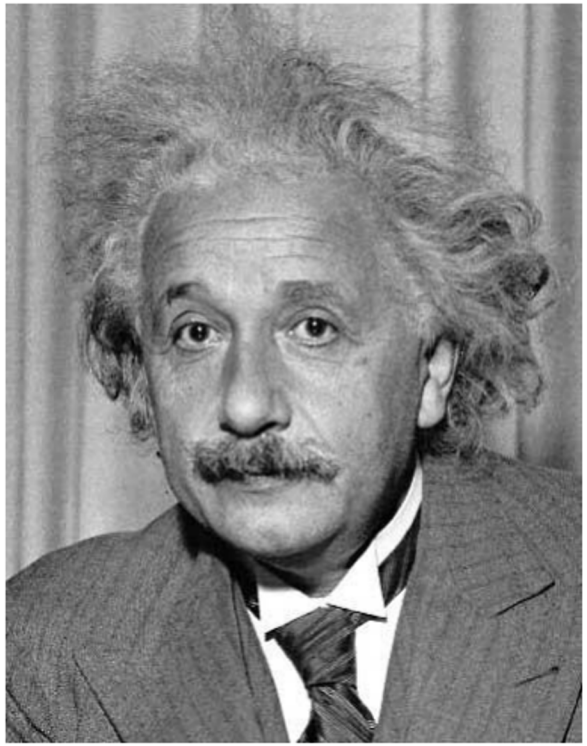
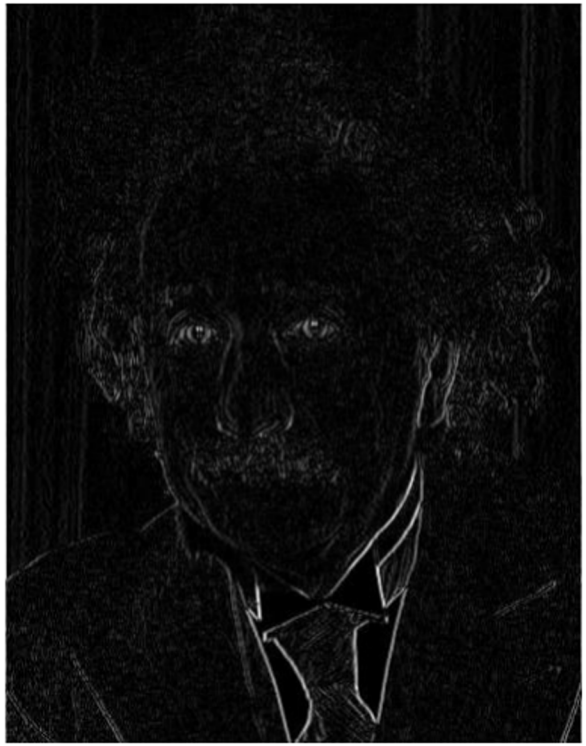
Seminar 3: CNN

