

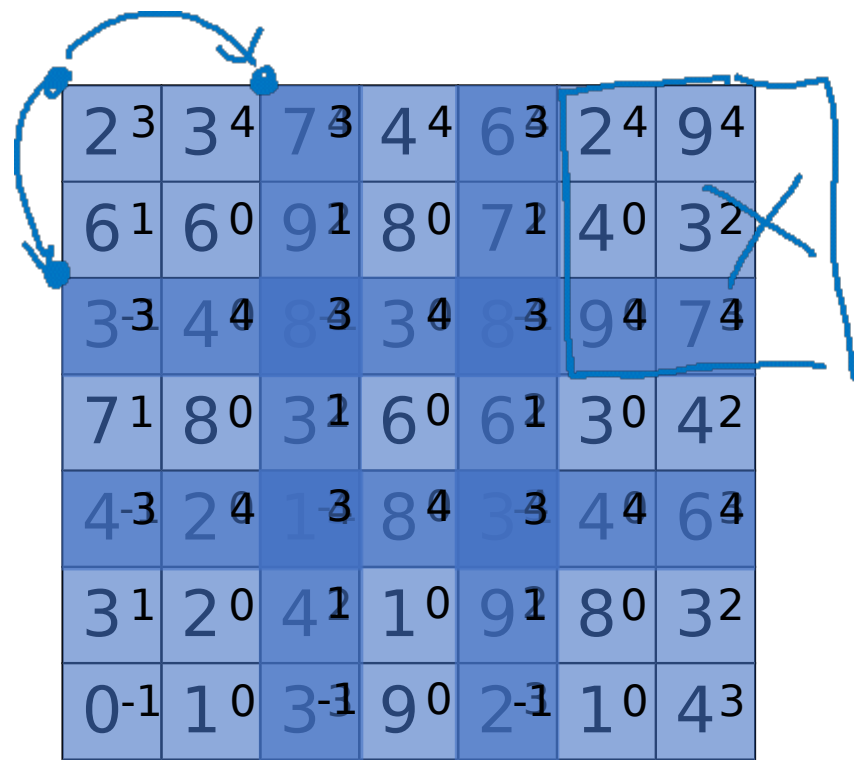


deeplearning.ai

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

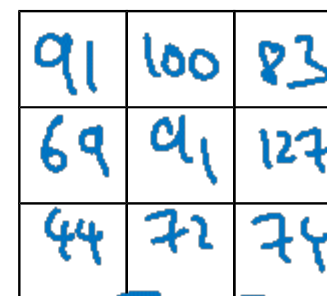
7x7

*

3	4	4
1	0	2
-1	0	3

3x3

=



91	100	83
69	91	127
44	72	74

3x3

stride = 2

$\lfloor \frac{7}{2} \rfloor = \text{floor}(\frac{7}{2})$

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

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

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 ⁷	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

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