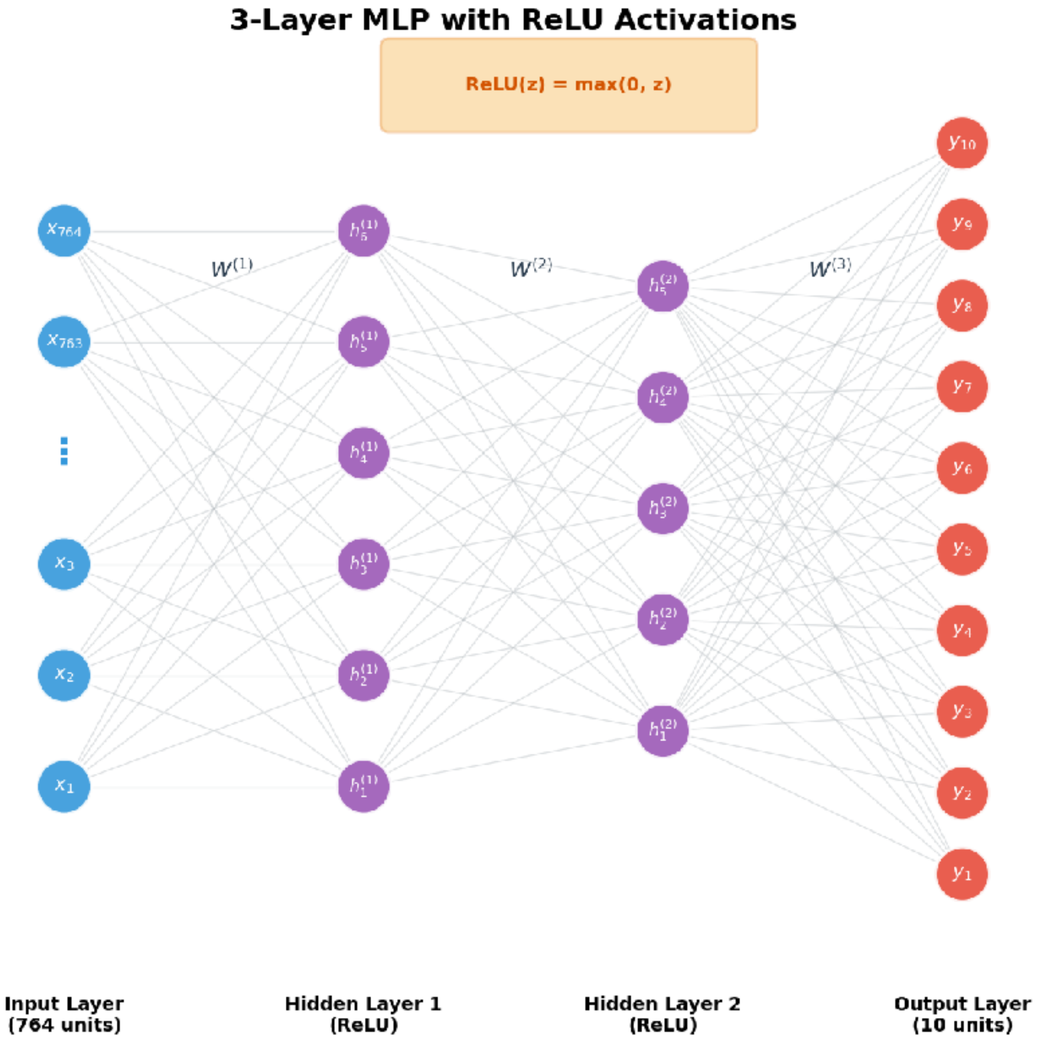
Deep Learning (1470)

Randall Balestriero

Class 8: Convolutional Neural Networks

Multilayer Perceptrons

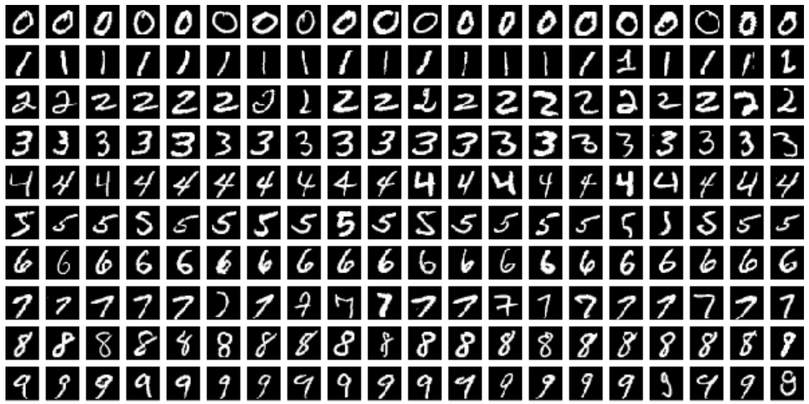
And why we need better

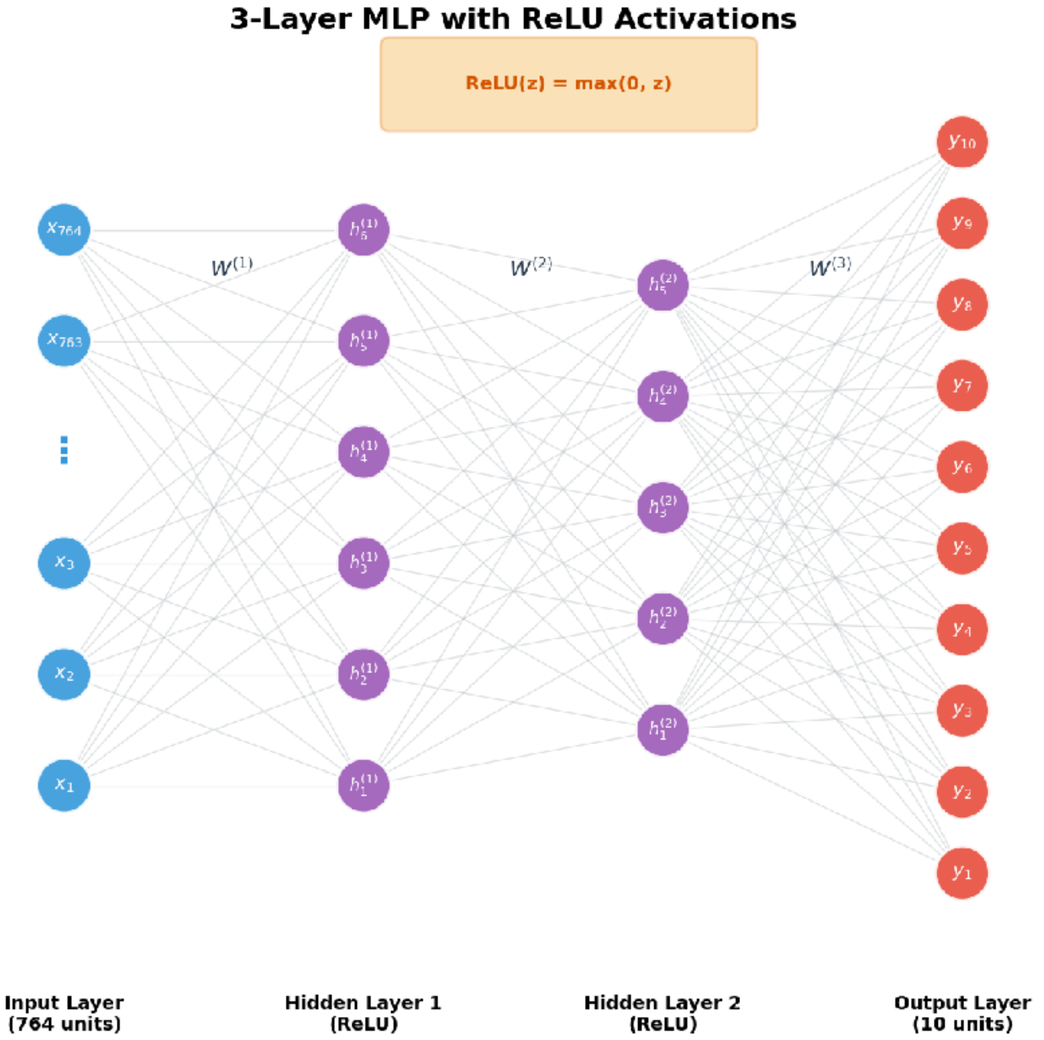


Multilayer Perceptrons

And why we need better

Extracting local features
at each layer is enough!





