Deep Learning for Images

I see what you mean...

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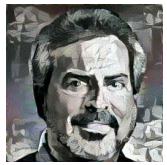
HOLBERTON school()

Class 2 - Q2 - 2016



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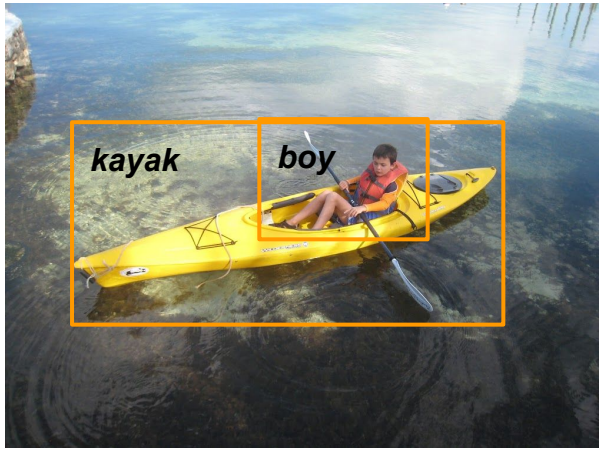
Fun with Images

***Image Classification**: kayak, boy*



Entity Detection

Face Recognition

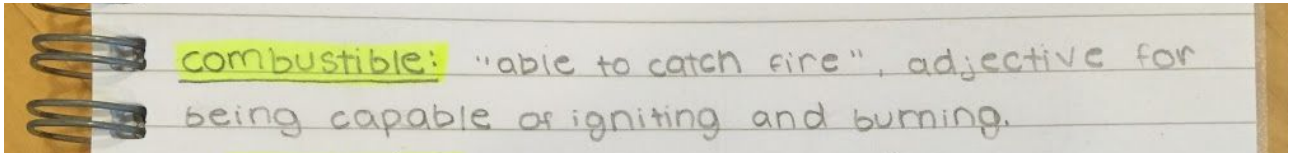
More Fun with Images

Image Captioning: *“A young boy wearing an orange vest riding a yellow kayak on water, with sunlight reflections.”*

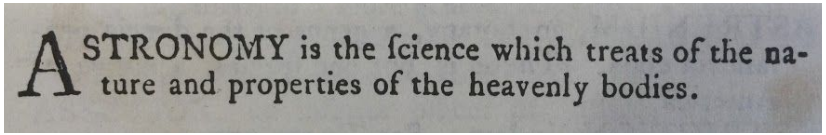
Image Segmentation

Pose Detection

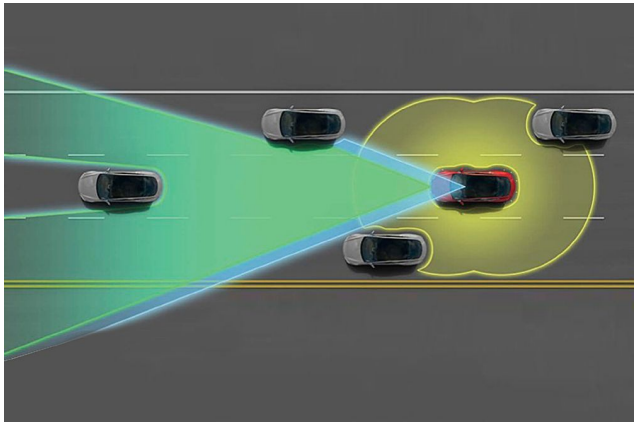
Yet more Fun with Images



Handwriting Recognition:
combustible: "able to catch fire", adjective for being capable of igniting and burning.



Optical Character Recognition (OCR):
Astronomy is the science which treats of the nature and properties of the heavenly bodies.



