

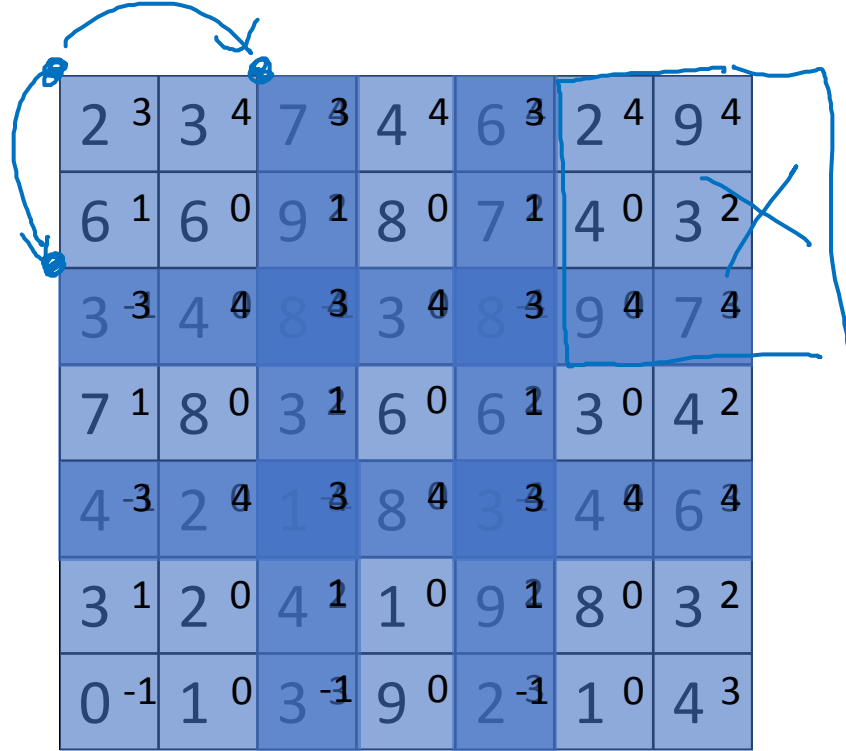


deeplearning.ai

Convolutional Neural Networks

Strided convolutions

Strided convolution



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

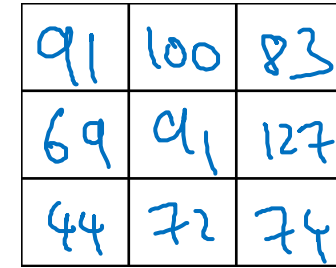
7x7

*

3	4	4
1	0	2
-1	0	3

3x3

=



91	100	83
69	91	127
44	72	74

3x3

Stride = 2

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

$n \times n$ * $f \times f$
 padding p stride s
 $s = 2$

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

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

Summary of convolutions

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

padding p stride s

Output Size:

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

Technical note on cross-correlation vs. convolution

Convolution in math textbook:

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

$*$

3	4	5
1	0	2
-1	9	7

7	2	5
9	0	4
-1	1	3

A hand-drawn 4x4 grid. The top-left cell (row 1, column 1) is shaded with diagonal lines. To the left of the grid, there are two vertical lines, possibly representing a margin or a list item.

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