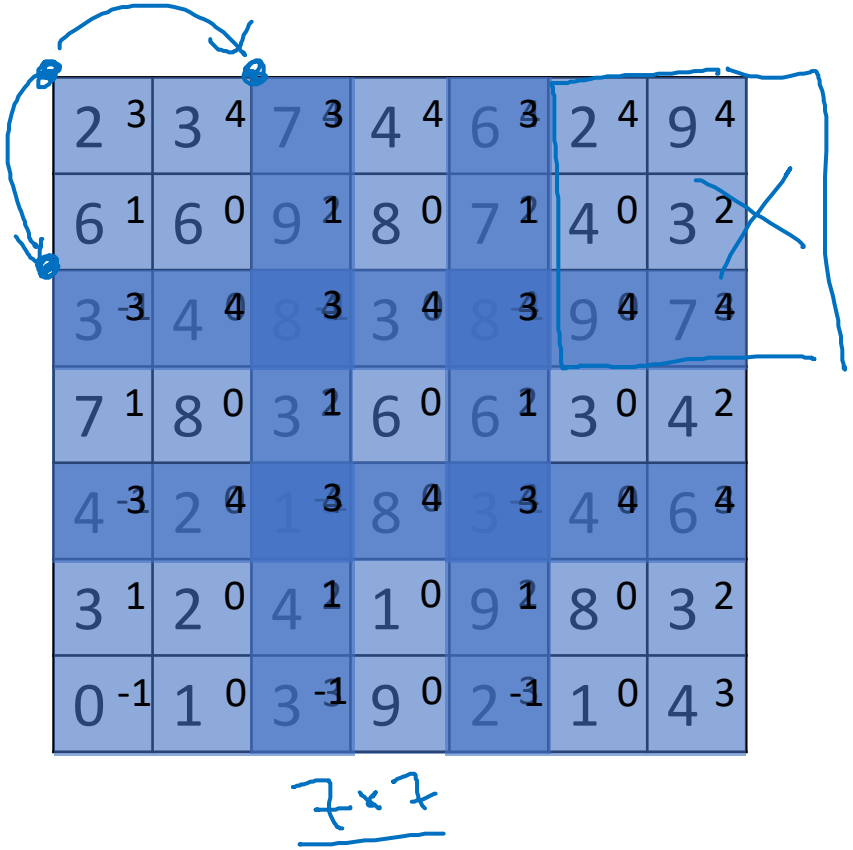
deeplearning.ai

Convolutional Neural Networks

Strided convolutions

Strided convolution



If after taking the stride, the filter goes out of the boundary, then omit it. That's why we use the floor() operation.

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3	4	4
1	0	2
-1	0	3

3×3

stride = 2

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91	100	83
69	91	127
44	72	74

3×3

$\lfloor z \rfloor = \text{floor}(z)$

$\lfloor \ \rfloor$ Floor Operation

$n \times n$ * $f \times f$

padding p stride s

$s = 2$

$$\left\lfloor \frac{n+2p-f}{s} + 1 \right\rfloor \times \left\lfloor \frac{n+2p-f}{s} + 1 \right\rfloor$$

$\frac{7+0-3}{2} + 1 = \frac{4}{2} + 1 = 3$

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Summary of convolutions

$n \times n$ image $\quad f \times f$ filter

padding p $\quad$ stride s

Output size:

$$\left\lfloor \frac{n+2p-f}{s} + 1 \right\rfloor \times \left\lfloor \frac{n+2p-f}{s} + 1 \right\rfloor$$

Technical note on cross-correlation vs. convolution

cross-correlation doesn't need to perform the double-mirror flipping operation.

Convolution in math textbook:

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

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3	4	5
1	0	2
-1	9	7

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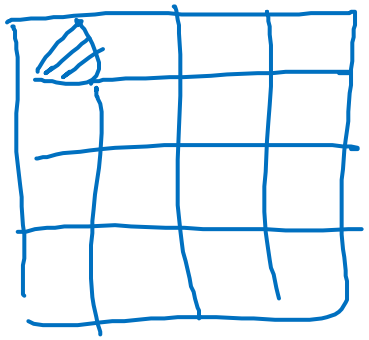

7	2	5
9	0	4
-1	1	3

$(A * B) * C = A * (B * C)$

Convolution needs this double-mirror flipping operation to enjoy the associativity.

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