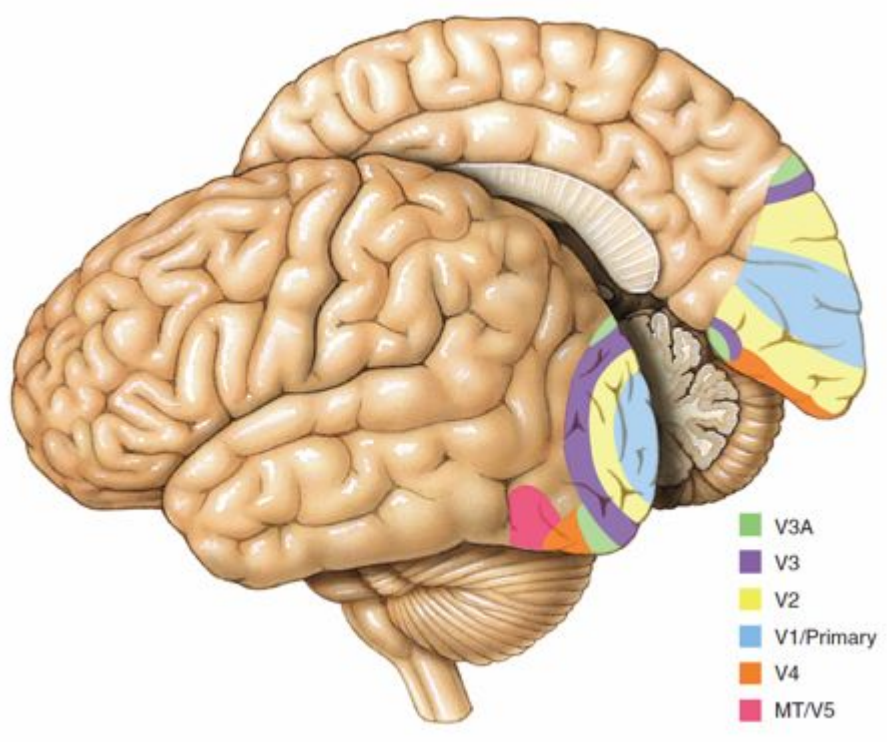
Autonomous Vehicles

Our Wet Hardware

Alternating layers of
- simple cells (filters)
- complex cells (combination)

Simple patterns to abstract concepts

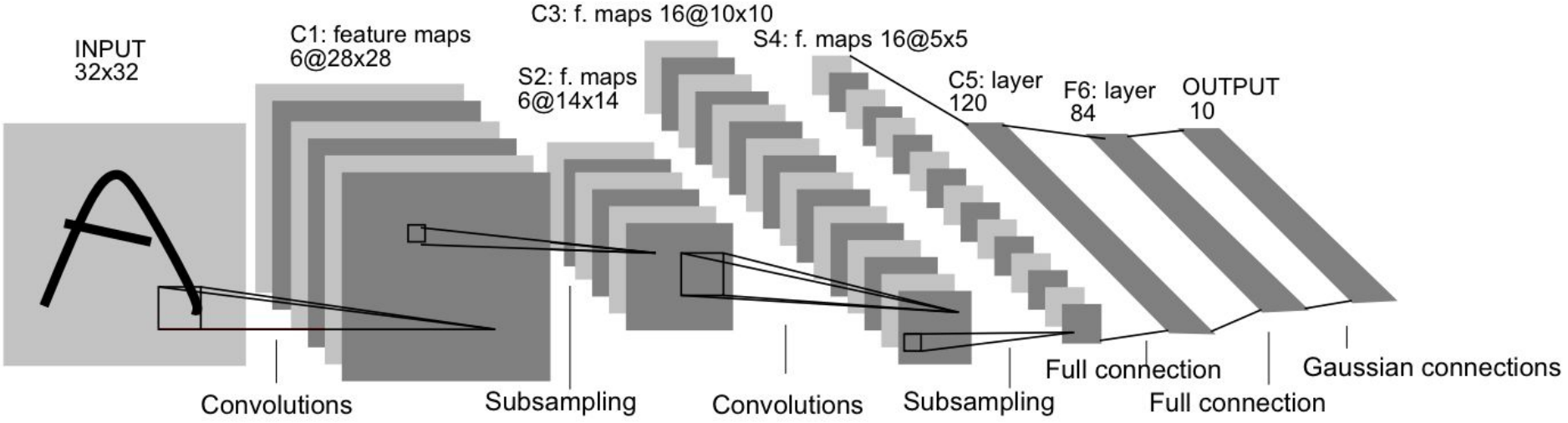
~ 5B neurons for vision



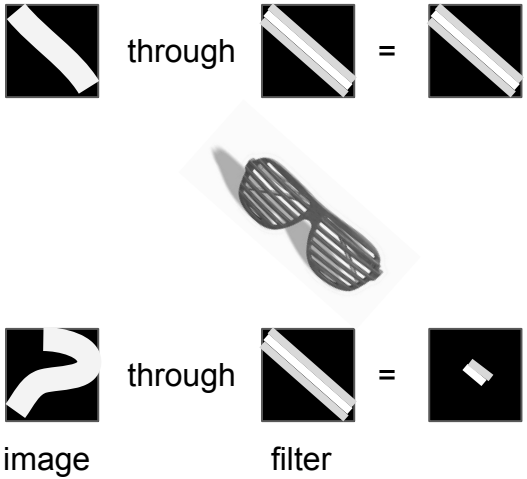
Convolutional Neural Network (ConvNet, CNN)