Filters is CV



*

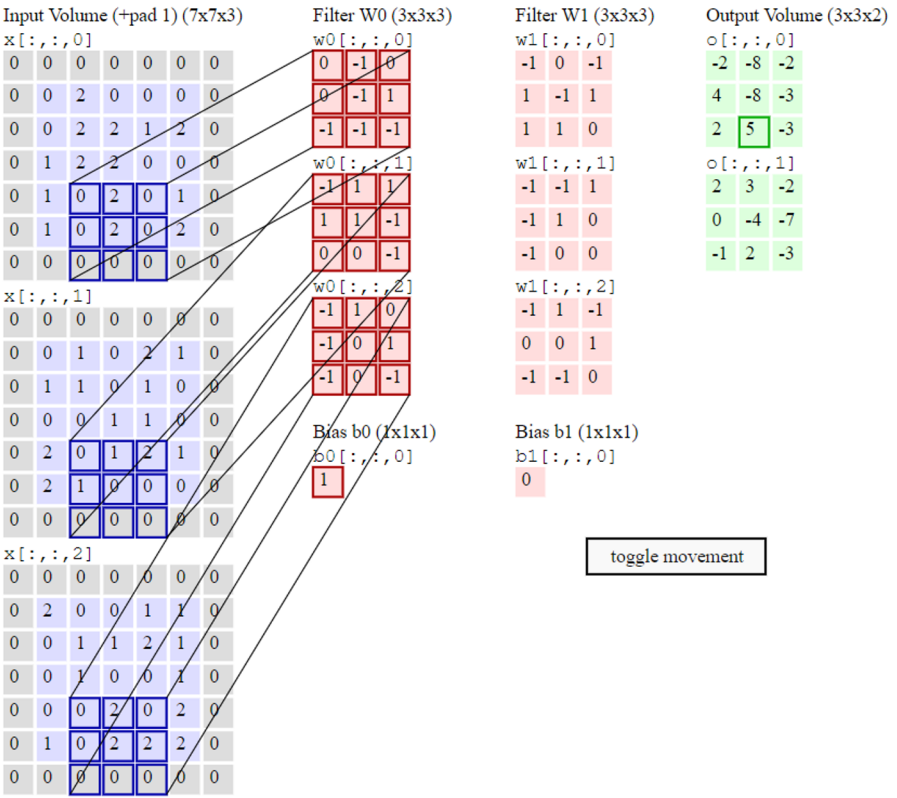
1	0	-1
2	0	-2
1	0	-1



Vertical Edge
(absolute value)

https://www.cs.toronto.edu/~lczhang/aps360_20191/lec/w03/convnet.html

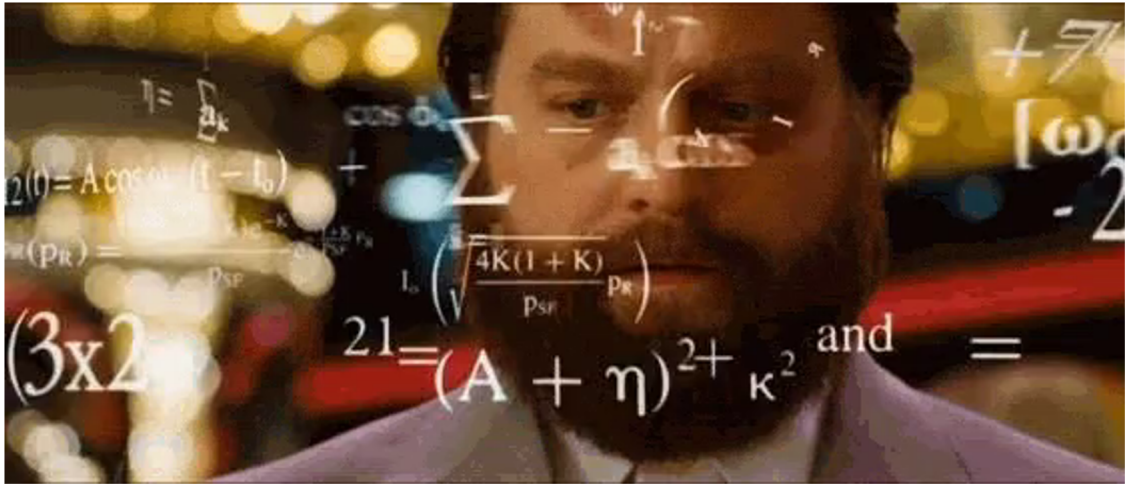
Convolution Laver



https://cs231n.github.io/convolutional-networks/

Why conv nets is better than fc?

Got it? Let's calculate parameters!