Multilayer Perceptrons

And why we need better

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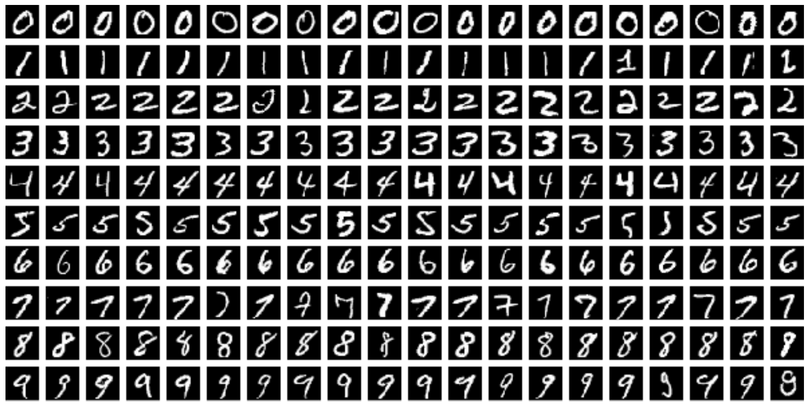
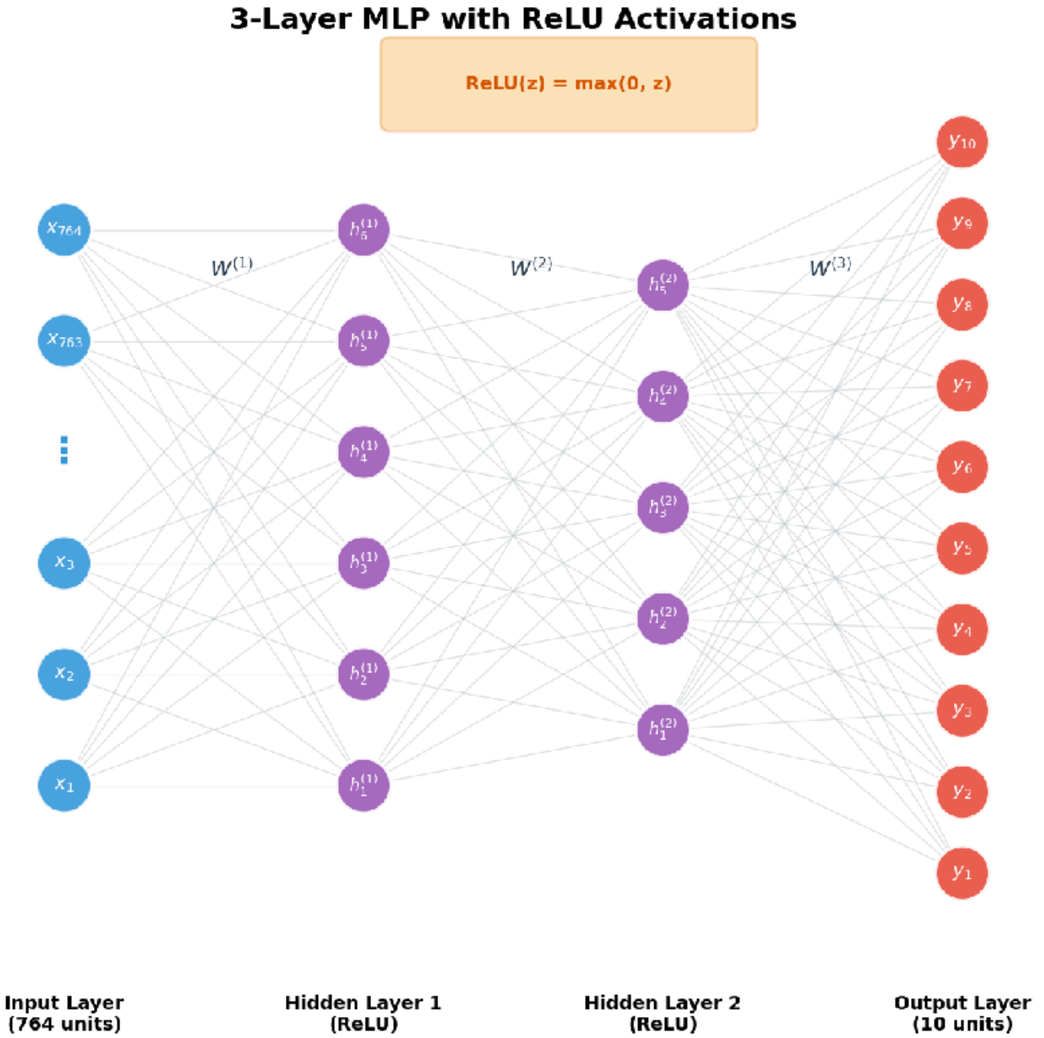
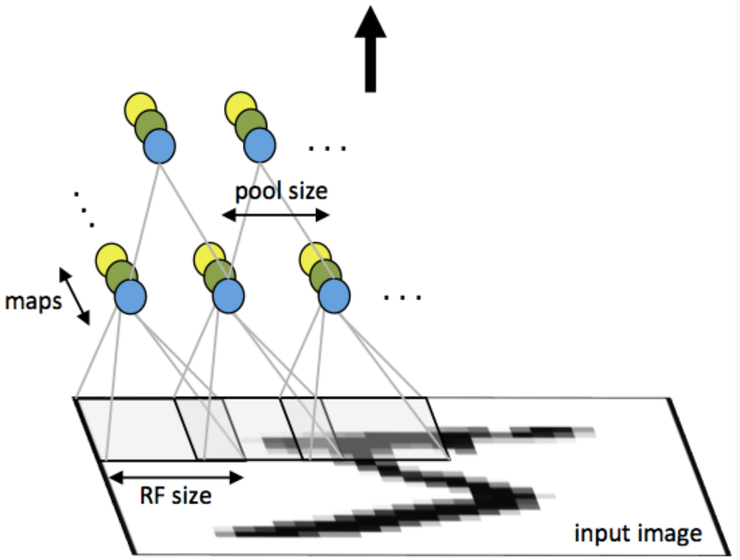
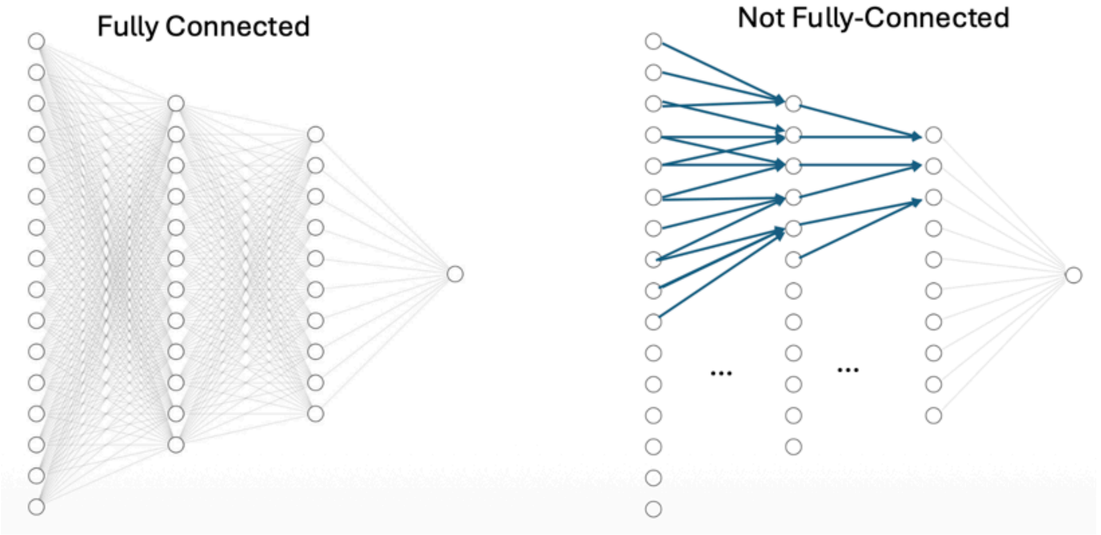