Suggested by Kunihiko Fukushima, 1980

LeNet, by Yann LeCun, 1998, to classify hand-written digits



Convolution: Applying a Filter to a Signal



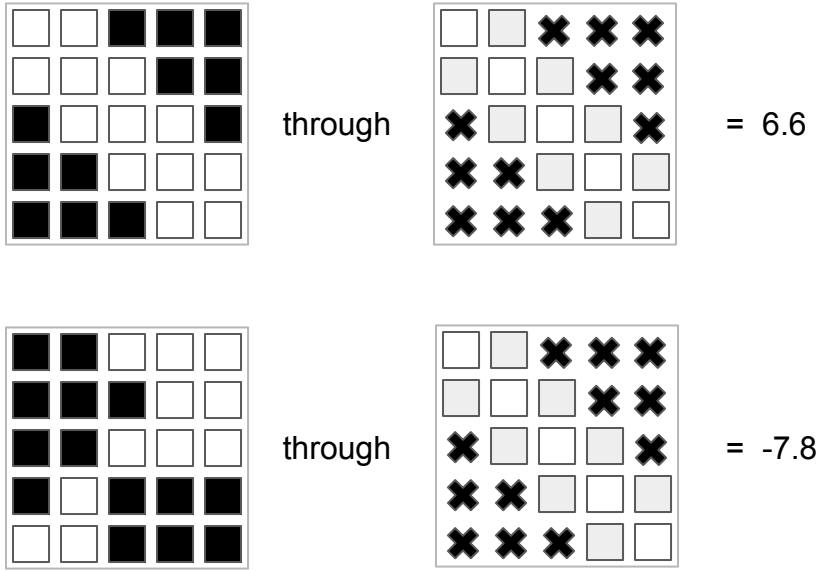
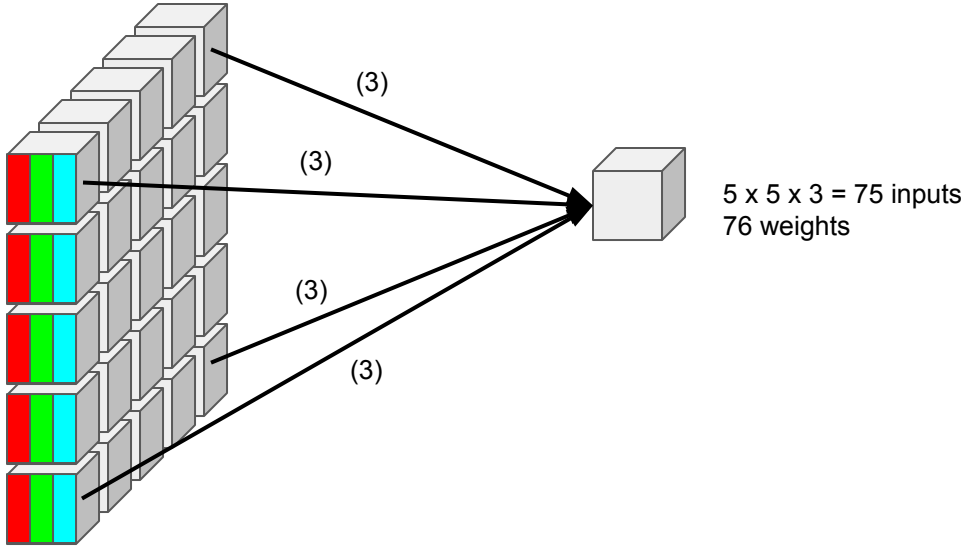