More convolutions!

$$\begin{bmatrix} 3 & 6 & 9 \\ 4 & 8 & 12 \\ 5 & 10 & 15 \end{bmatrix} = \begin{bmatrix} 3 \\ 4 \\ 5 \end{bmatrix} \times \begin{bmatrix} 1 & 2 & 3 \end{bmatrix}$$

Image 1: Separating a 3×3 kernel spatially

Spatial Separable Convolutions =

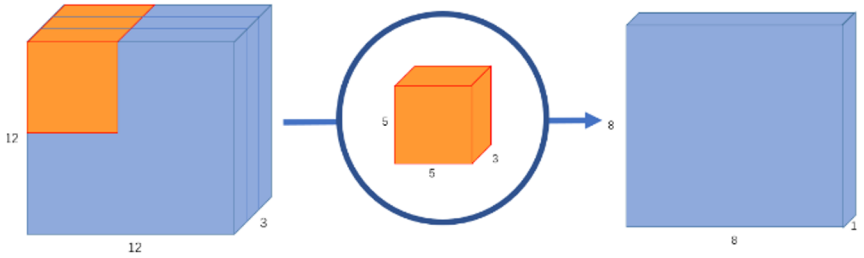


Image 4: A normal convolution with 8×8×1 output

Depthwise Separable Convolutions =
depthwise convolution + pointwise convolution

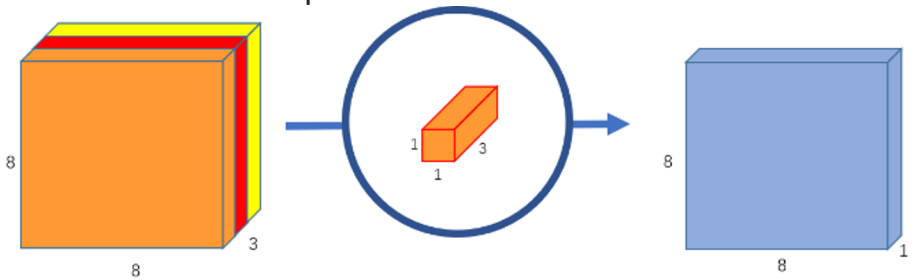


Image 7: Pointwise convolution, transforms an image of 3 channels to an image of 1 channel

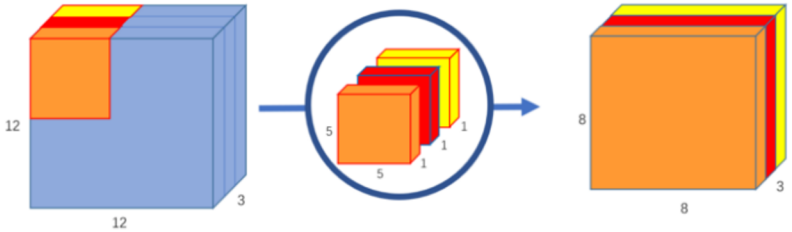
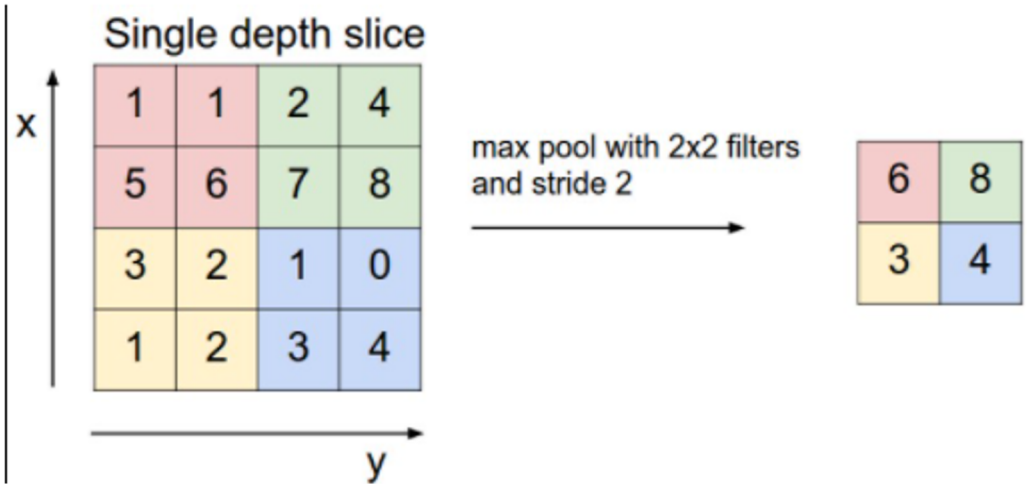


