

# Some key terms and concepts


## Frequency in images

frequency in image is a rate of change.

images change in space.

e.g., when the level of brightness changes quickly from one pixel to the next.

most images have both.

High-frequency components 

edges of objects in image

## filters

used in images to filter out noise or  
amplify some features



## High-pass filters

a filter that sharpens an image



enhance high frequency regions  
it creates edges/boundaries



## Convolution Kernels

Conv. Kernel = a matrix of numbers that modifies image.

0	-1	0
-1	4	-1
0	-1	0

edge detection filter

$$\sum \text{cell} = 0$$

this filter, intuitively, wants to subtract the blue cells from the middle cell.

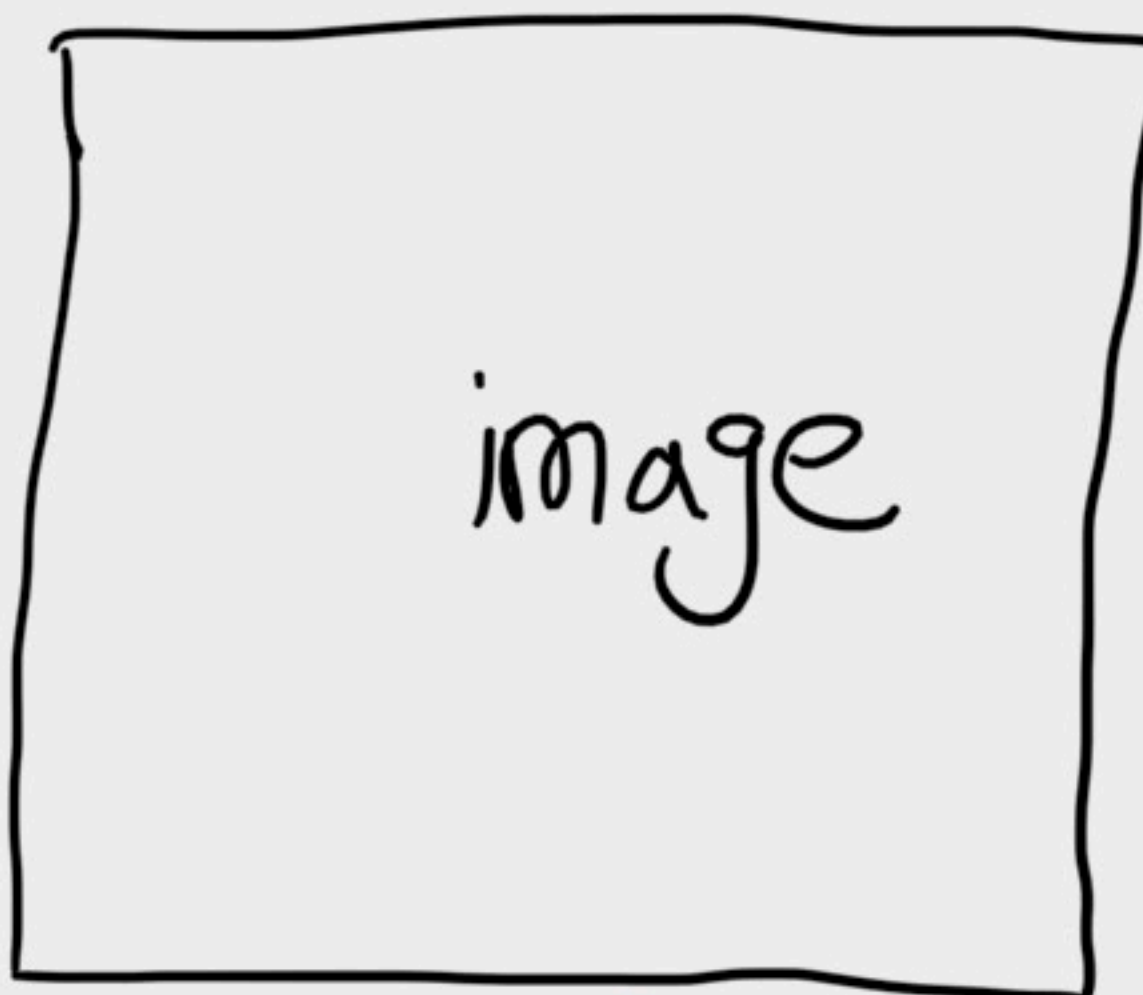


# Convolution

0	-1	0
-1	4	-1
0	-1	0

K

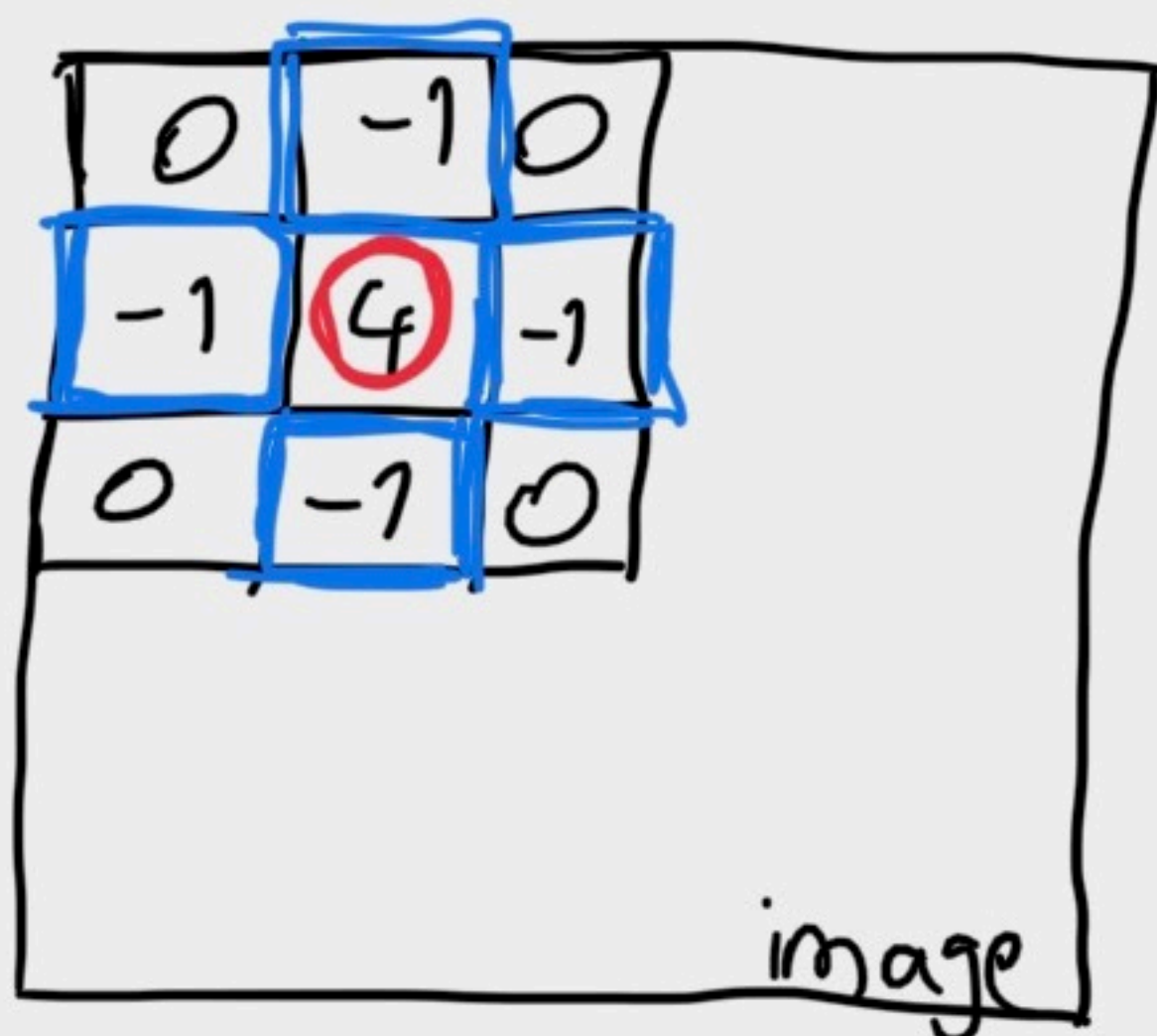
\*



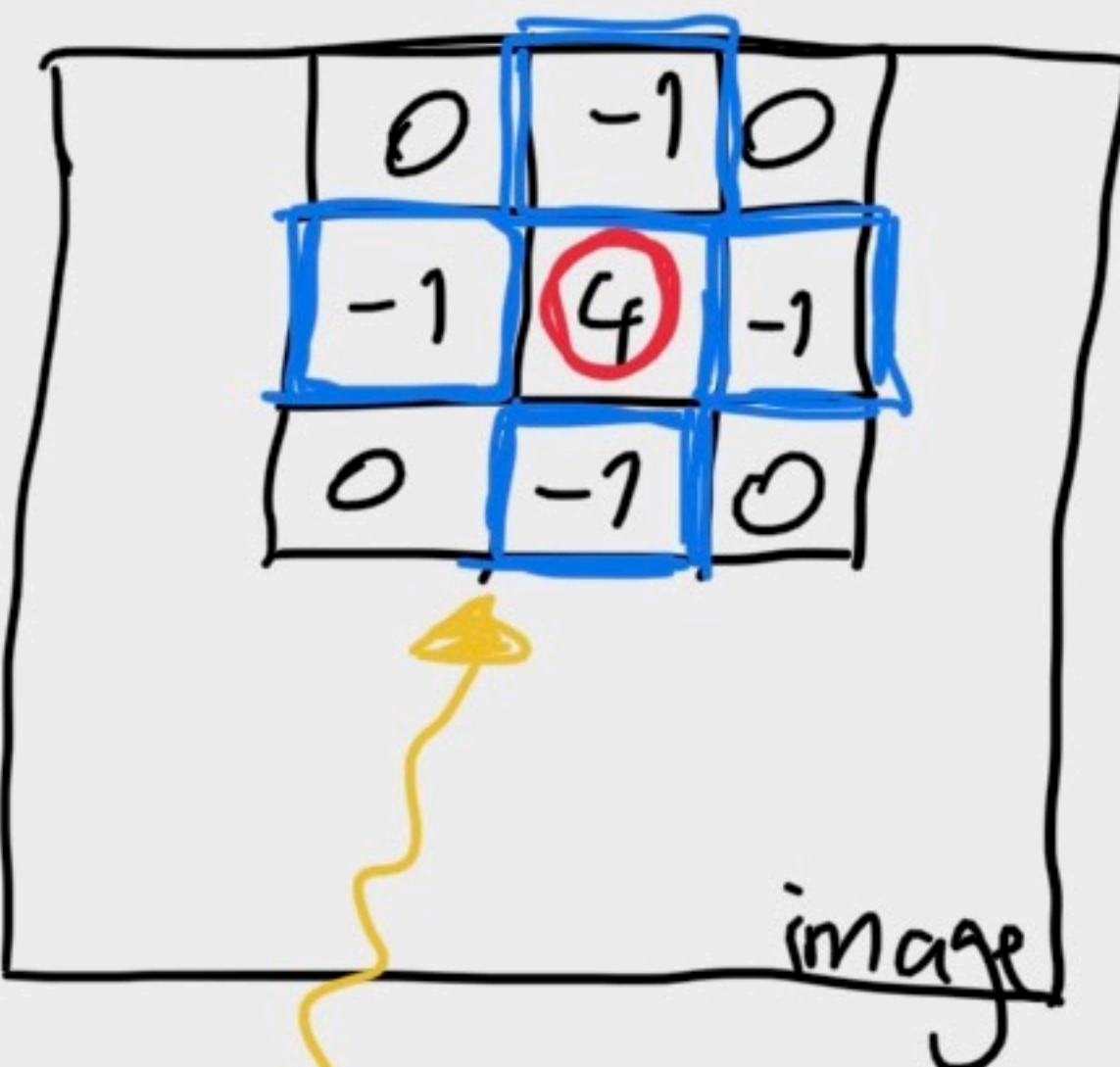
$F(x,y)$

Convolution