image
1.0
0.5
0.0

filter
1.0 - really want
0.2 - sort of want
-1.0 - don't want

Convolutional Layer - Basic Unit



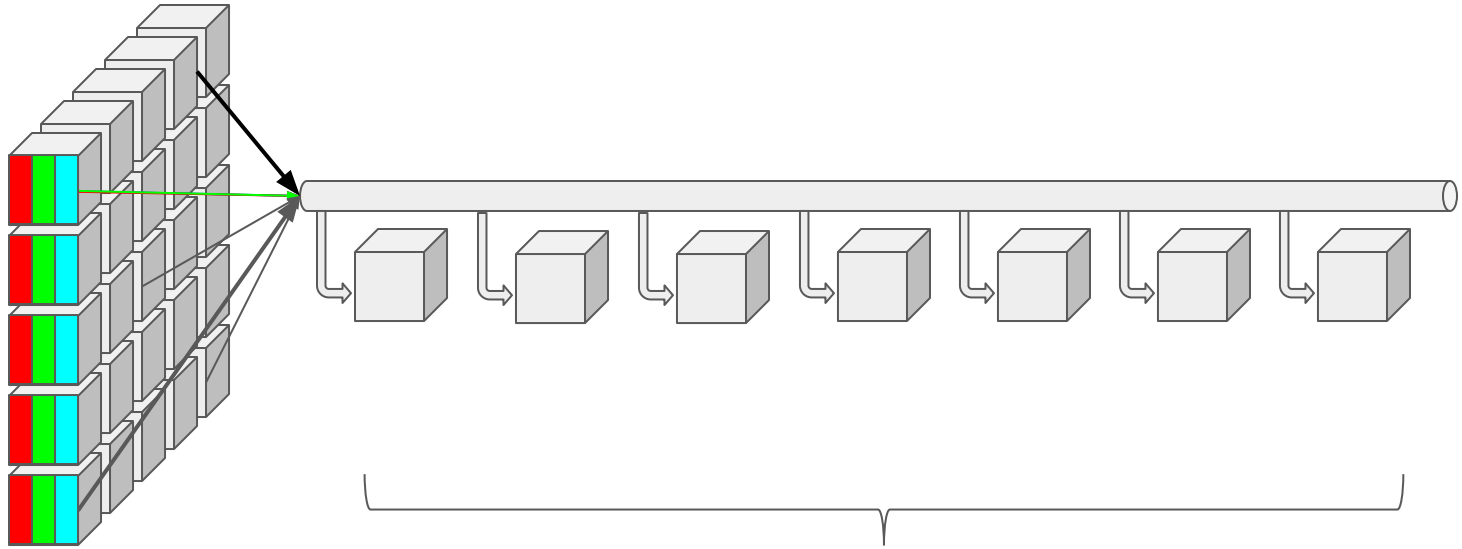
5x5x3 chunk of inputs

ReLU
neuron

Layer N

Layer N+1

Convolutional Layer: Add Depth



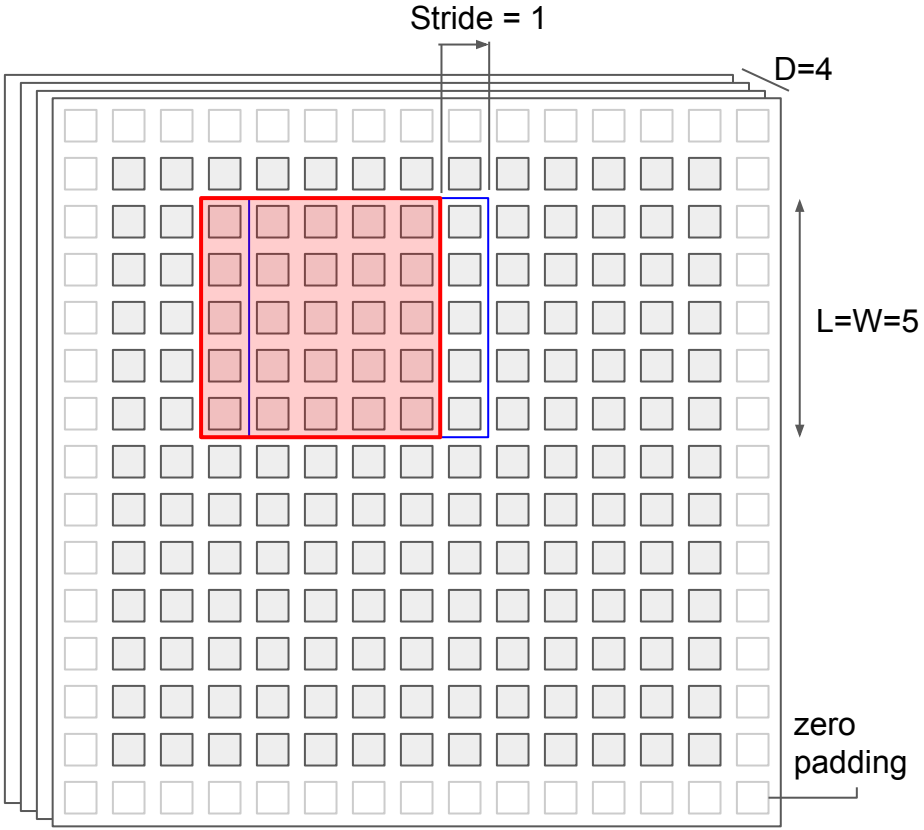
5x5x3 chunk of inputs

Depth = 7 ReLU neurons in parallel,
with different weights

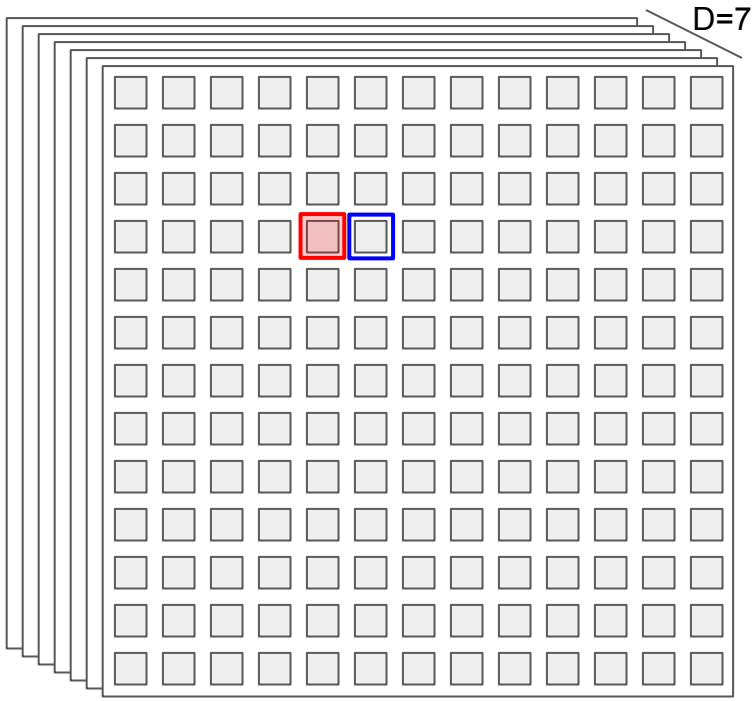
Layer N

Layer N+1

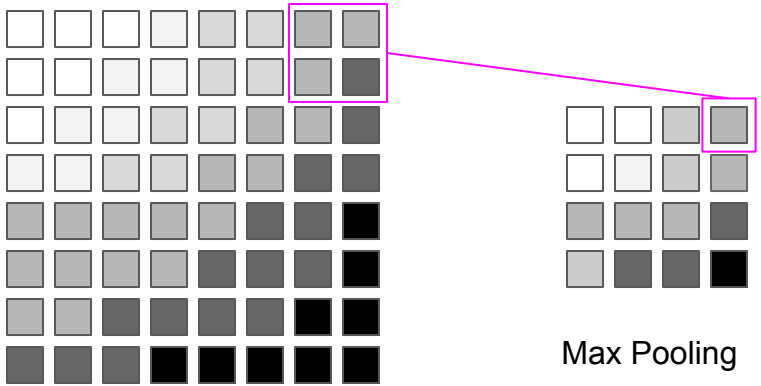
Convolutional Layer: Repeat over entire image



Shared weights!!!



