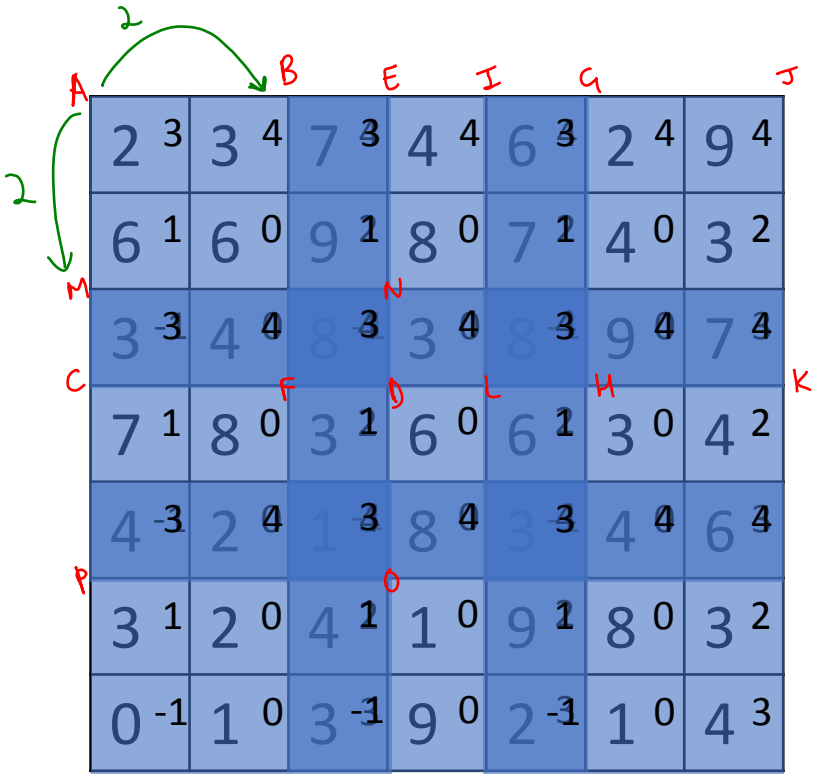
deeplearning.ai

Convolutional Neural Networks

Strided convolutions

Strided convolution

Say Stride = 2



1st convolution is, AECD * Filter

2nd is BGHF * Filter

3rd is IJKL * Filter

4th is MNOP * Filter

$$* \begin{bmatrix} 3 & 4 & 4 \\ 1 & 0 & 2 \\ -1 & 0 & 3 \end{bmatrix} = \begin{bmatrix} & & \\ & & \\ & & \end{bmatrix}$$

$n \times n$ Image (7×7)

$f \times f$ filter (3×3)

padding "p" ($p = 0$)

stride "s" ($s = 2$)

$\Rightarrow$ output Image

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

$$= \left(\frac{7+0-3}{2}+1, \frac{7+0-3}{2}+1\right)$$

$$= (3 \times 3)$$

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Summary of convolutions

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

padding p $\quad$ stride s

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

Round down if the output image is NOT an integer

Technical note on cross-correlation vs. convolution

What we technically do is NOT the convolution operation, rather we do cross correlation

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

*

3	4	5
1	0	2
-1	9	7

Actual convolution b/w Image & Filter uses a transposed version of the filter

7	2	5
9	0	4
-1	1	3

correct filter for convolution

(However, for our purposes, we wont do this transform) → Also, we will call our normal matrix mult. "convolution" Instead of cross correlation

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