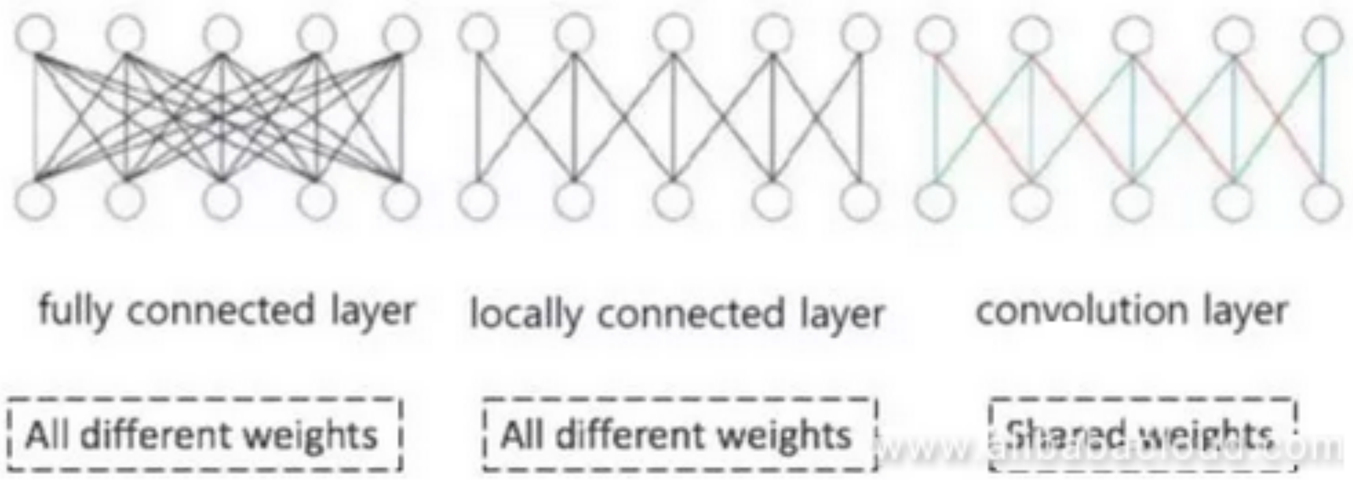
Not only local features… but
translation invariant features!



How to Diagram







Deep Convolutional Networks