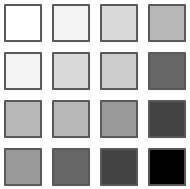
Pooling Layer: Squeeeeeze!



Layer N

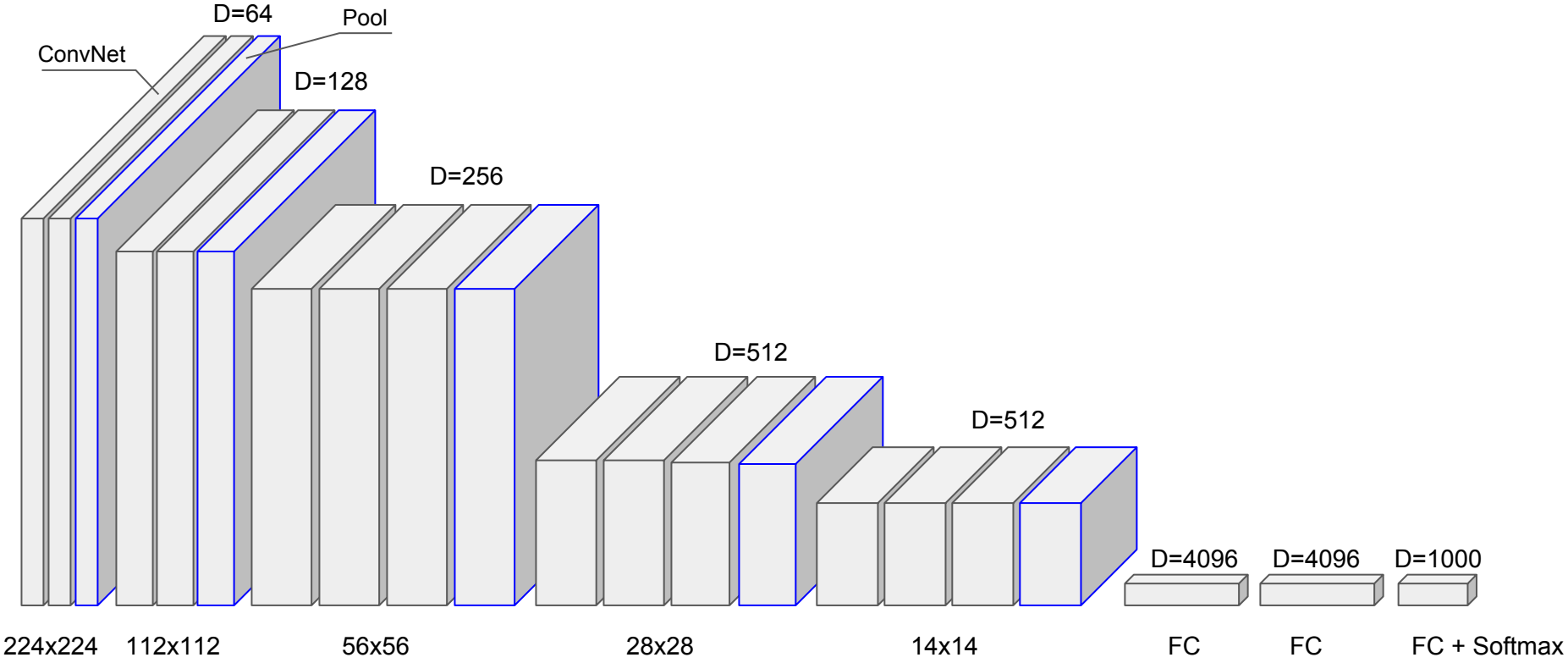
Max Pooling

Layer N+1

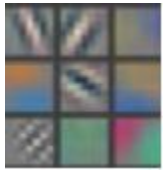


Average Pooling

Classical CNN topology - VGGNet (2013)



