

OpenSieg

common
noises

1. Salt and Pepper \rightarrow Randomly + {white
black}

2. Gaussian \rightarrow Gaussian + {Gray}

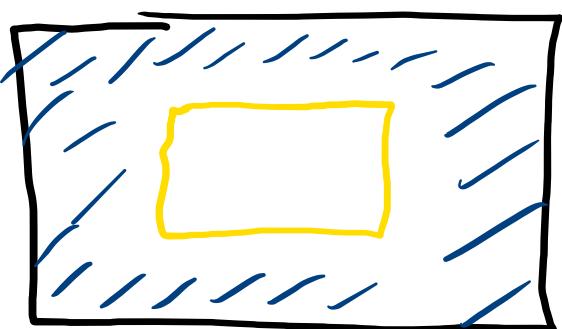
3. impulse \rightarrow random + {white
gray}

like, object ← Size, Shape 

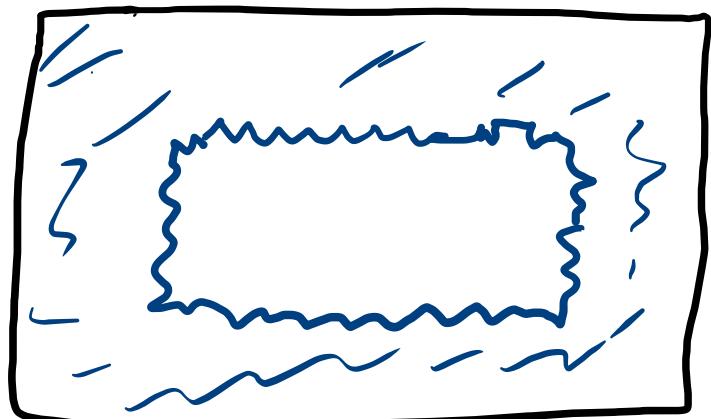
I. Morphological

methods. operators

Image Segmentation



real

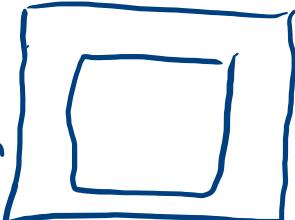


morphological

ops.

پکردن
تدریجی
پنهان کردن

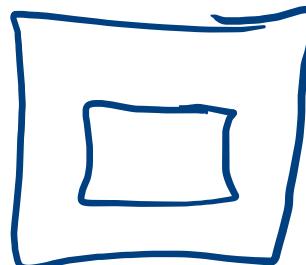
dilatation



پهنگ کردن

هرفت زدن طیها
پهنگ کردن

erosion

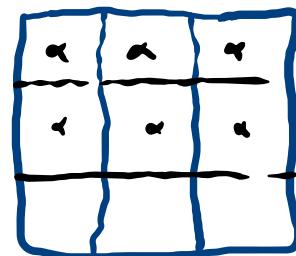


Binary image!

Gray image!

2. Dilatation

window → { Kernel
mask
filter }

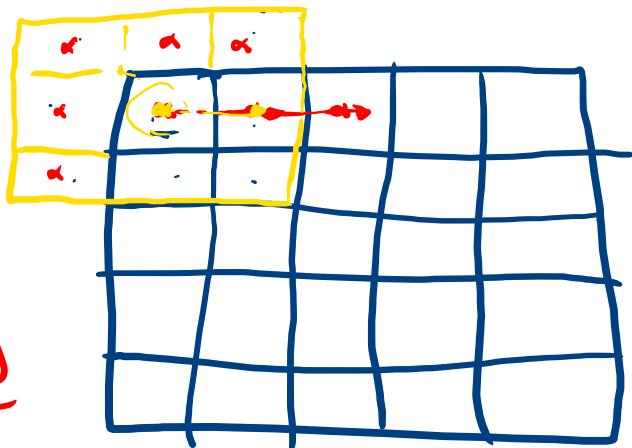


1 - 0 "�
"�
1000000000
! ! ! ! ! ! ! ! ! !

