



deeplearning.ai

Convolutional Neural Networks

More edge
detection

Vertical edge detection examples

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



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	10	10	10



*

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



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



*

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




=

0	-30	-30	0
0	-30	-30	0
0	-30	-30	0
0	-30	-30	0




Vertical and Horizontal Edge Detection



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

Vertical



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

Horizontal

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

6x6

*



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

=

0	0	0	0
30	10	-10	-30
30	10	-10	-30
0	0	0	0

Learning to detect edges

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



→

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

Sobel filter



convolution



W_1	W_2	W_3
W_4	W_5	W_6
W_7	W_8	W_9

3×3

=

$\begin{bmatrix} 45^\circ \\ 70^\circ \\ 73^\circ \end{bmatrix}$

3	0	-3
10	0	-10
3	0	-3

Scharr filter





Andrew Ng

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