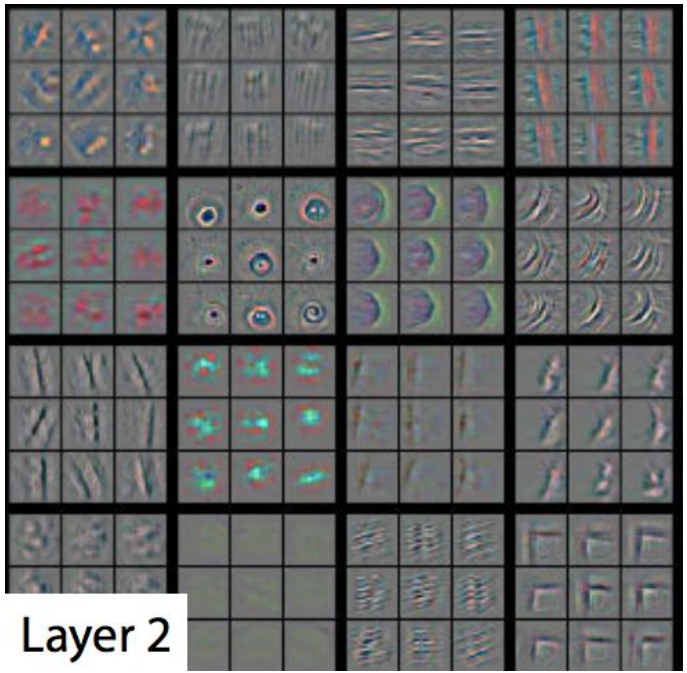
Layer 1

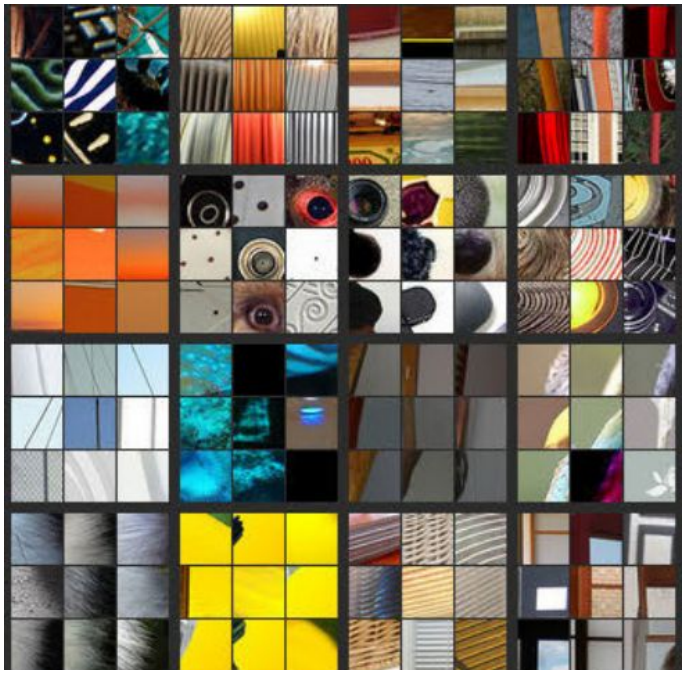


Filter

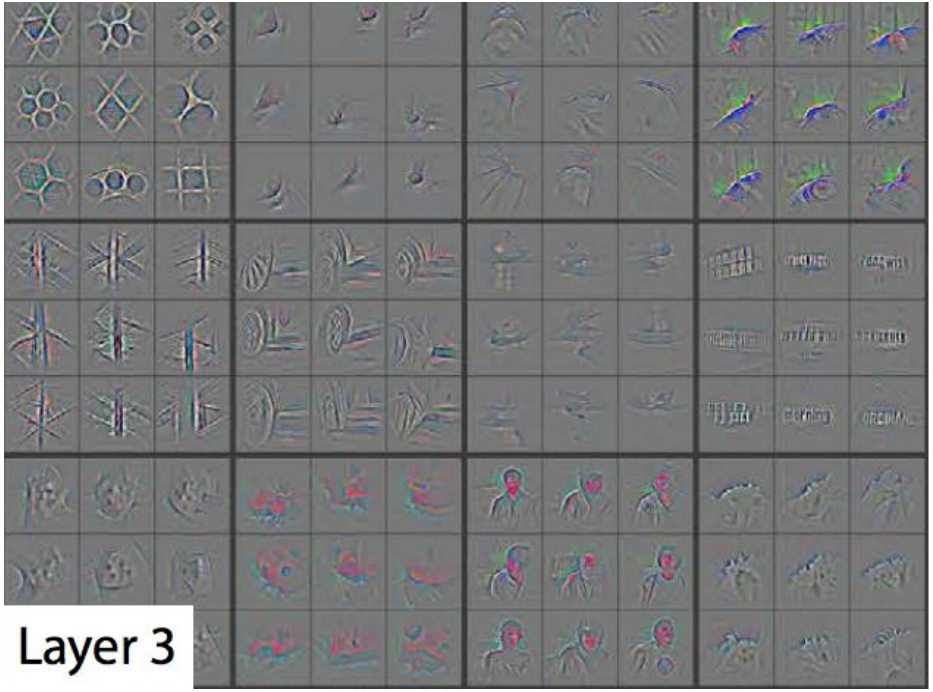
Matching images

Layer 2

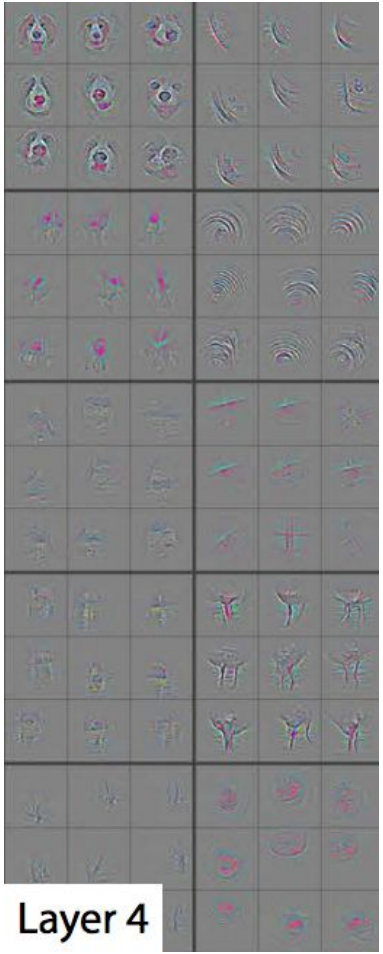