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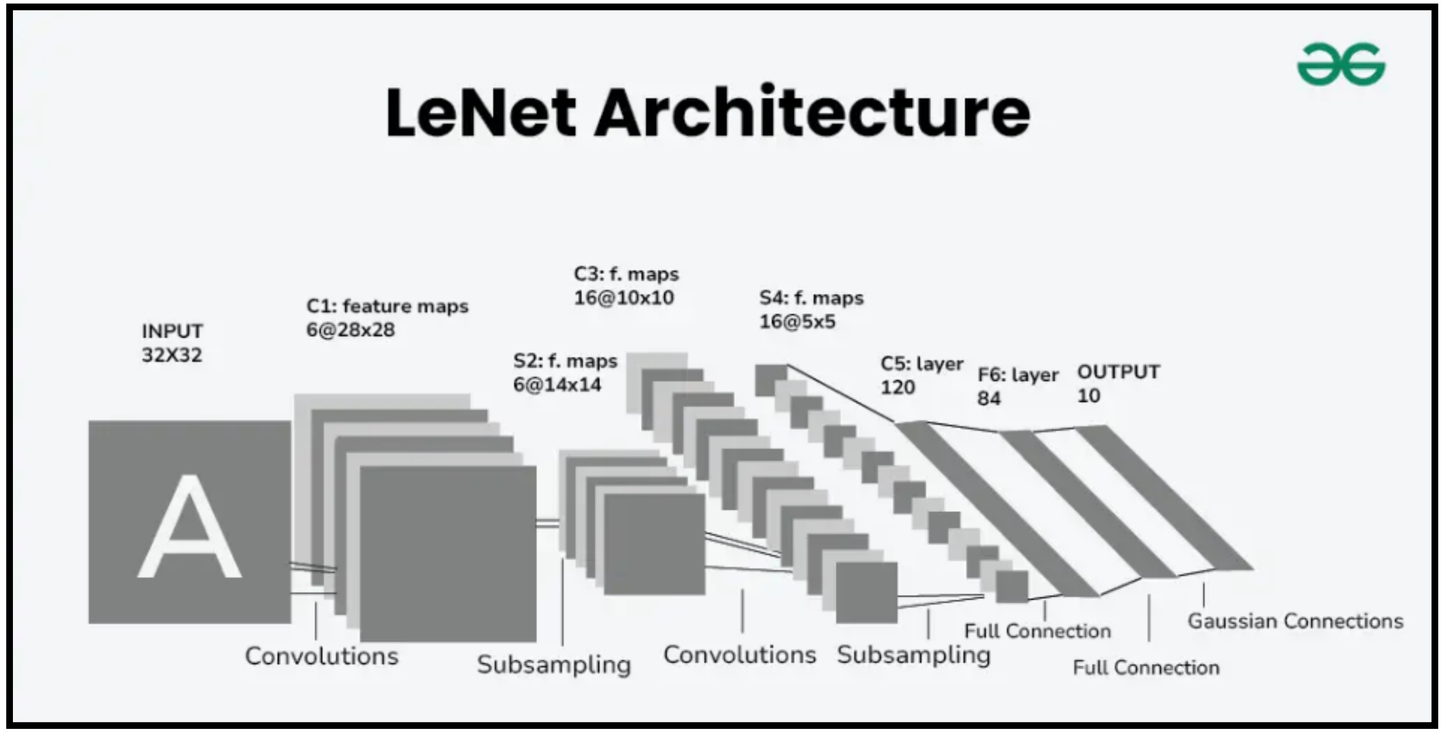
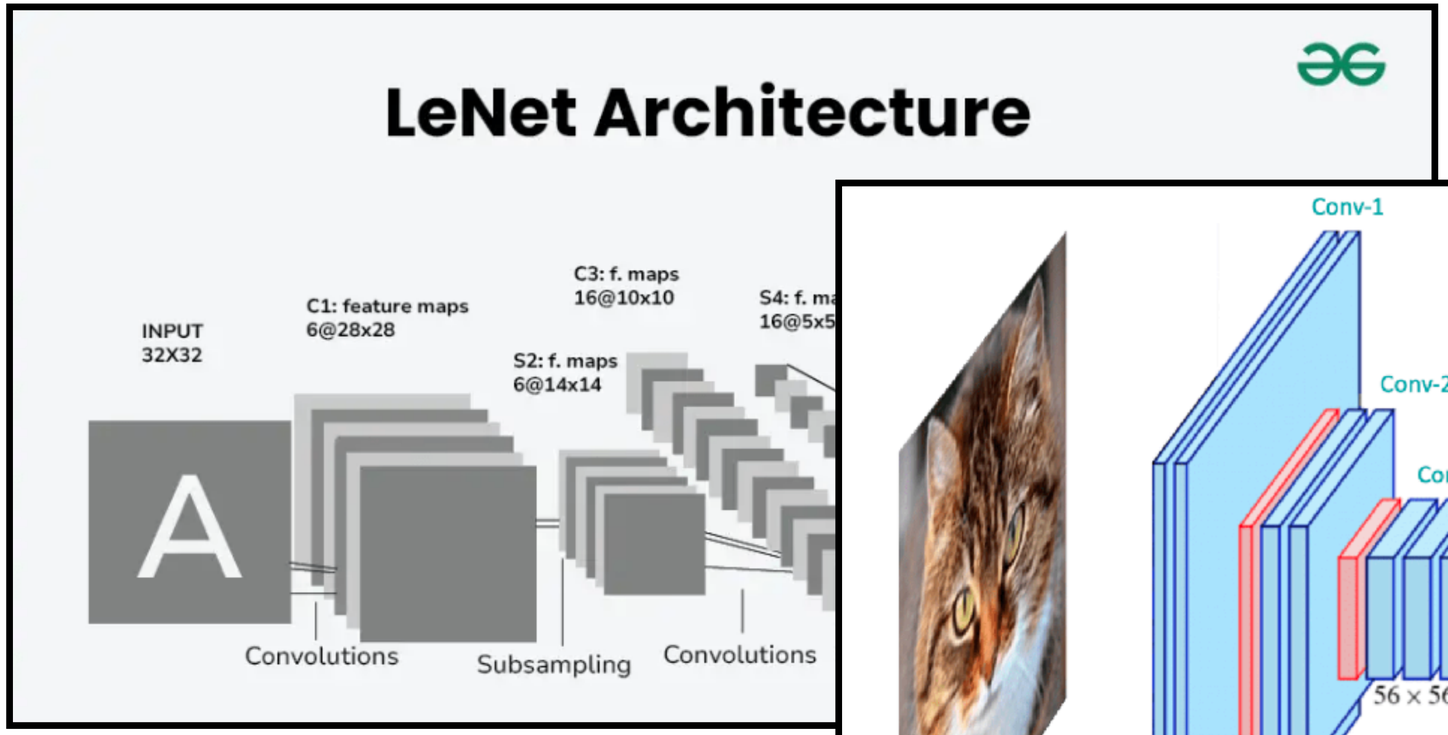
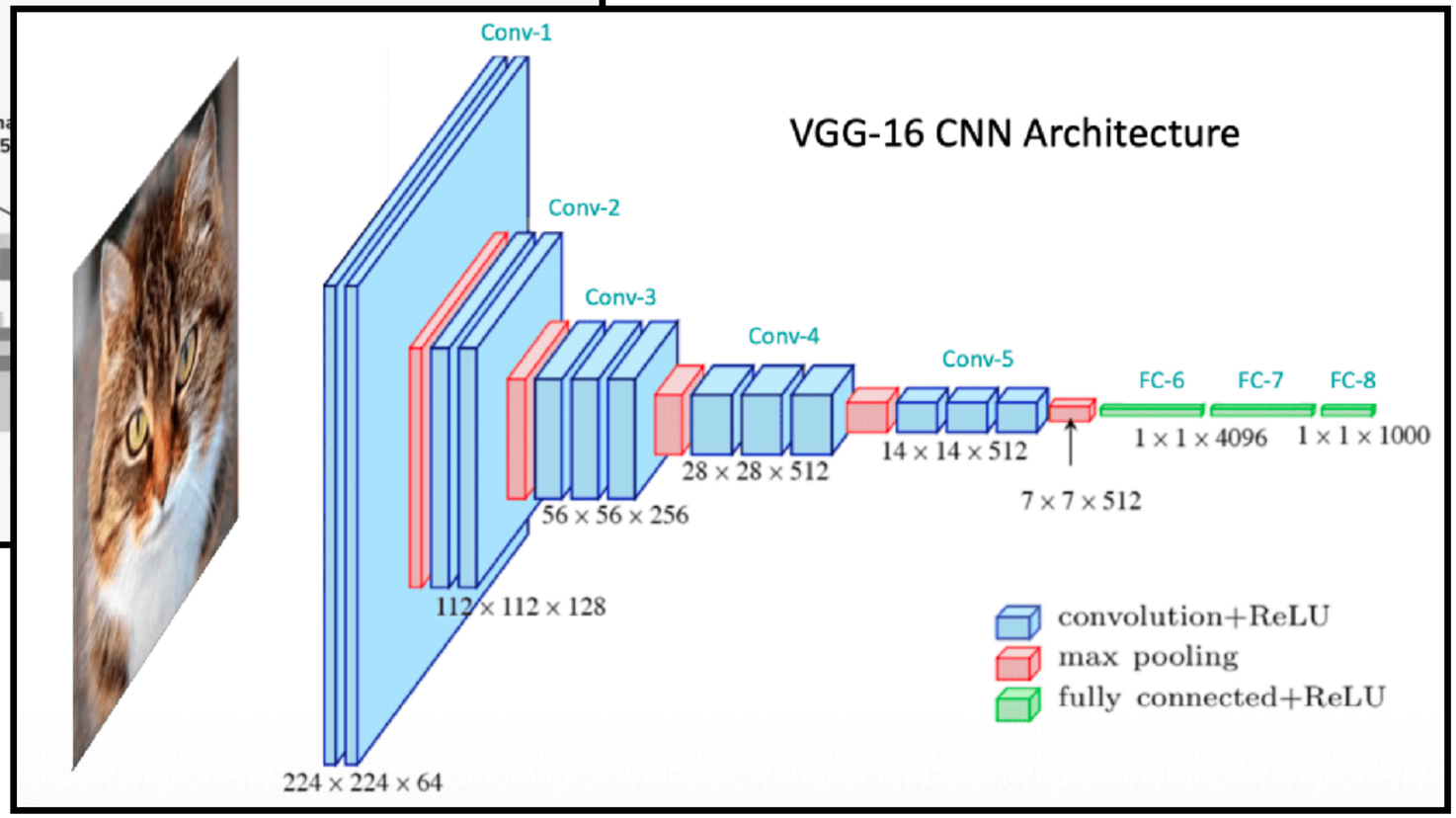