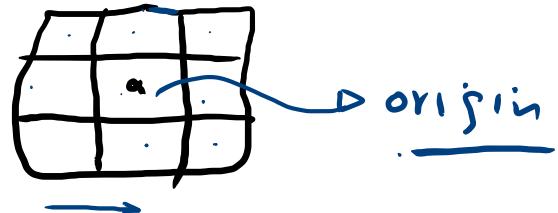
odd -
dimension!

(0,0)

Zero padding



Kernel



Binary

Binary-mask

1. full match $\rightarrow 1$
2. Some match $\rightarrow 1$
3. no match $\rightarrow 0$

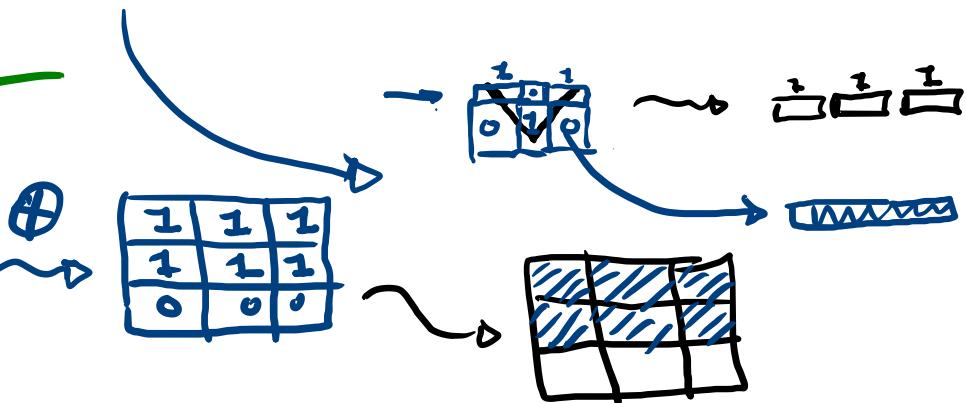
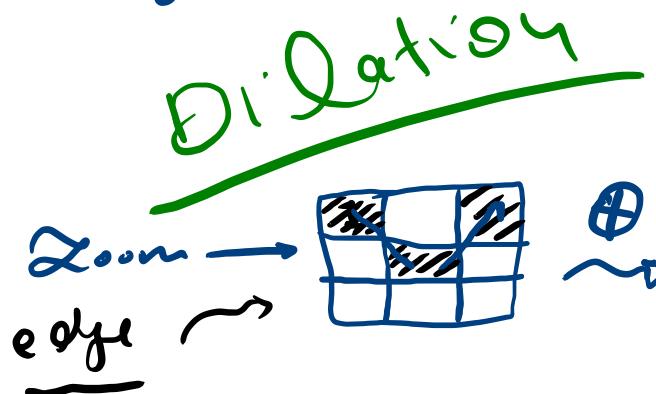
1	0	1	1	0	0	0	0	1	0	1	1
1	1	0	1	1	1	0	1	0	0	0	0
0	1	1	0	1	1	0	1	0	0	0	0
0	1	1	0	1	1	0	1	0	0	0	0
0	0	0	0	1	1	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

img

kernel



0	0	0	0	0	1
1	1	1	1	1	0
1	1	1	1	1	0
1	1	1	1	1	0
1	1	1	1	1	0
0	0	0	0	1	1
0	0	0	0	1	1
0	0	0	0	1	1
0	0	0	0	1	1
0	0	0	0	1	1



Erosion

1. full match $\rightarrow 1$
2. Some match $\rightarrow 0$
3. no match $\rightarrow 0$