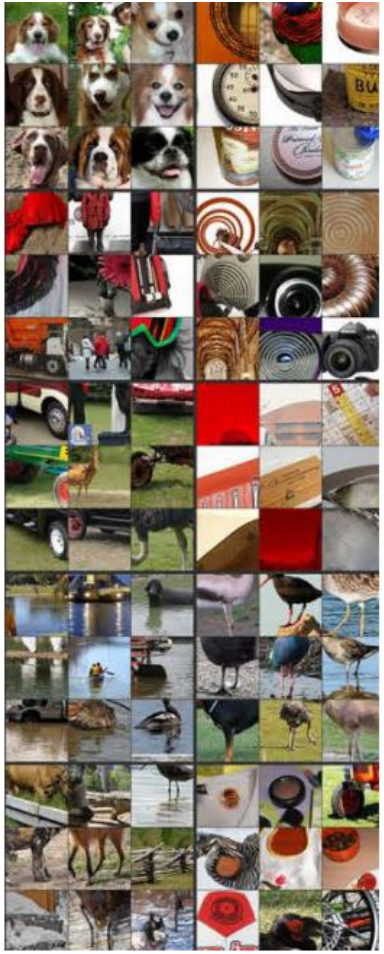


Layer 3



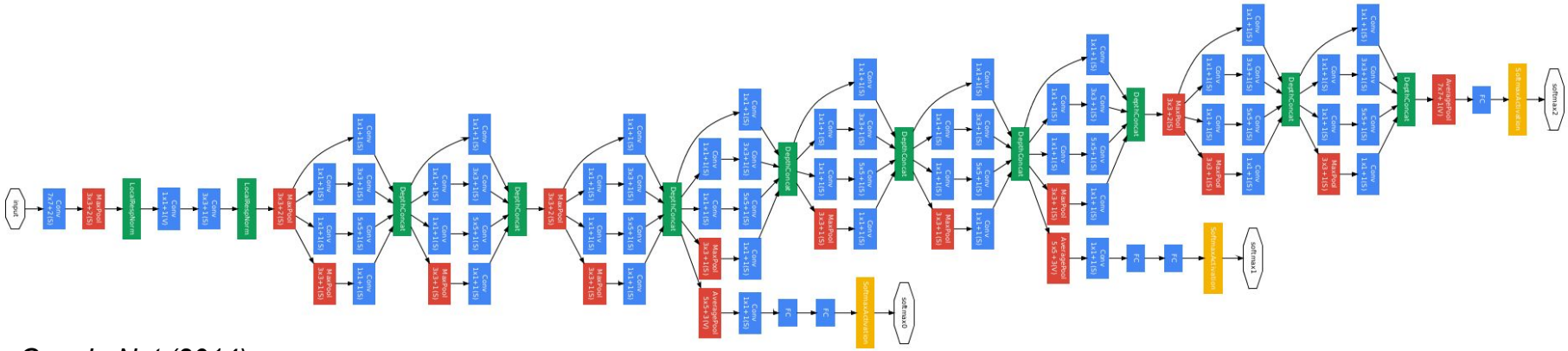
Layer 4



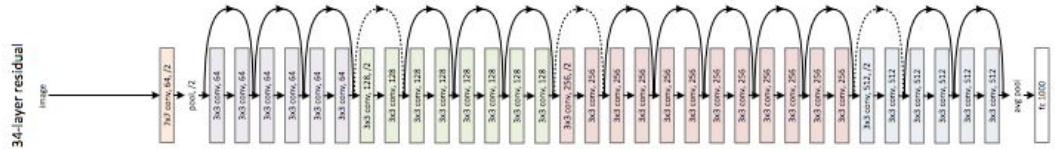


Layer 5

Modern ConvNet - GoogLeNet



GoogLeNet (2014)



ResNet-34 (2015)

