Convolutional Neural Networks
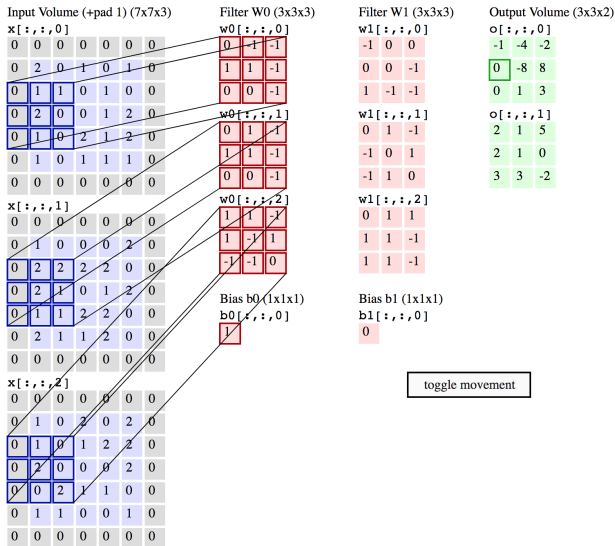
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November 17, 2017

CNN: Overview

- Applications: image classification, facial recognition, feature generation, etc.

- *Receptive fields of single neurons in the cat's striate cortex* (Hubel, 1959)

- Filters specialize to search for local patterns in an image

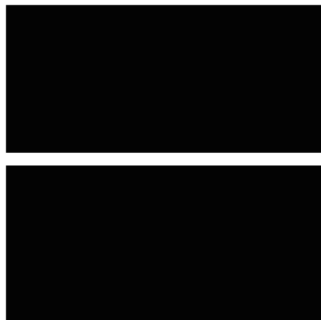- See http://cs231n.github.io/convolutional-networks/

Convolution

Filters

Vertical Filter   Horizontal Filter

Filters: Example

Actual Image · Vertical Filter · Horizontal Filter

Pooling

Single depth slice

1	1	2	4
5	6	7	8
3	2	1	0
1	2	3	4

max pool with 2x2 filters
and stride 2

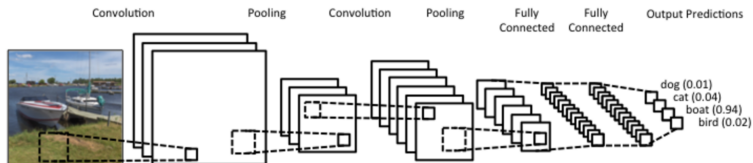| 6	8
3	4
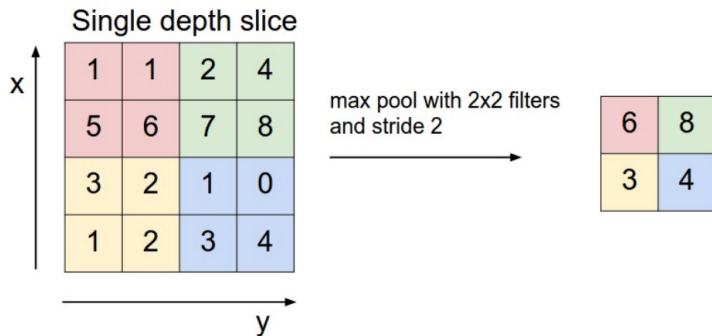
Pooling: Example

Actual Image

Max Pooling
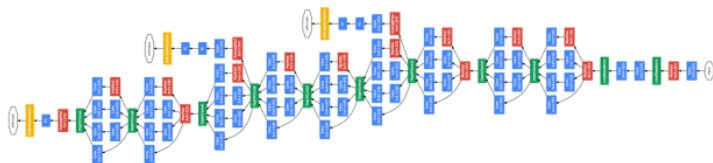
Convolutional Neural Network

Convolutional Neural Network: Example

Famous CNNs

- AlexNet

- Inception

- GoogLeNet

- ResNet

Inception: Example

- Reuse inception model on new training task
- Data: 500 pictures of Nike shoes, 500 pictures of Addidas shoes
- Freeze hidden layers and add a new output layer with two classes
- 85% test set accuracy (holdout set of 500 images)