1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1

$\frac{6 \times 6}{6}$



(-)

origin



1	1
1	1

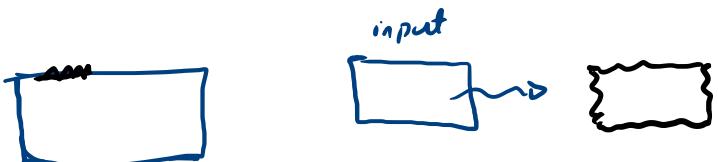
origin

1	1	1
---	---	---

matrix

مatri

اعتبار



0	0	0	0	0	0
0	0	1	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

Convolution

→ Denoising
→ edge detect -
→ feature extra -
→ object o -
→ segment

→ CNN → convolutional neural network!

image

y	x	w	
a	b	c	d
v	e	f	g
s	i	j	k
m	n	o	p

Kernel

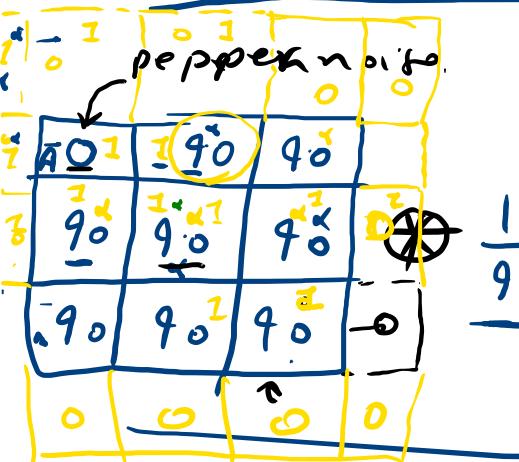
Convolve

y	u	w
v	+	t
s	l	q

$$\begin{aligned} F_{\text{new}} = & ay + bx + cw + ev + fu \\ & + gt + vs + lj + qk \end{aligned}$$

f-convolved

Convolution - Denoising



blurred
Denoising

30	50	40
50	80	60
40	60	40

A-convolved =

$$\frac{1}{9} (1 \times 0 + 1 \times 0 + 1 \times 0 + 1 \times 0 + 1 \times 90 + 1 \times 0 + 1 \times 90 + 1 \times 40) = \frac{1}{9} (3 \times 90) = 30$$

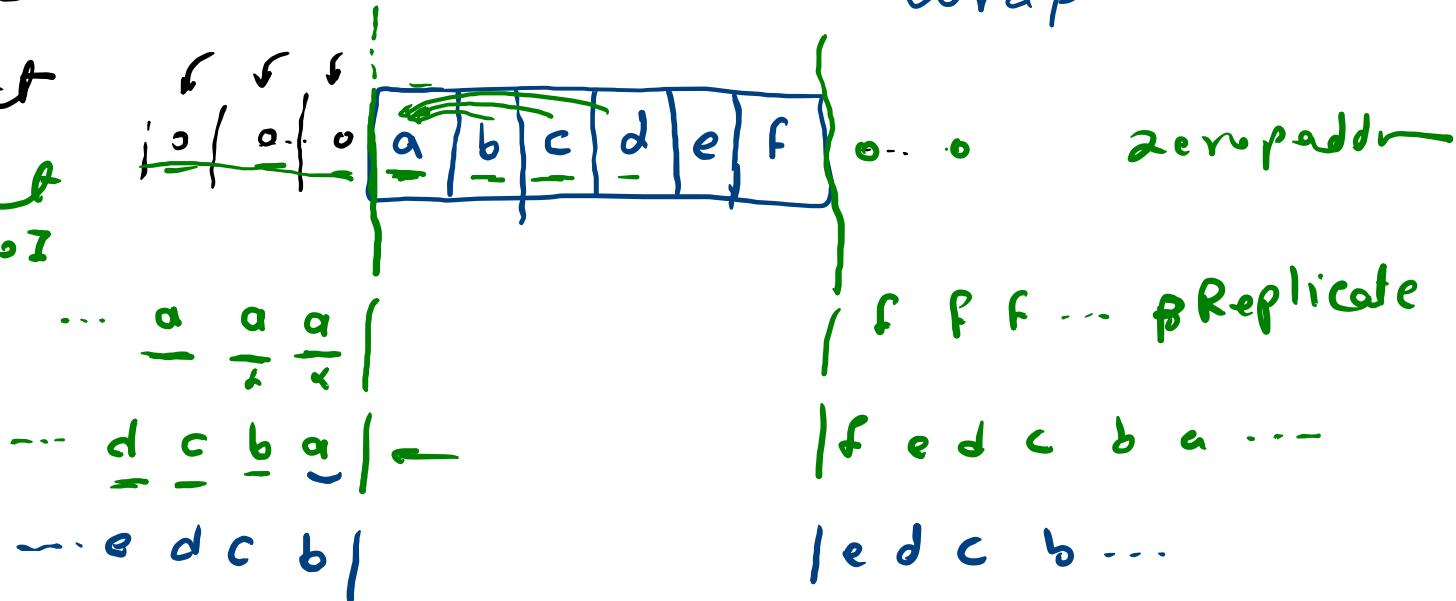
1. Constant padding → { Zero padding. ←
 abcdef | a b c d e f | abc -
 wrap