Deep Convolutional Networks





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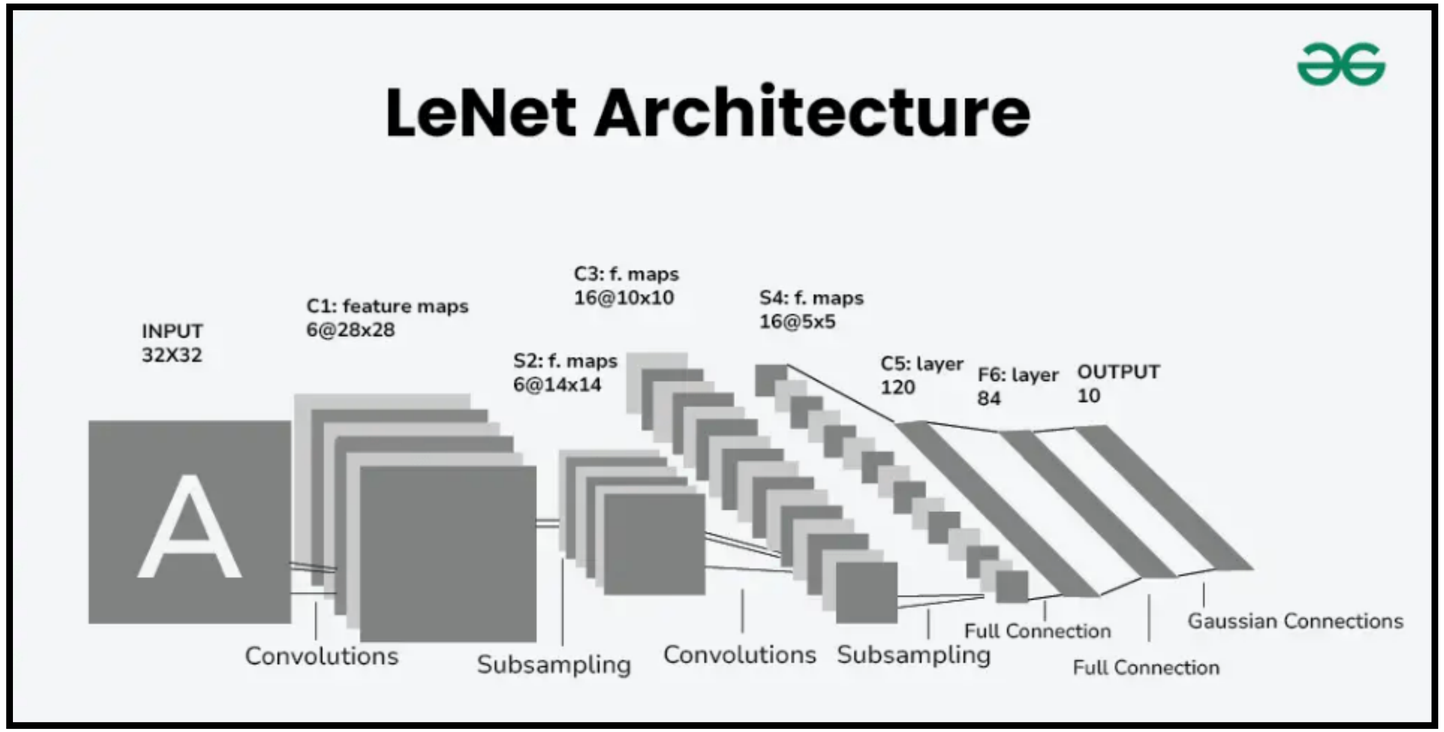
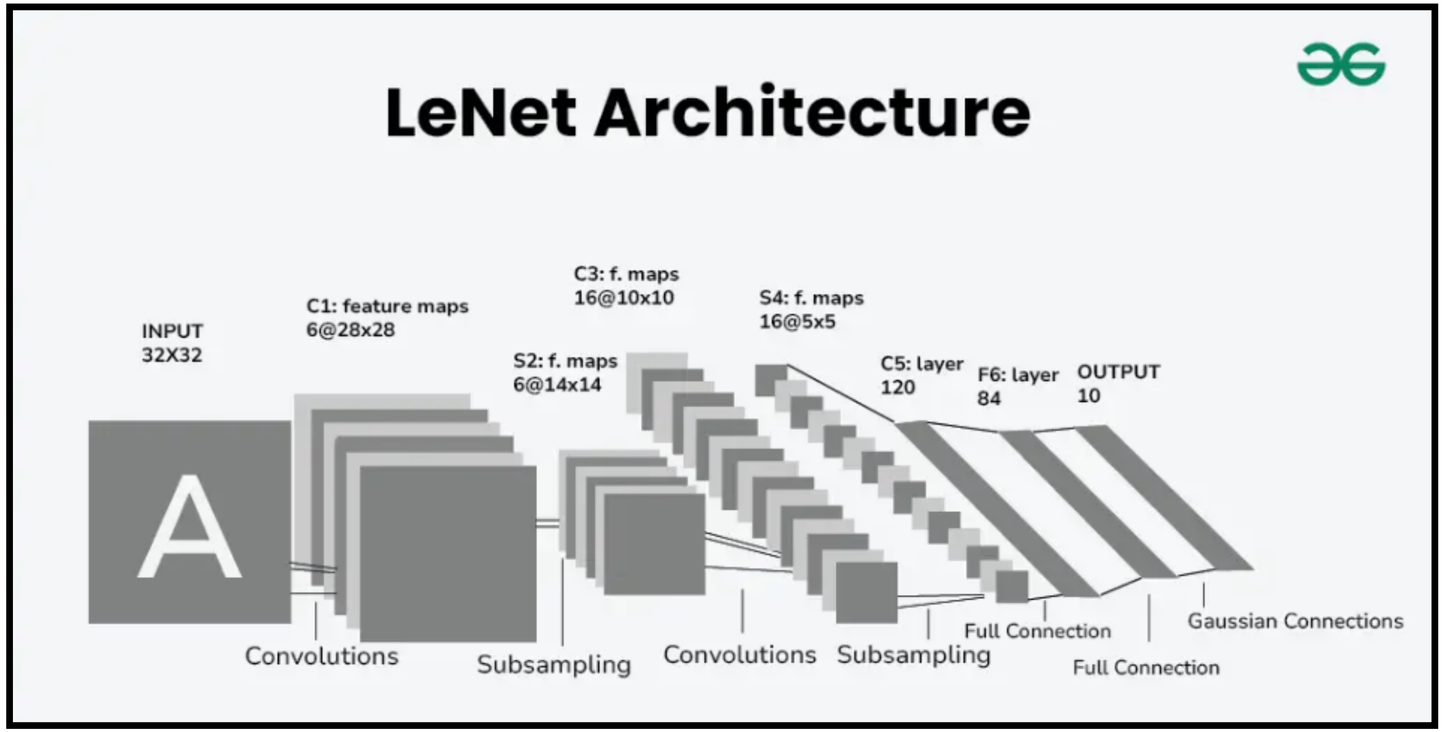


Can you guess how many parameters it has?

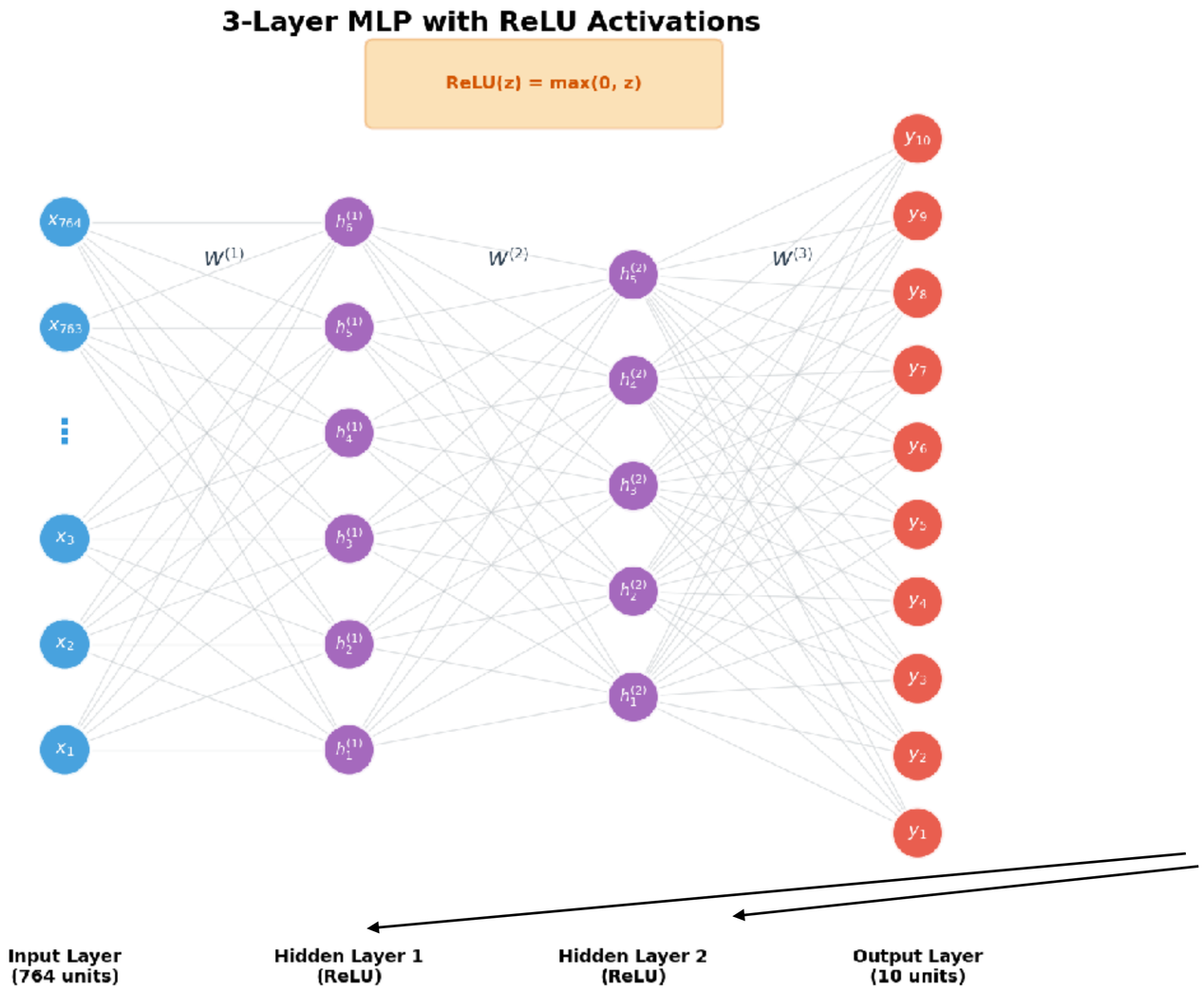
Deep Convolutional Networks



Can you guess how many parameters it has?

~60K!