Image 6: Depthwise convolution, uses 3 kernels to transform a 12×12×3 image to a 8×8×3 image

https://towardsdatascience.com/a-basic-introduction-to-separable-convolutions-b99ec3102728

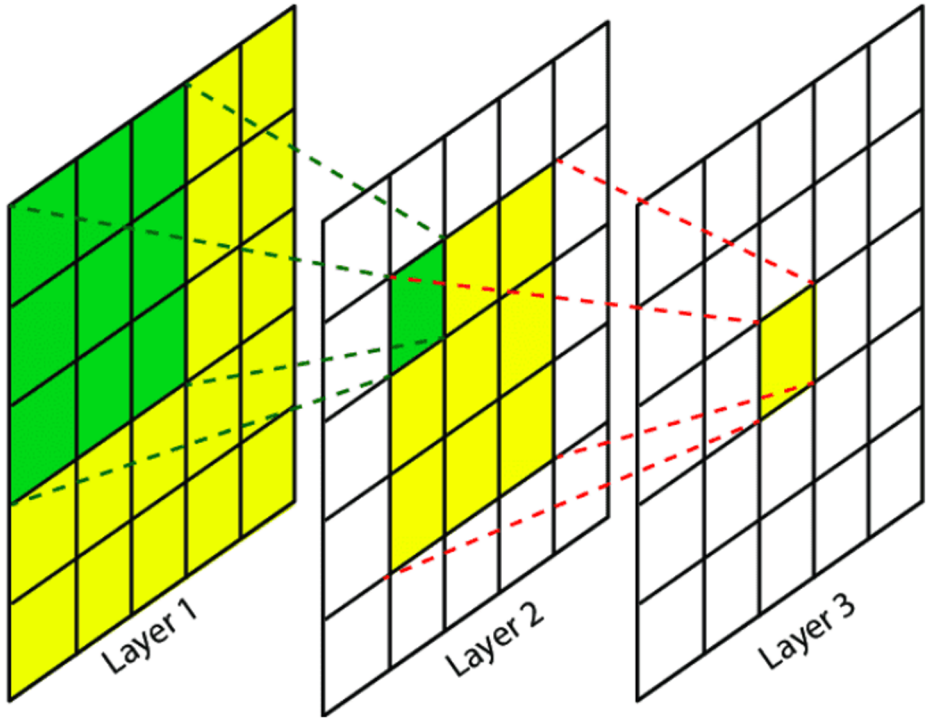
Max Pooling

"The pooling operation used in convolutional neural networks is a big mistake and the fact that it works so well is a disaster."



