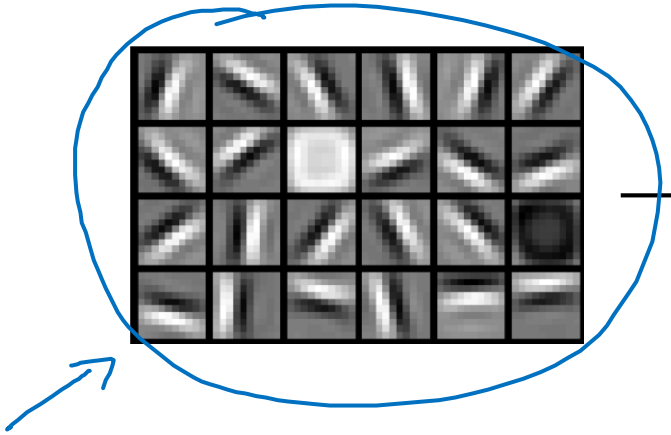
deeplearning.ai

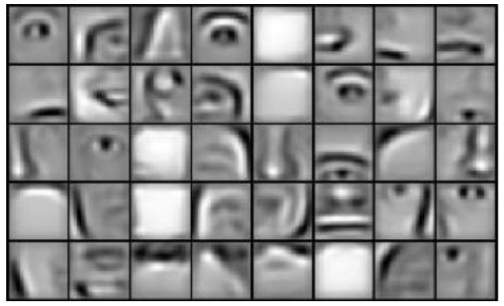
Convolutional Neural Networks

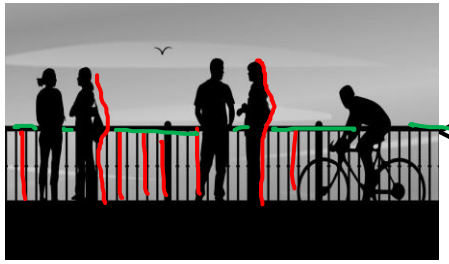
Edge detection example

The convolutional operation is one of the fundamental building blocks of a convolutional neural network

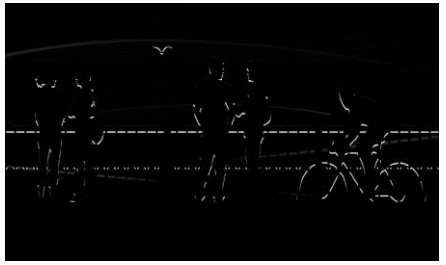
Computer Vision Problem







vertical edges



horizontal edges

Vertical edge detection

$3\times1 + 1\times1 + 2\times1 + 0\times0 + 5\times0 + 7\times0 + 1\times-1 + 8\times-1 + 2\times-1 = -5$

3	0	1	2	7	4
1	5	8	9	3	1
2	7	2	5	1	3
0	1	3	1	7	8
4	2	1	6	2	8
2	4	5	2	3	9

6 x 6

"convolution"

take 6*6 image and convolve it with 3 by filter.

And convolutional operation is denote by this asterisk

$*$

1	0	-1
1	0	-1
1	0	-1

3 x 3

$=$

-5	-4	0	8
-10	-2	2	3
0	-2	-4	-7
-3	-2	-3	-16

4 x 4

Pooling 池化

-> filter / kernel

And this turns out to be a vertical edge detector.

And because this is a grayscale image, this is just a 6*6*1 matrix, rather than 6*6*3, because there aren't separate RGB channels.

python: comv_forward
tensorflow:tf.nn.conv2d
keras: Conv2D

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Vertical edge detection

And the convolution operation gives you a convenient way to specify how to find these vertical edges in an image.

10	10	10	0	0	0
10	10	10	0	0	0
10	10	10	0	0	0
10	10	10	0	0	0
10	10	10	0	0	0
10	10	10	0	0	0

6 x 6

*

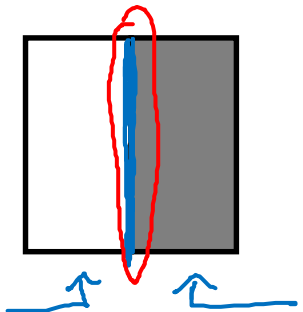
1	0	-1
1	0	-1
1	0	-1

3 x 3

=

0	30	30	0
0	30	30	0
0	30	30	0
0	30	30	0

4 x 4



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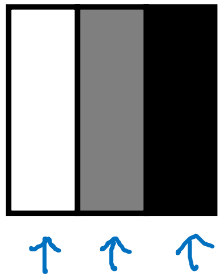

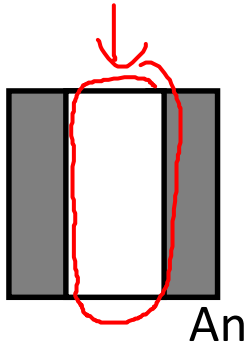

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