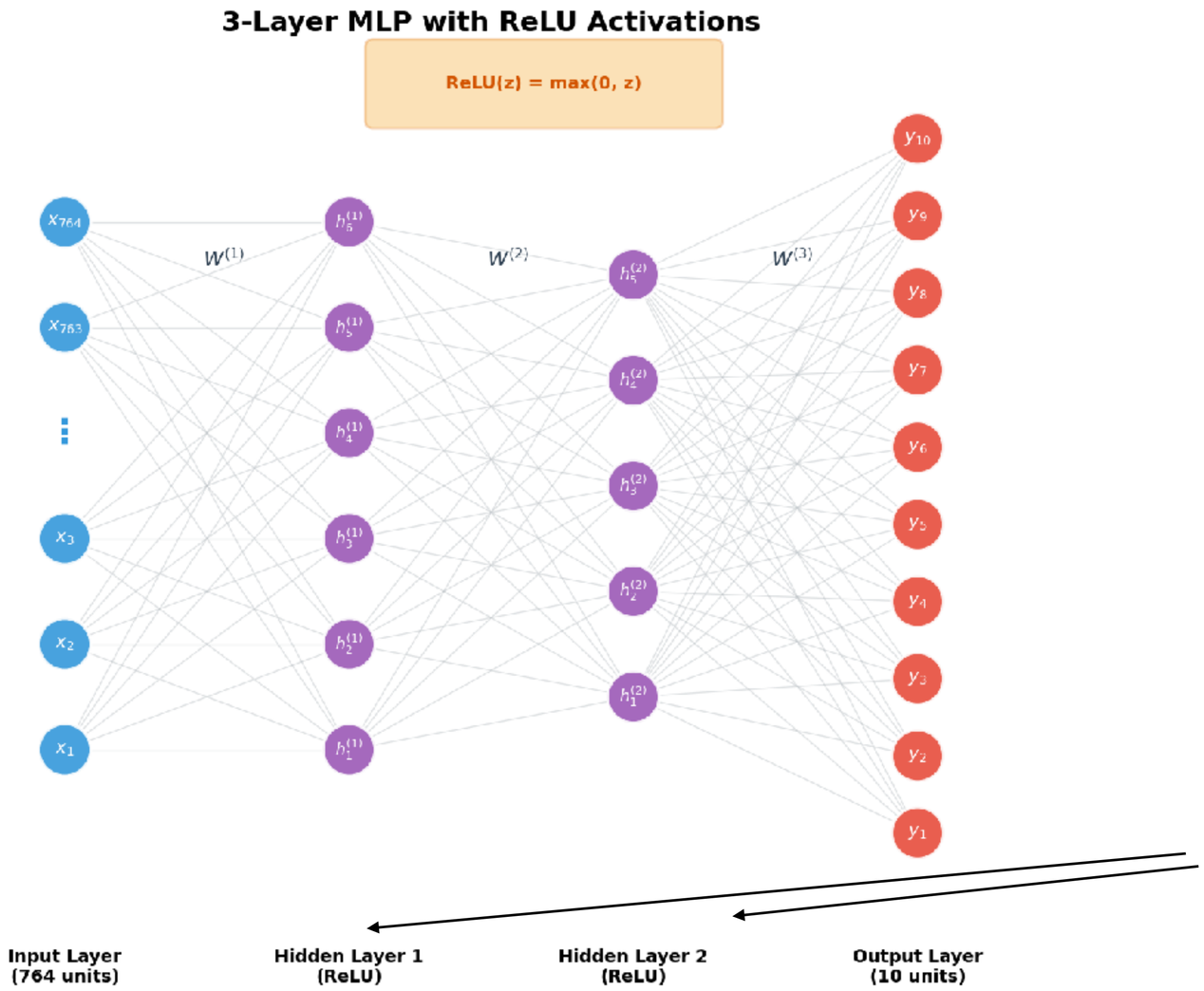
Deep Convolutional Networks



Can you guess how many parameters it has?

128 units

Deep Convolutional Networks



Can you guess how many parameters it has?

~120K!

128 units

Output Size of a Convolution Layer

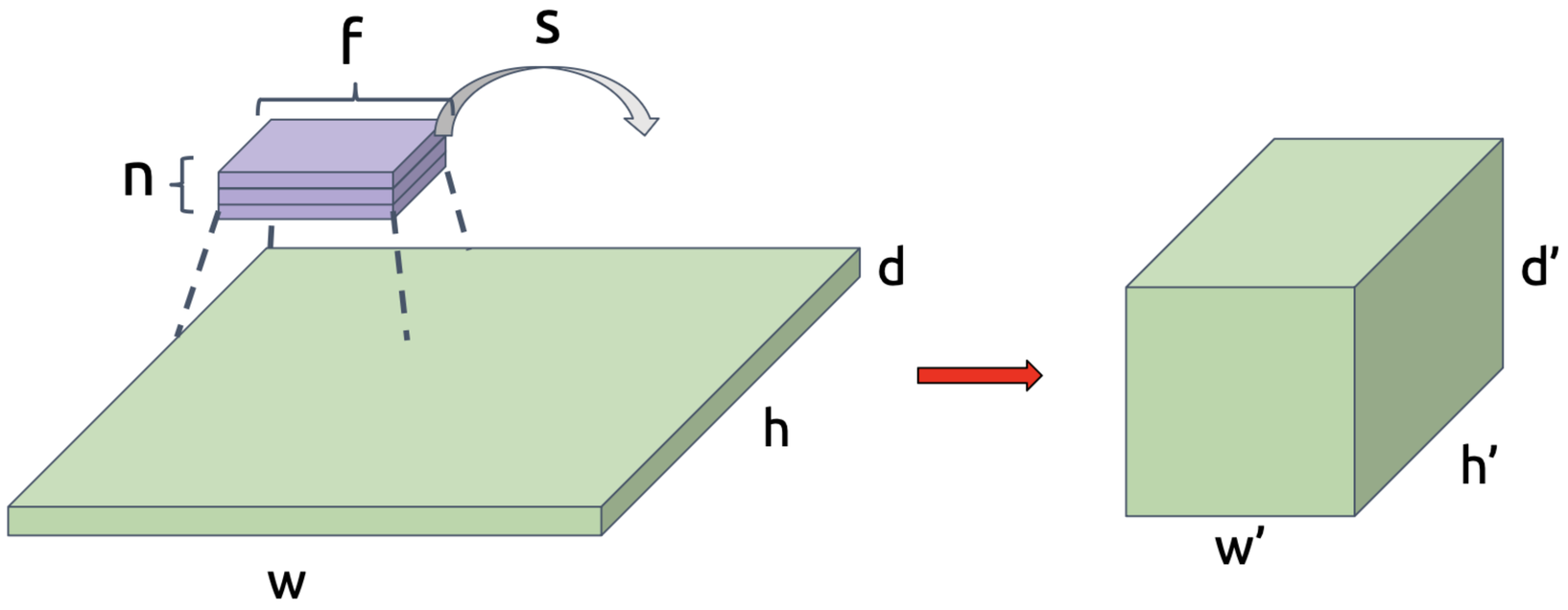
Suppose we know the number of filters, their size, the stride, and padding (**n,f,s,p**).