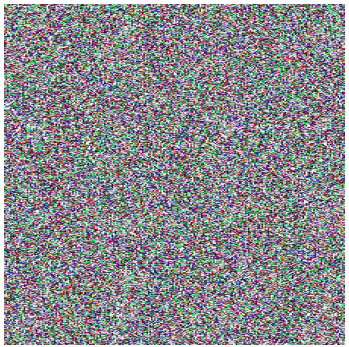
Manifolds

Real-life Data vs Random Data

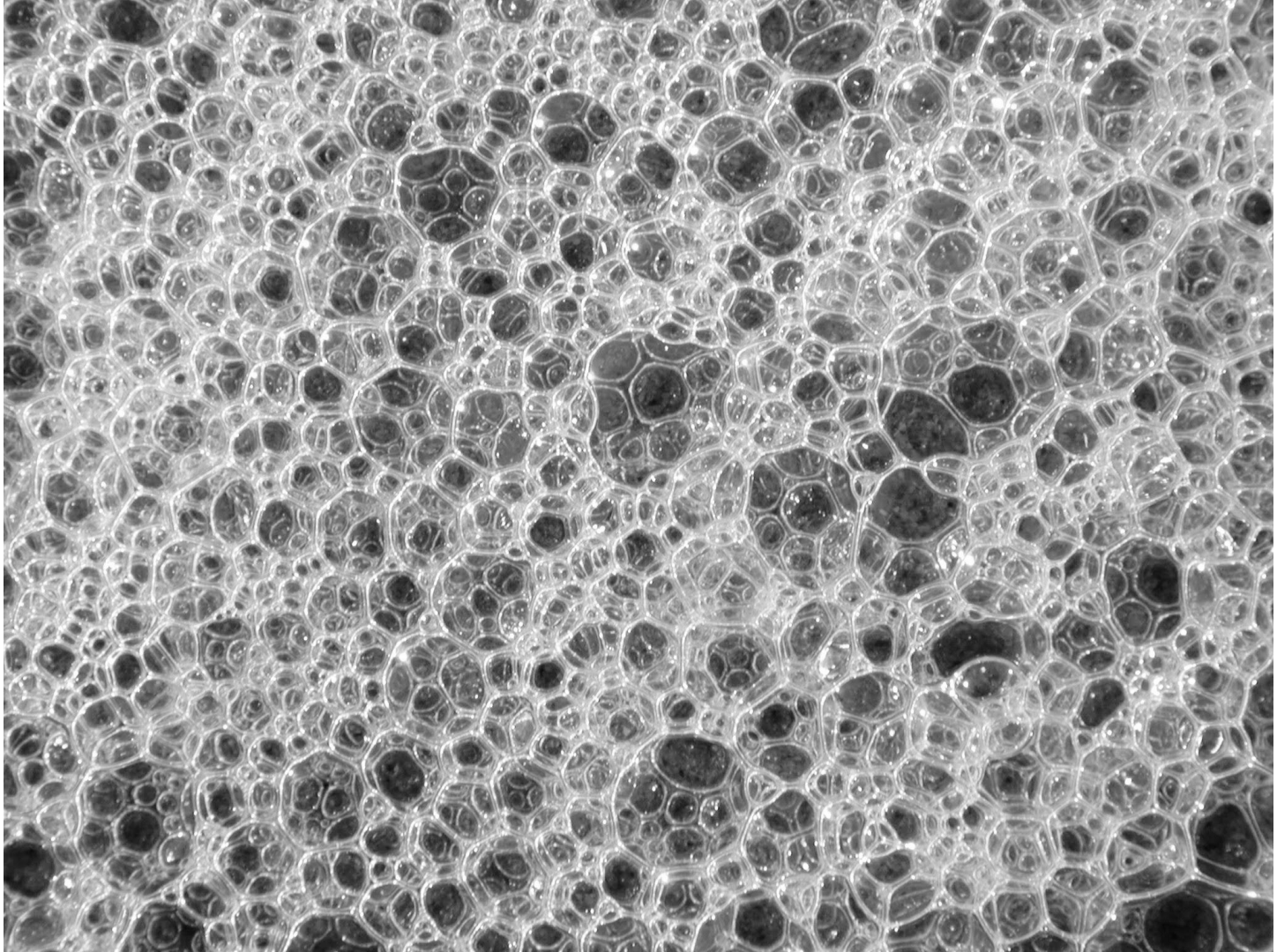
If music be the food of love, play on!
-- William Shakespeare

3Flr'kI5;LS3oLj1xK52,BA1 Rea5lYSf
-- 1000 monkeys typing

-- Real world

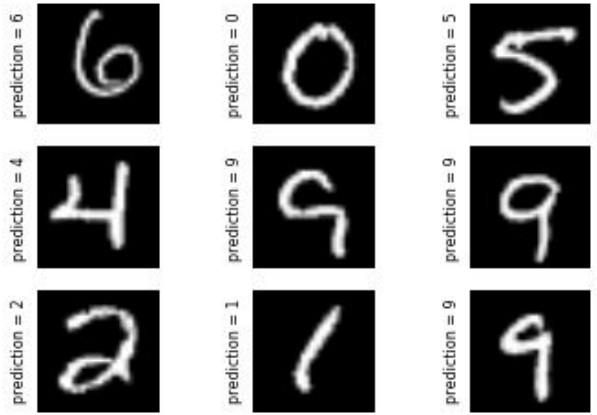


-- Random Pixels



Workshop : Keras & MNIST

https://github.com/holbertonschool/deep-learning/tree/master/Class%20%232



Workshop : Keras & CIFAR 10

https://github.com/holbertonschool/deep-learning/tree/master/Class%20%232