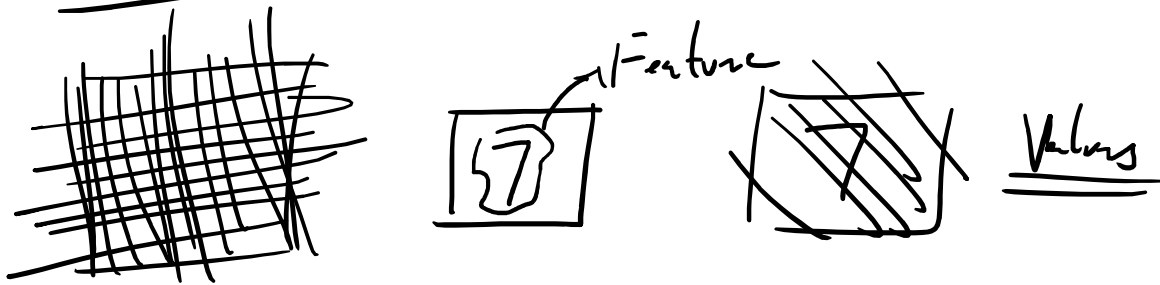
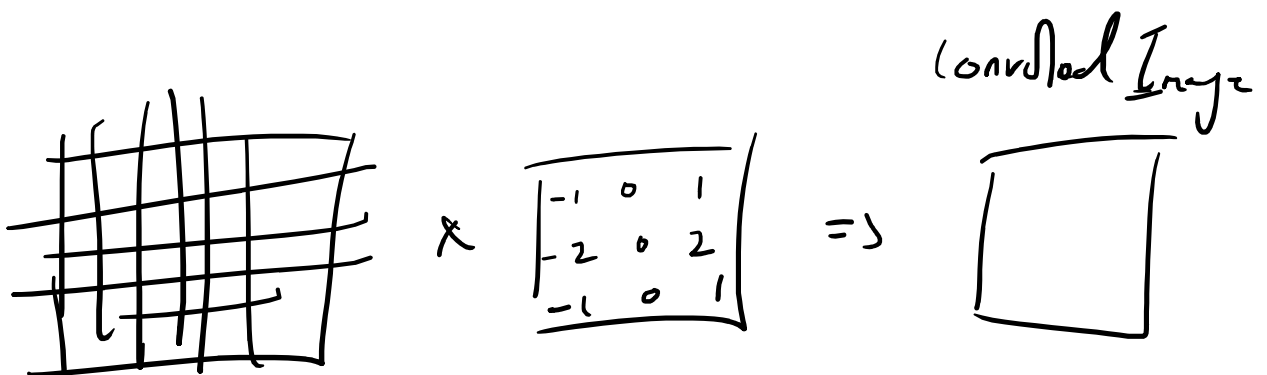
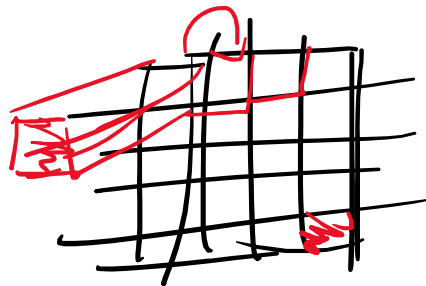


M.L 4 : CNN

# Convolutional Neural N/w



=> Convolution : Filter Application (Kernels)



5x5

9	7	2	4	0
1	0	6	2	9

3x3

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

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

1st  $\Rightarrow 9 \times -1 + 1 \times 0 + 2 \times 1 + 1 \times -2 + 8 \times 0 + 6 \times 2 + 0 \times -1$   
 $+ 2 \times 0 + 5 \times 1 =$

2nd  $\Rightarrow 7 \times -1 \dots \dots =$

$\Rightarrow$  Determine the dimension of convolved image.

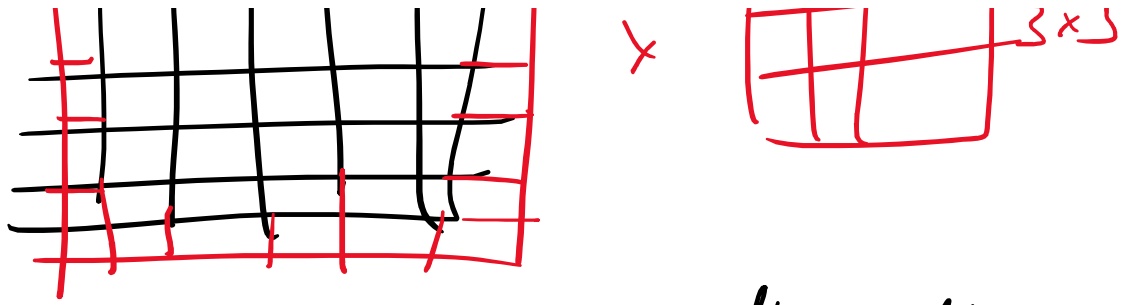
$$D_{CI} = \left[ \frac{\text{Dimension of Image} - \text{Size of filter}}{\text{Strides}} \right] + 1$$

Eg:  $\left( \frac{5-3}{1} \right) + 1 = \frac{2}{1} + 1 = \underline{3}$

Padding: This add arbitrary pixels on the edges of images.