Then for a convolution layer with input dimension **w x h x d**, the output dimensions **w' x h' x d'** are:

$$w' = \frac{w - f + 2p}{s} + 1$$

$$h' = \frac{h - f + 2p}{s} + 1$$

$$d' = n$$



Output Size for “VALID” Padding

$$w' = \frac{w - f + 2p}{s} + 1$$

Let $w = 4$

num filters n = 1
filter size f = 3
stride s = 1
padding p = 0

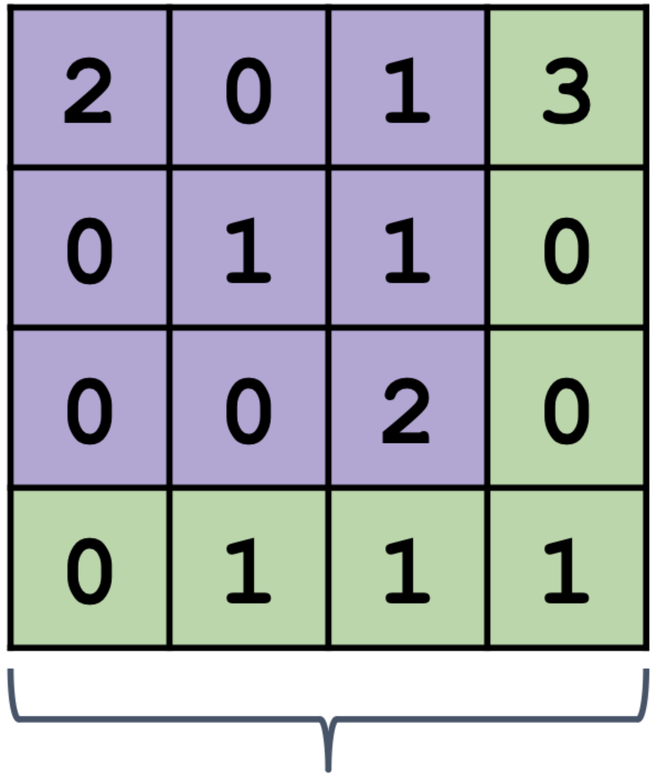
$$w' = \frac{4 - 3 + 2 \cdot 0}{1} + 1$$

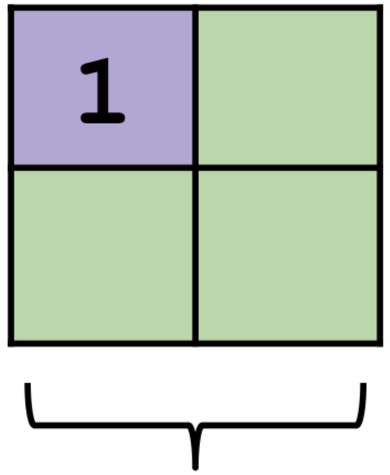
$$= 1 + 1 = 2$$

Output Size for “VALID” Padding

$$w' = \frac{w - f + 2p}{s} + 1$$

num filters n = 1
filter size f = 3
stride s = 1
padding p = 0





Output Size for “SAME” Padding

$$w' = \frac{w - f + 2p}{s} + 1$$

num filters n = 1
filter size f = 3
stride s = 1
padding p = 1*

Padding size needs to be determined

Let $w = 4$

$$w' = \frac{4 - 3 + 2 \cdot 1}{1} + 1$$

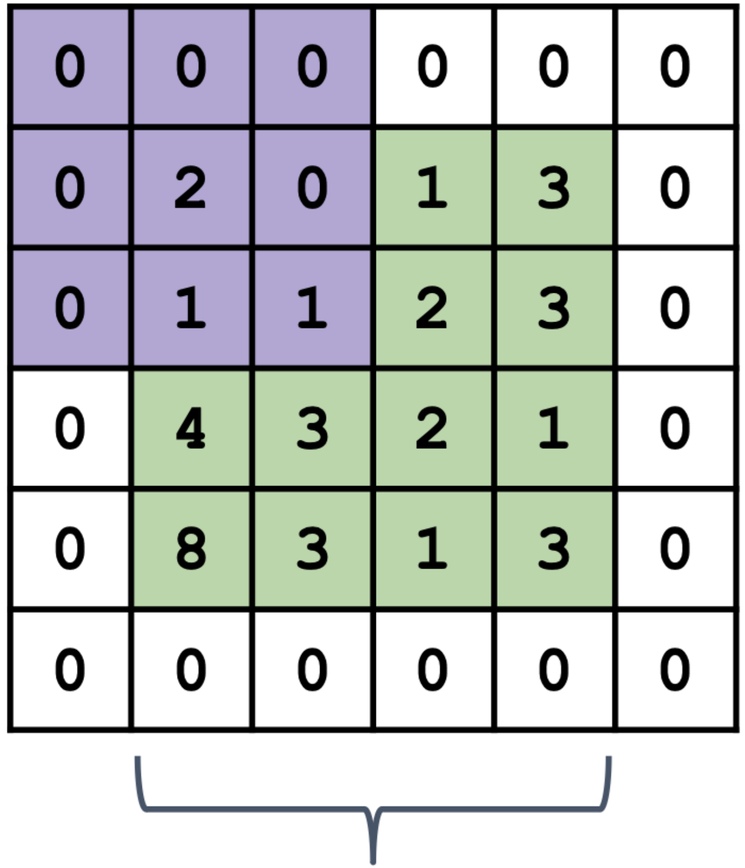
$$= 3 + 1 = 4$$

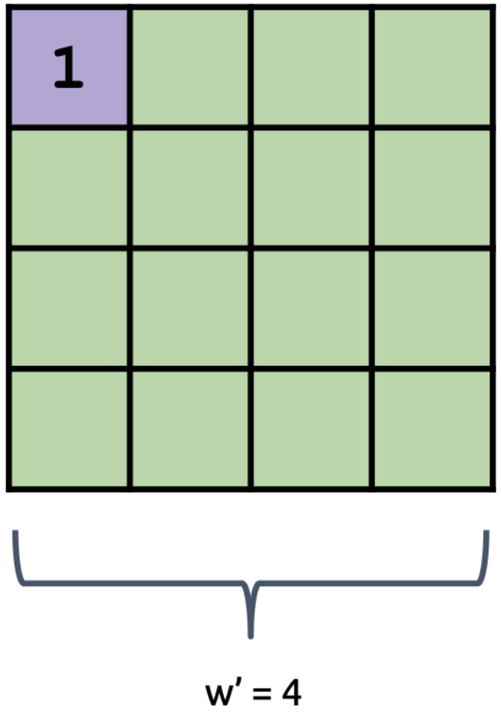
Output Size for “SAME” Padding

$$w' = \frac{w - f + 2p}{s} + 1$$

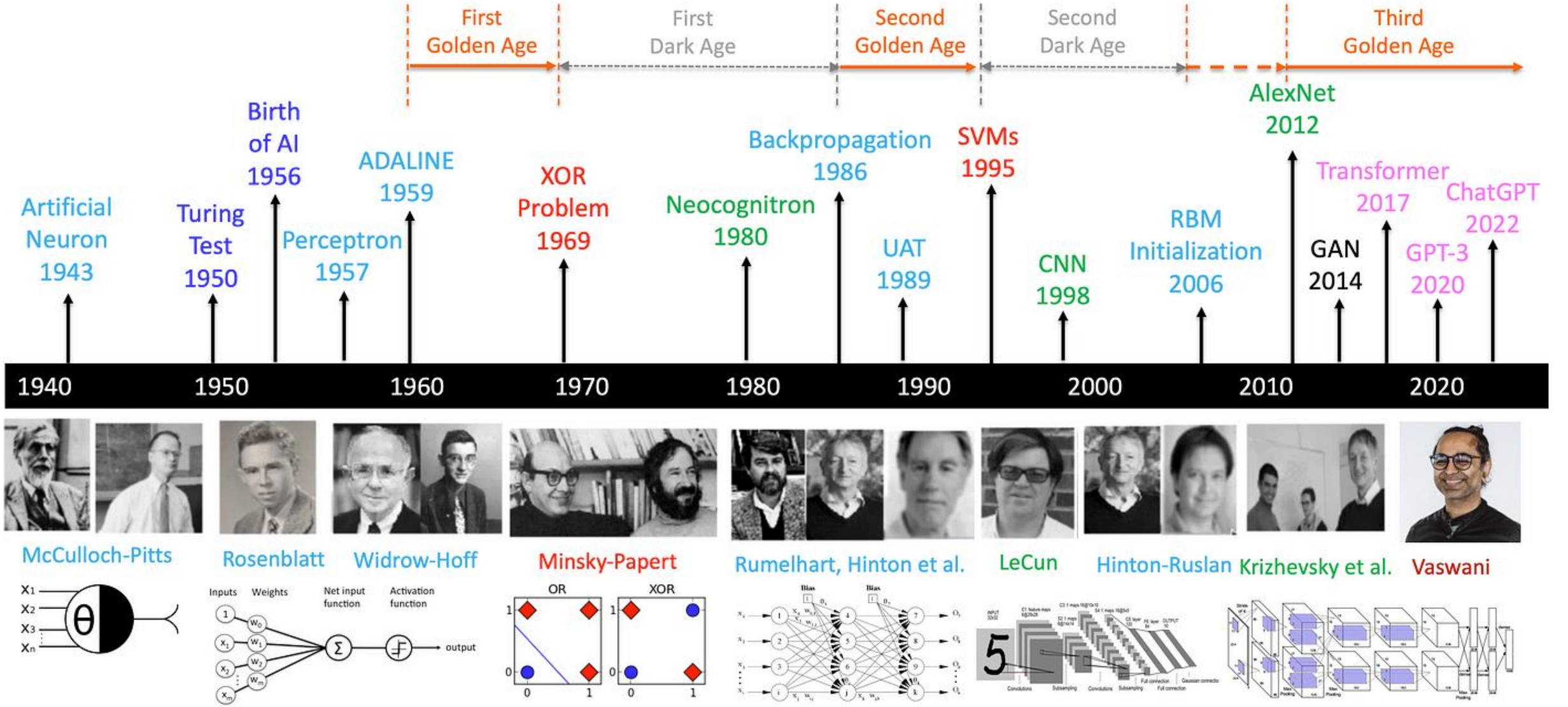
num filters n = 1
filter size f = 3
stride s = 1
padding p = 1*