https://cs231n.github.io/convolutional-networks/

Idea of receptive field



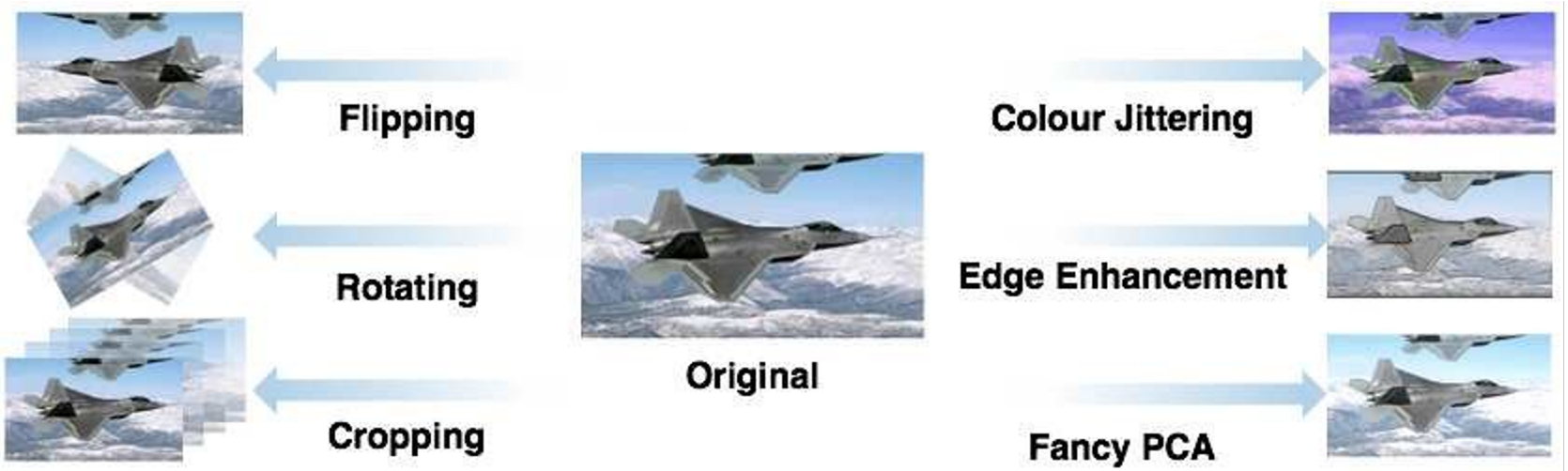
more info: https://theaisummer.com/receptive-field/

Invariance

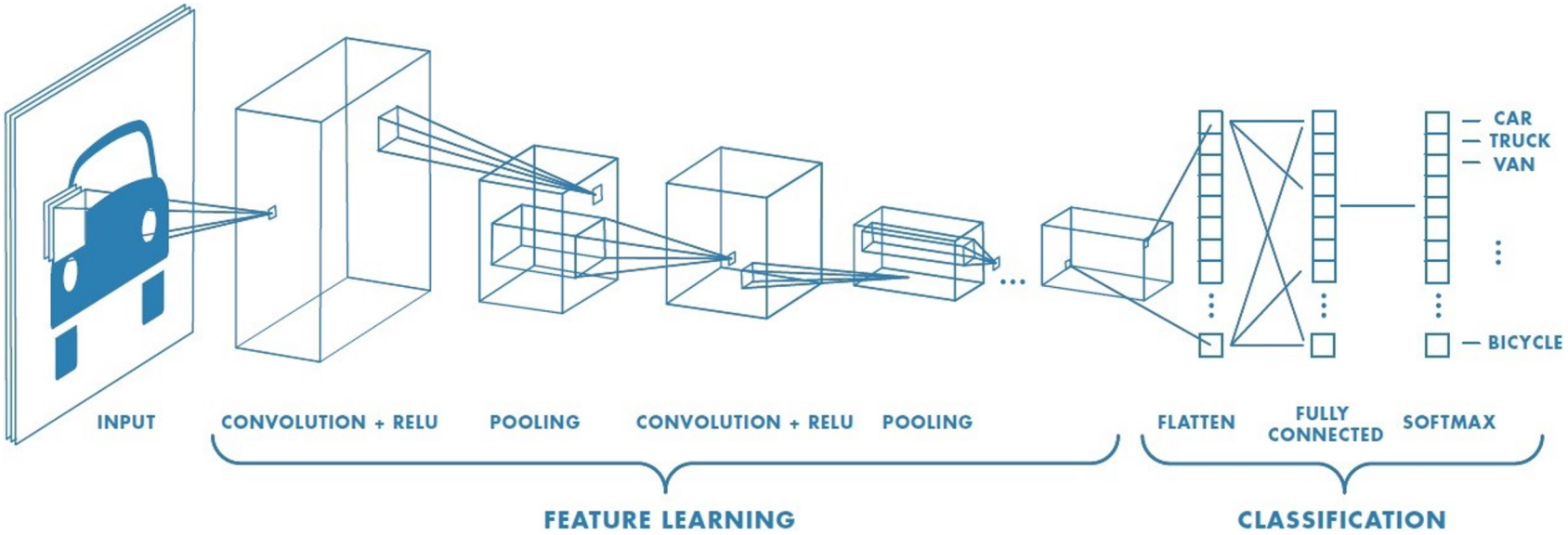
https://stats.stackexchange.com/questions/208936/what-is-translation-invariance-in-computer-vision-and-convolutional-neural-netwo

