

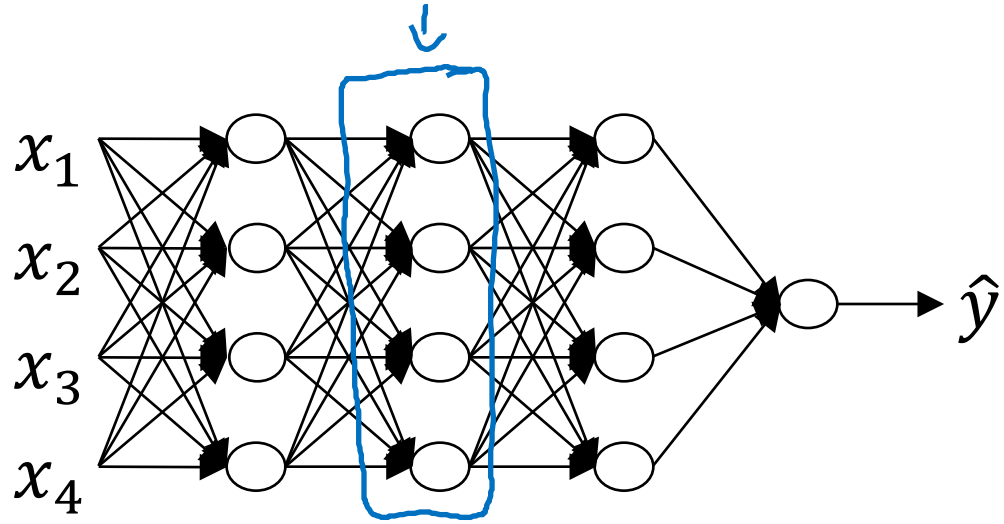


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Deep Neural Networks

Building blocks of
deep neural networks

Forward and backward functions



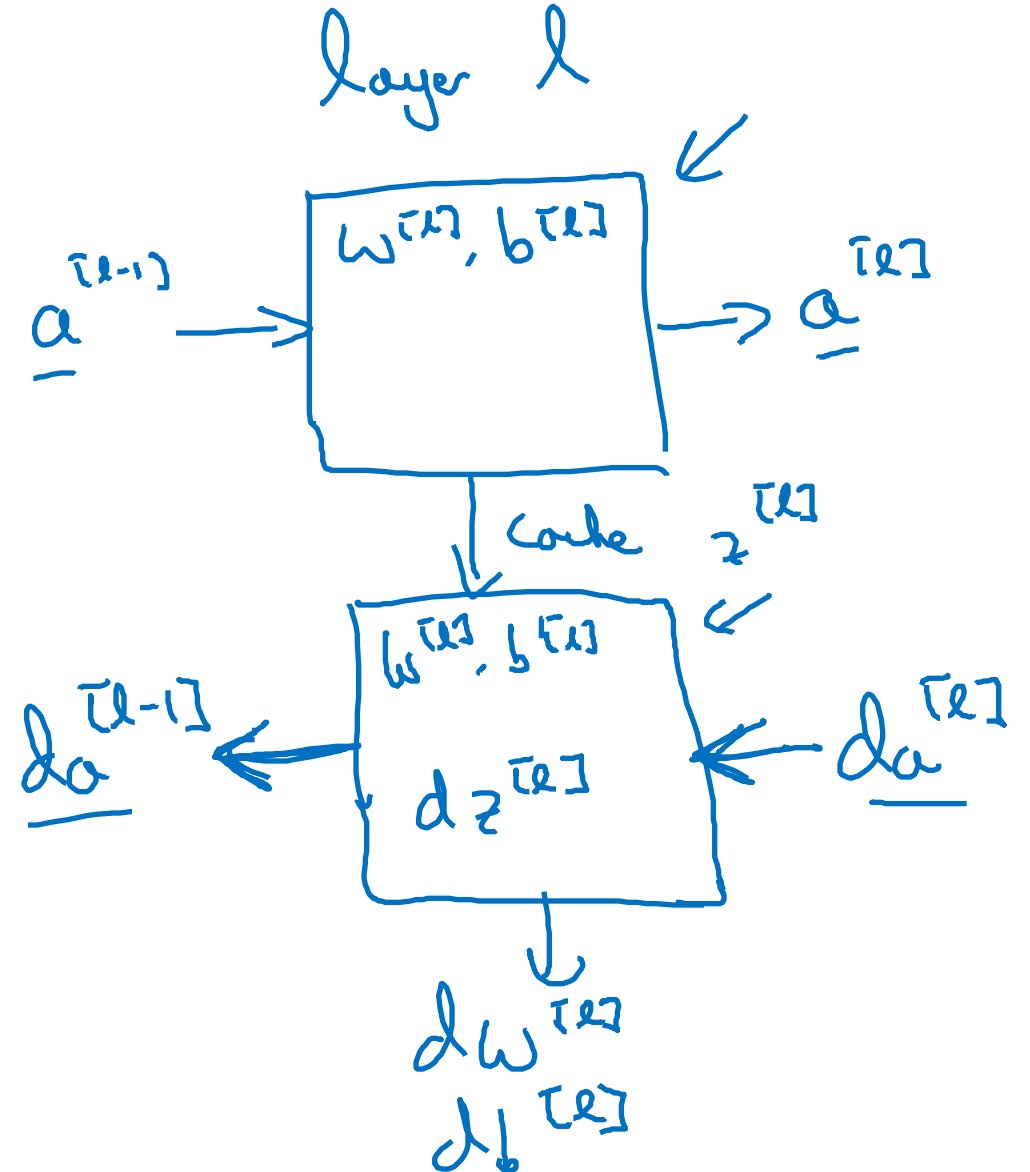
layer l : $W^{[l]}, b^{[l]}$

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

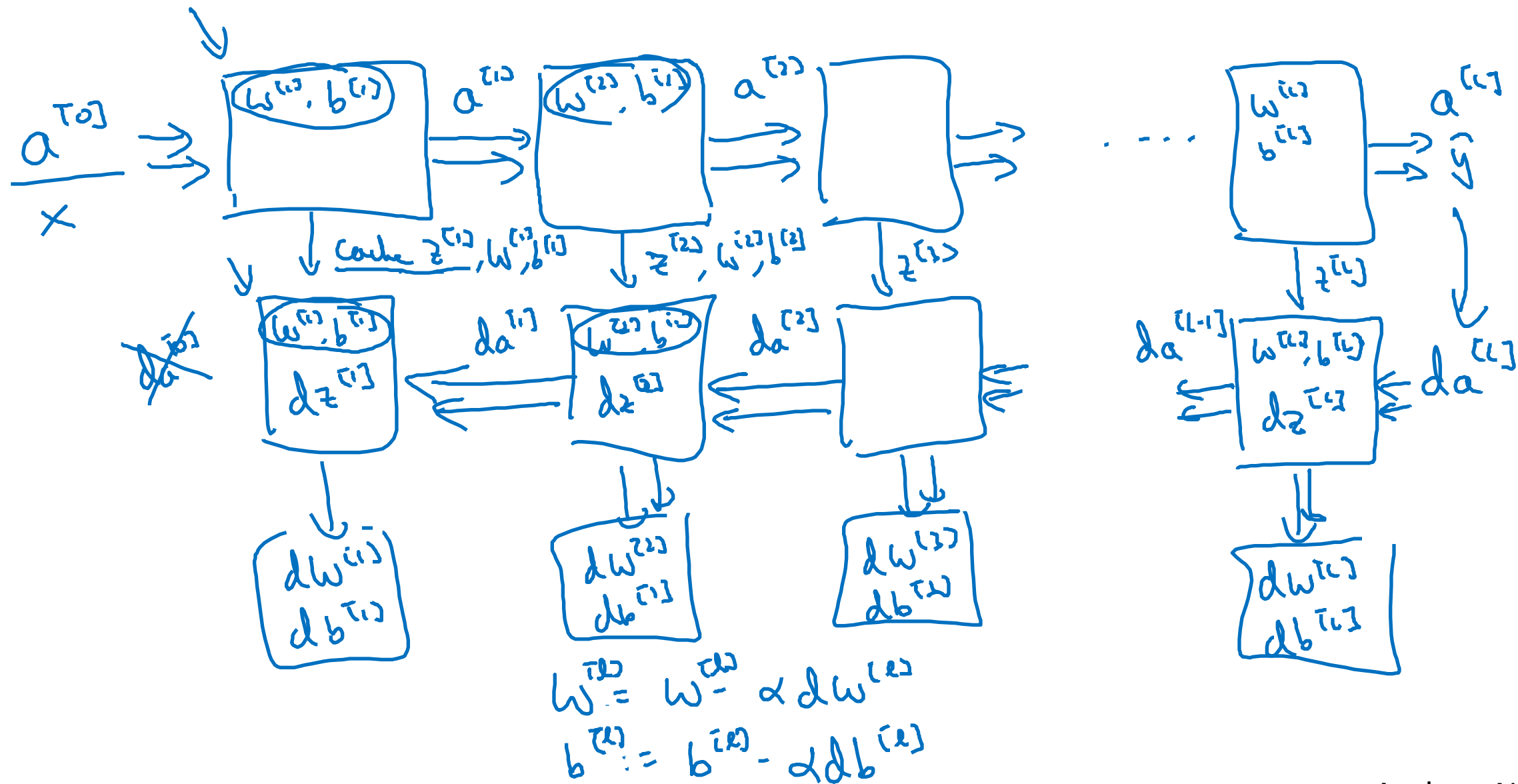
$z^{[l]}: W^{[l]} a^{[l-1]} + b^{[l]}$ cache $z^{[l]}$

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

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



Forward and backward functions





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Deep Neural Networks

Forward and backward
propagation

Forward propagation for layer l

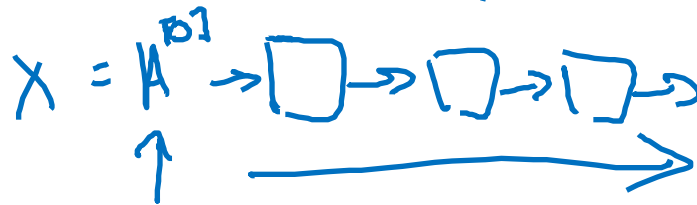
→ Input $a^{[l-1]}$ ←

→ Output $a^{[l]}$, cache ($z^{[l]}$)

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

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

$$\begin{matrix} a^{[0]} \\ A^{[0]} \end{matrix}$$



Verwijst:

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

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

Backward propagation for layer l

→ Input $da^{[l]}$

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

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

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

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

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

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

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

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

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

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

Summary