Padding size needs to be determined





A Brief History of AI with Deep Learning



https://medium.com/@lmpo/a-brief-history-of-ai-with-deep-learning-26f7948bc87b

The AlexNet moment

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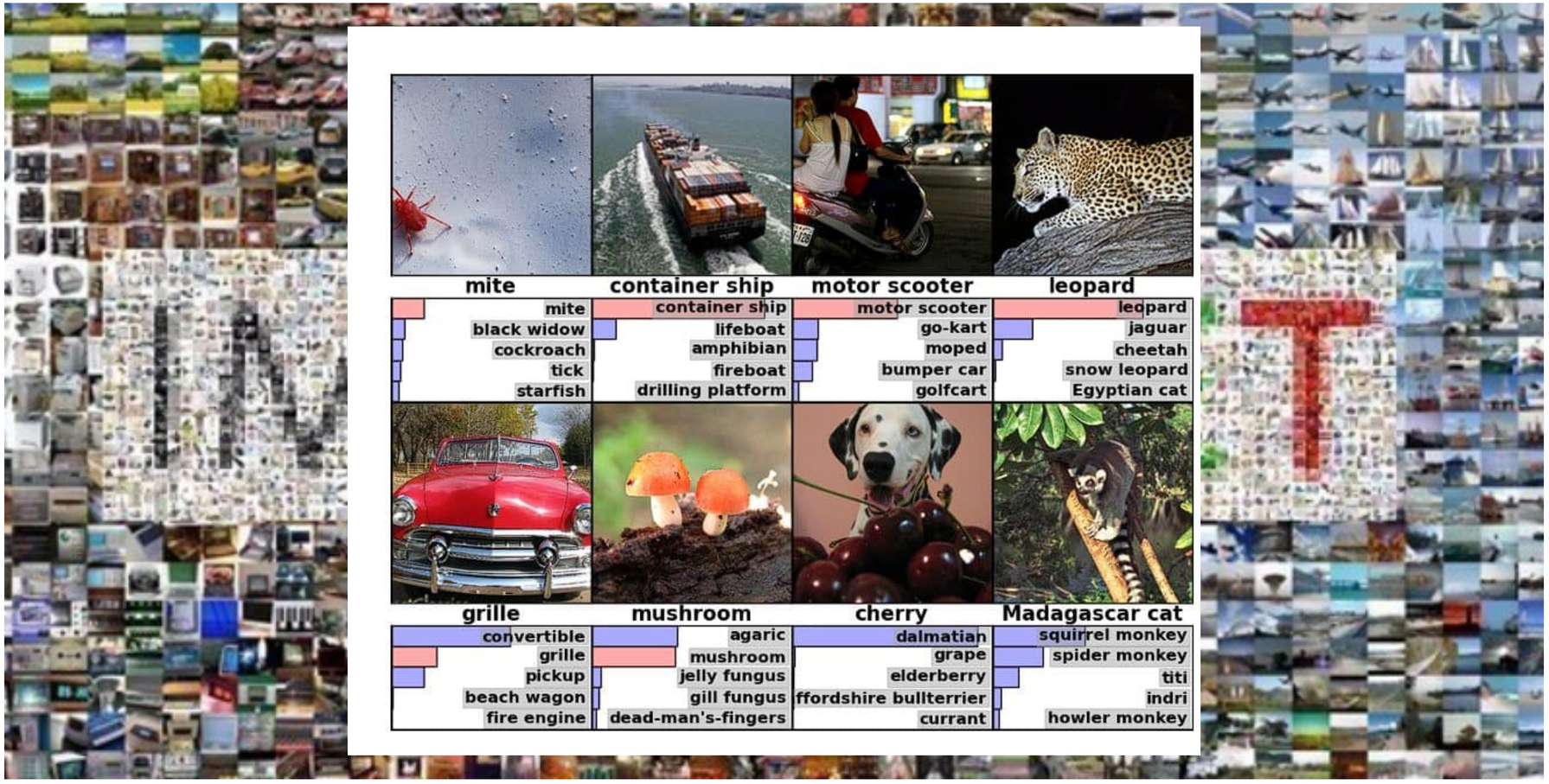
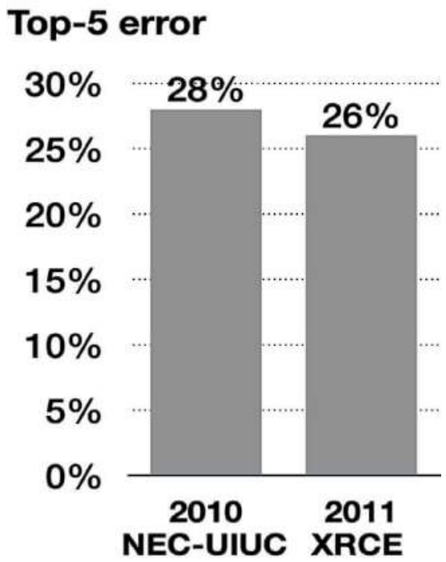
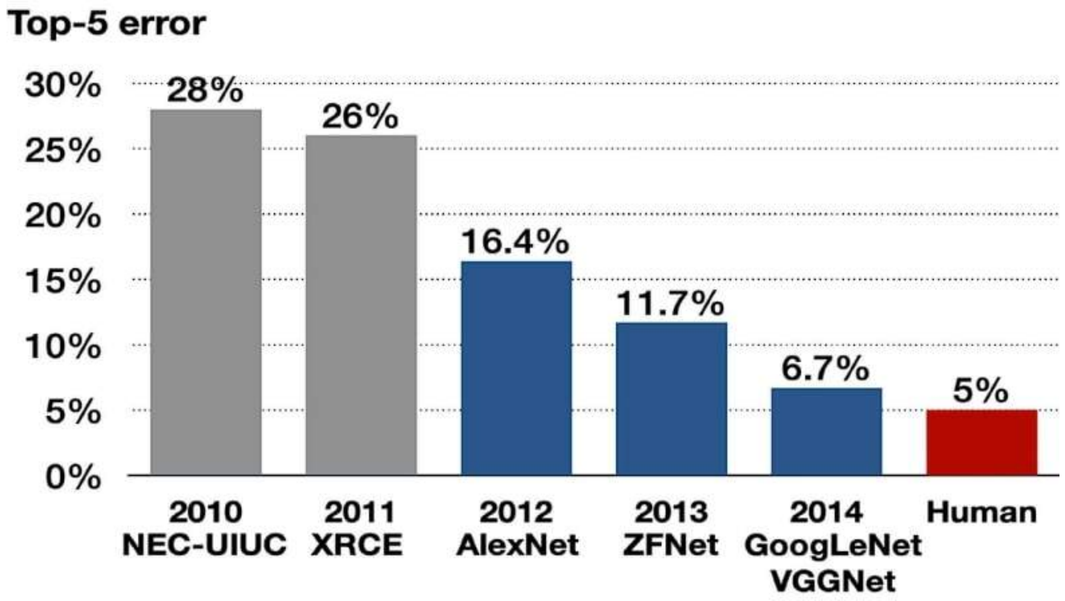


The AlexNet moment



The AlexNet moment



The AlexNet moment