7x7


3x3

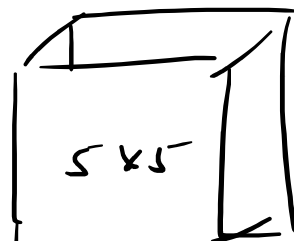
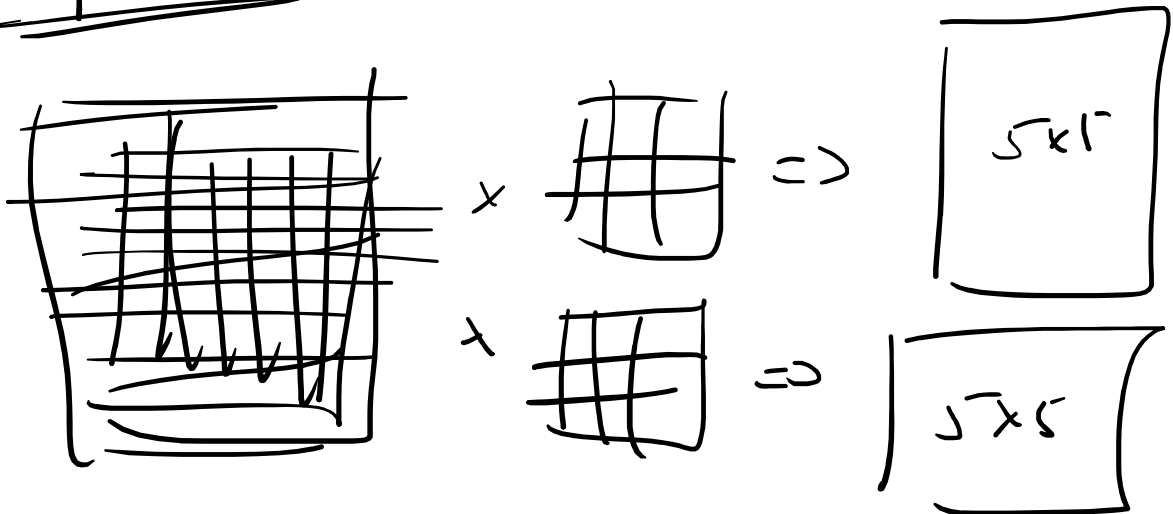



⇒ Dimension of convolved image after padding:

$$D_{ic}^p = \left[ \frac{\text{Dim of Image} - \text{Size of filter} + (2 \times \text{padding})}{\text{strides}} \right] + 1$$

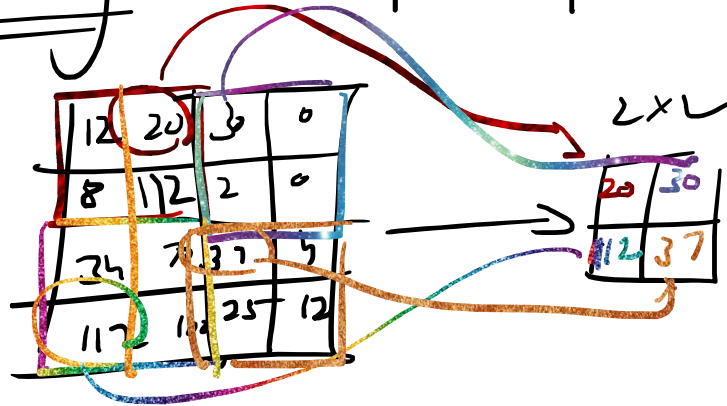
$$= \left[ \frac{5 - 3 + 2}{1} \right] + 1 = \underline{\underline{5}} \quad (5 \times 5)$$

⇒ Multiple filters



5x5

⇒ Max-Pooling : Retain important features



$$\text{Dim}_{MP} = \left\lceil \frac{\text{Dim of Image} - \text{Size of filter} + (2 \times \text{padding})}{\text{Strides}} \right\rceil + 1$$

