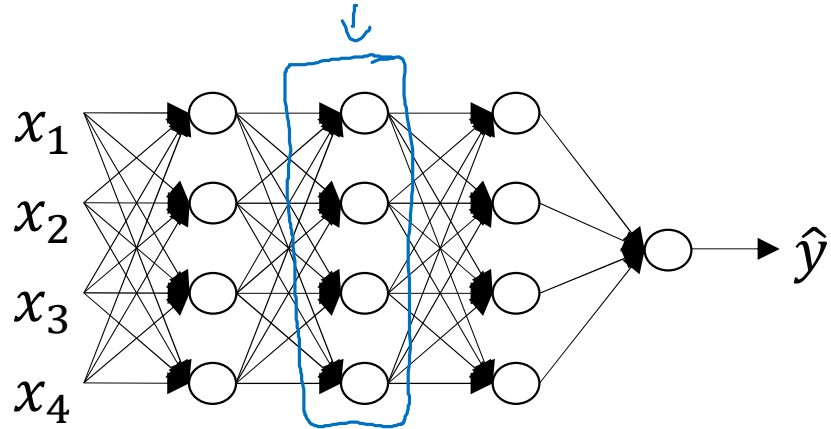


deeplearning.ai

Deep Neural Networks

Building blocks of
deep neural networks

Forward and backward functions



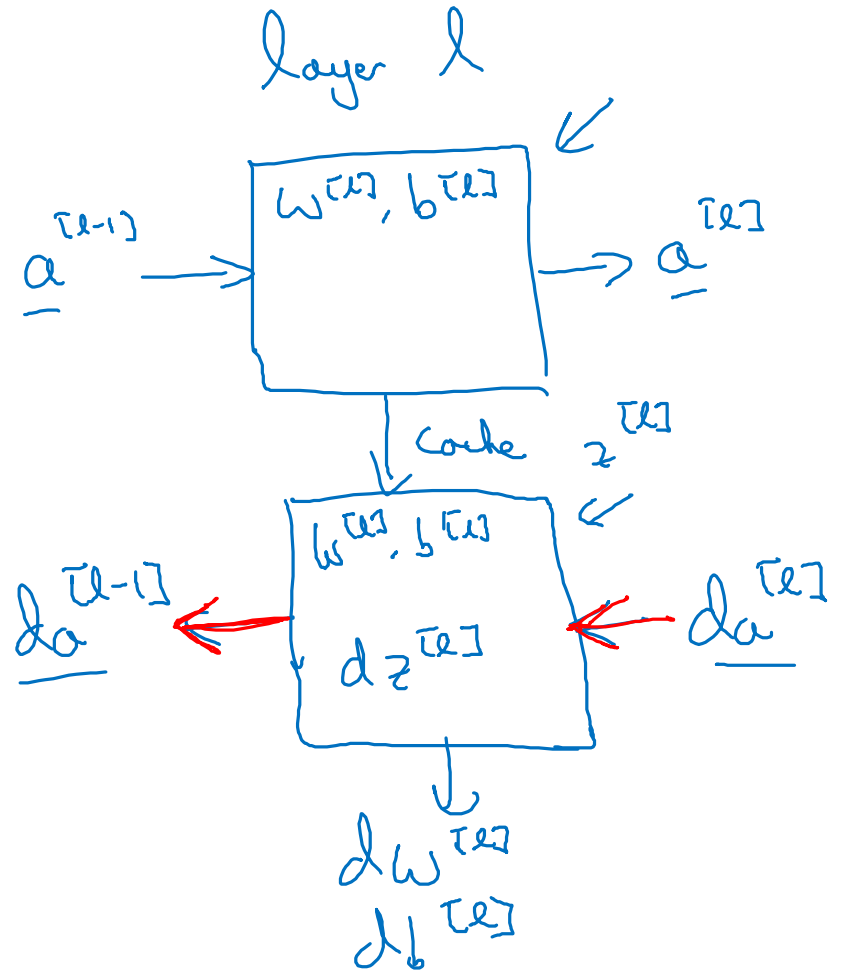
layer l : $W^{[l]}, b^{[l]}$

→ Forward: Input $a^{[l-1]}$, output $a^{[l]}$

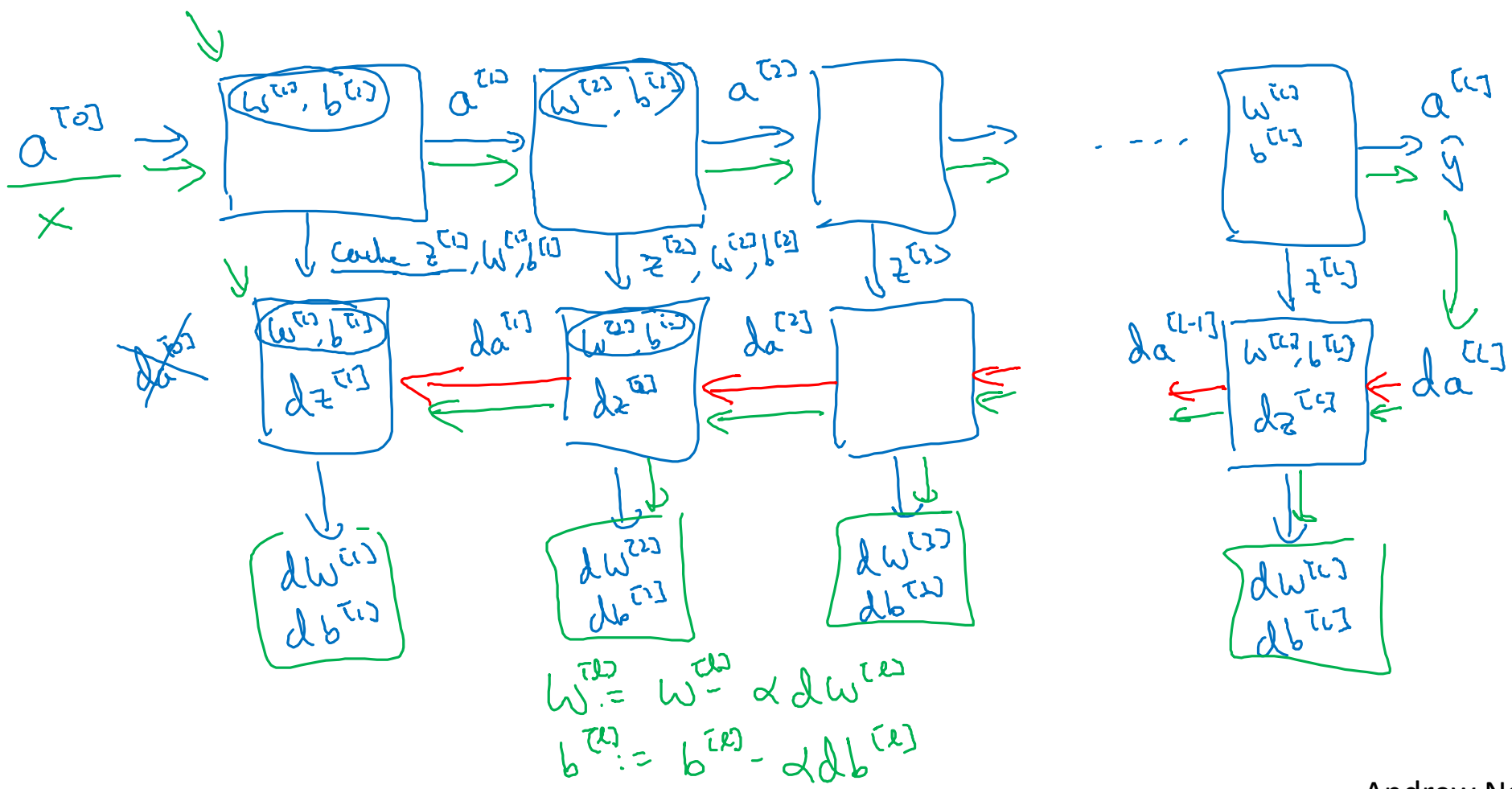
$$z^{[l]} = W^{[l]} a^{[l-1]} + b^{[l]} \quad \text{cache } z^{[l]}$$

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

→ Backward: Input $da^{[l]}$, output $da^{[l-1]}$
 cache $(z^{[l]})$
 $\frac{dL}{dW^{[l]}}$
 $\frac{dL}{db^{[l]}}$



Forward and backward functions





deeplearning.ai

Deep Neural Networks

Forward and backward propagation

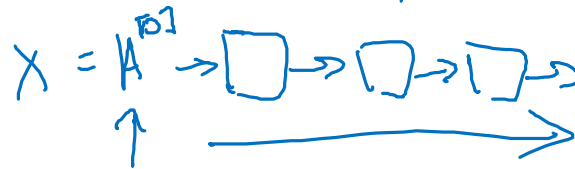
Forward propagation for layer l

→ Input $a^{[l-1]}$ ←

→ Output $a^{[l]}$, cache ($z^{[l]}$)

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

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



Verzweig:

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

Backward propagation for layer l

→ Input $da^{[l]}$

→ Output $da^{[l-1]}$, $dW^{[l]}$, $db^{[l]}$

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

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

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

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

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

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

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

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

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

Summary