$$K * F(x,y) = \text{output image}$$



→



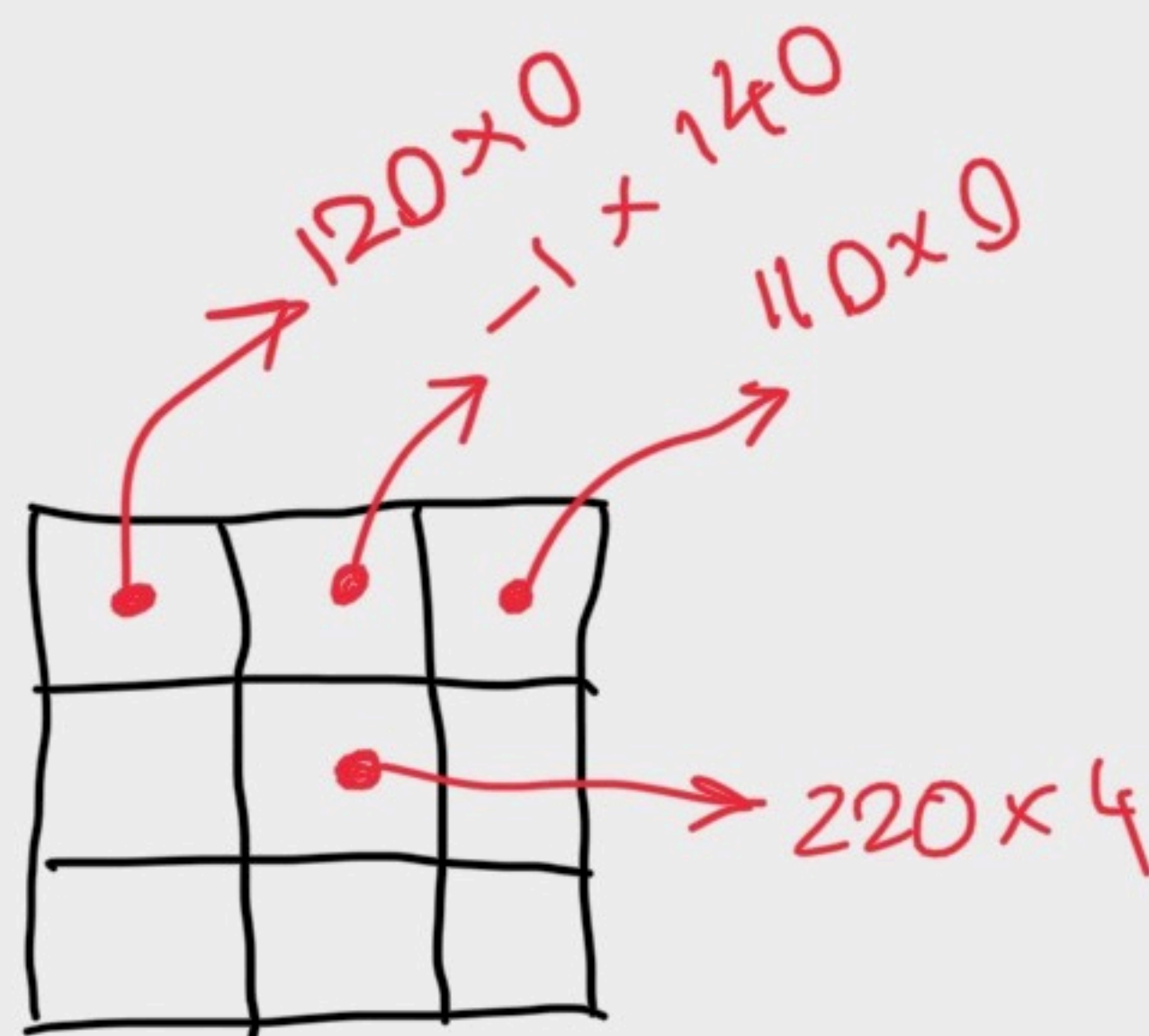
...

0	-1	0
-1	4	-1
0	-1	0

120	140	110
225	220	200
255	250	230

from image

new  
⇒  
region



sum  
them up

$$120 \times 0 + -1 \times 140 + \dots = \text{Some number}$$

values in the kernel matrix are called weights.