Augmentation

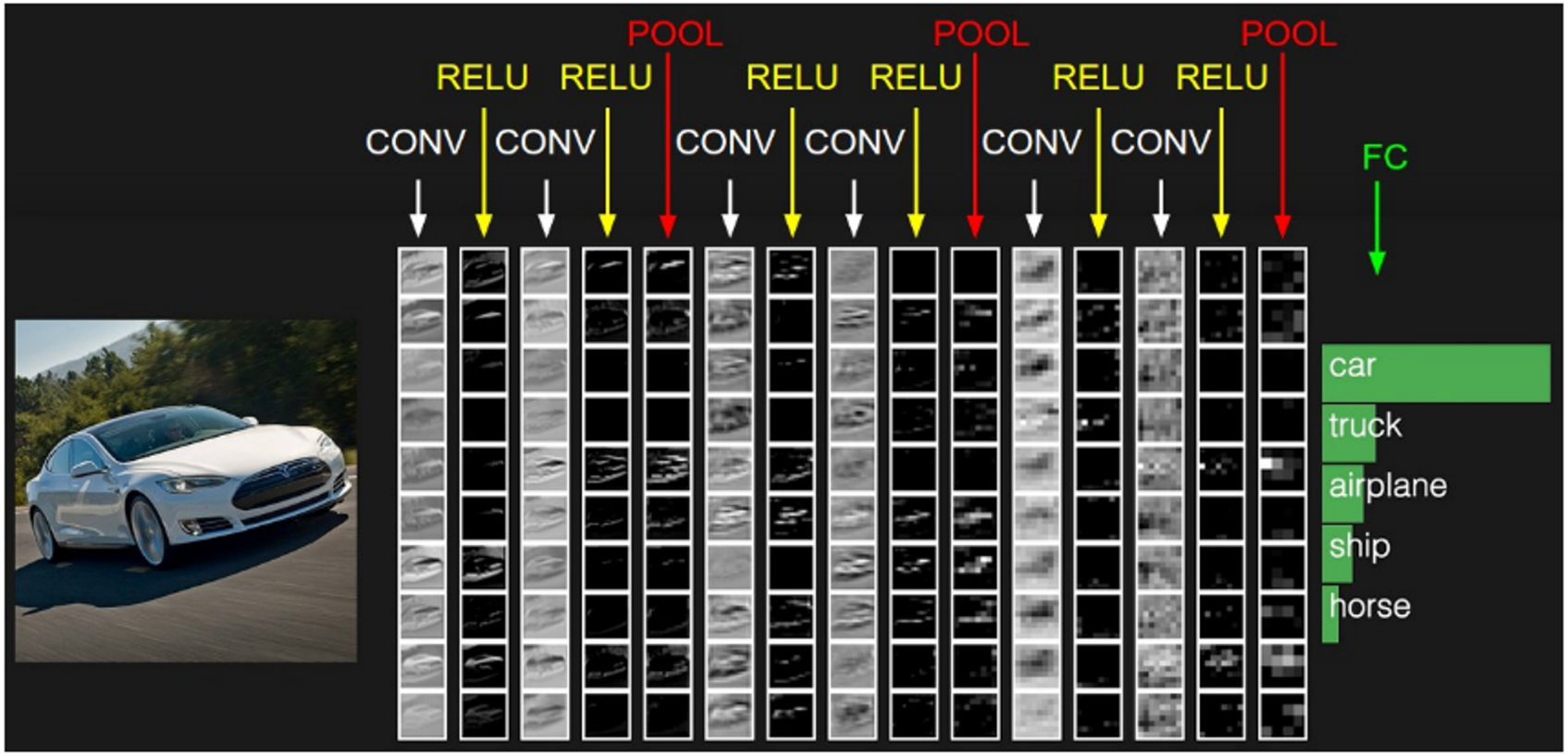
Enlarge your Dataset



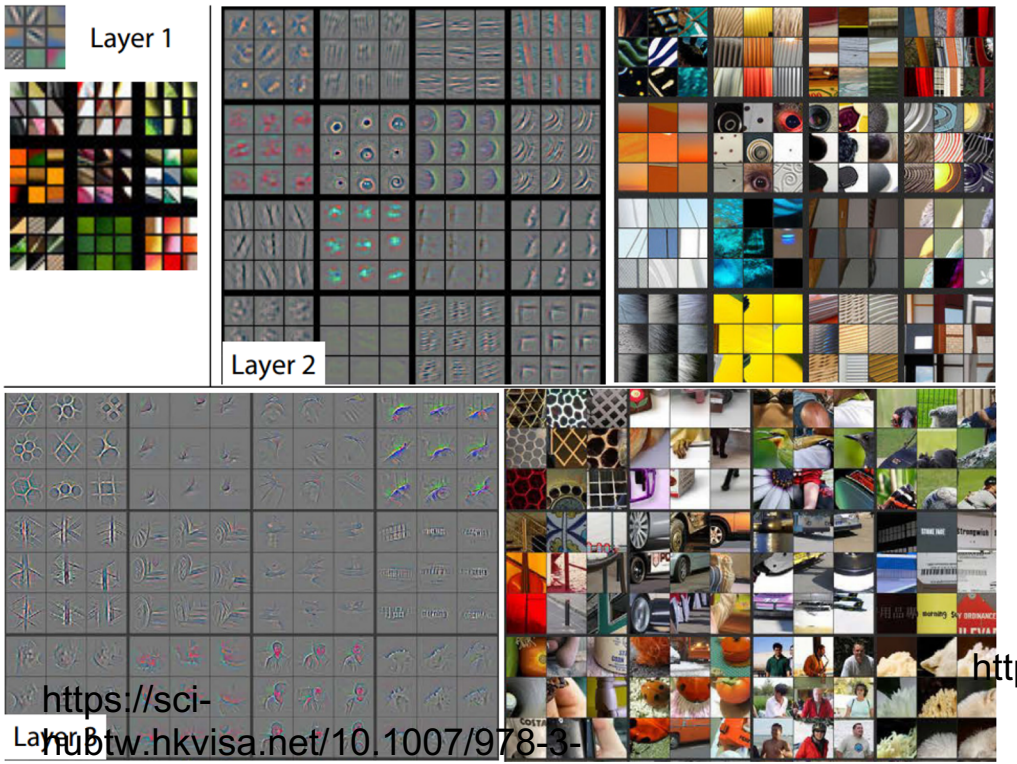
Convolutional NN

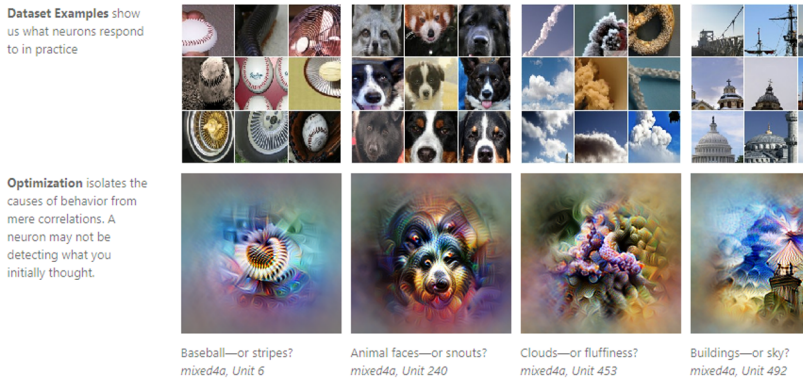


Convolutional NN



What CNN actually learn?





https://distill.pub/2017/feature-visualization/

https://sci-hubtw.hkvisa.net/10.1007/978-3-319-10590-1_53