2. Replicate

3. Reflect

4. Reflect
101

5. Wrap



Open source

Kernels

~~edge
details~~

I. Box Filter (kernel)

Gaussian Noise.
-quick
-blurred

$$3 \times 3$$
$$\frac{1}{9} \left(\begin{array}{ccc} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{array} \right)$$

3×3

$$4 \times 4$$
$$\frac{1}{16} \left(\begin{array}{cccc} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{array} \right)$$

5×5

2. Gaussian Kernel. {

Gaussian noise.

Blur → Box filter

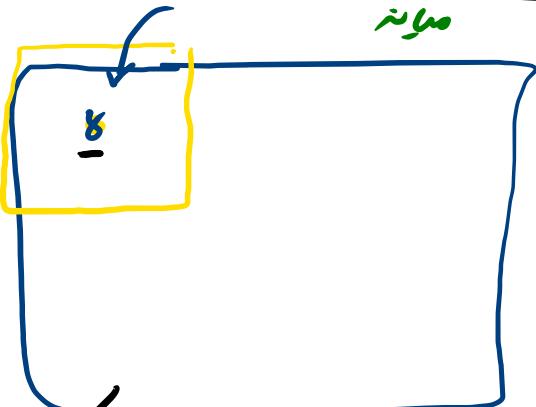
Box → Blur

$$\frac{1}{16} \begin{bmatrix} 1 & 2 & 1 \\ 2 & 4 & 2 \\ 1 & 2 & 1 \end{bmatrix}$$

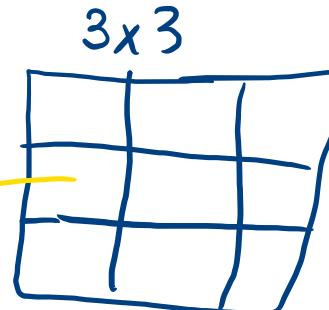
$$\frac{1}{64} \begin{bmatrix} 1 & 3 & 3 & 1 \\ 3 & 9 & 9 & 3 \\ 3 & 9 & 9 & 3 \\ 1 & 3 & 3 & 1 \end{bmatrix}$$

non linear

3. median filter



صورة
صورة مدخل
حذف كرل من خارج نواة المتر



Salt and pepper
impulse.

$$\left\{ \underline{\underline{25}}, 3, 8, 7, 16, 19, 25, 8, 0 \right\}$$

Sort

$$\left\{ 0, 3, 7, \underline{\underline{8}}, 16, 19, 25 \right\}$$

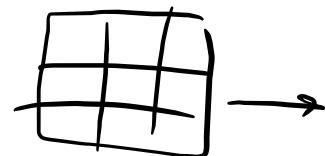
8 ↓ صورة

جهاز كمبيوتر
جهاز كمبيوتر
جهاز كمبيوتر

4. Max Filter

~~✓~~

25



}

Salt & pepper
impulse.

erosion

. 2x2

5. min Filter

min

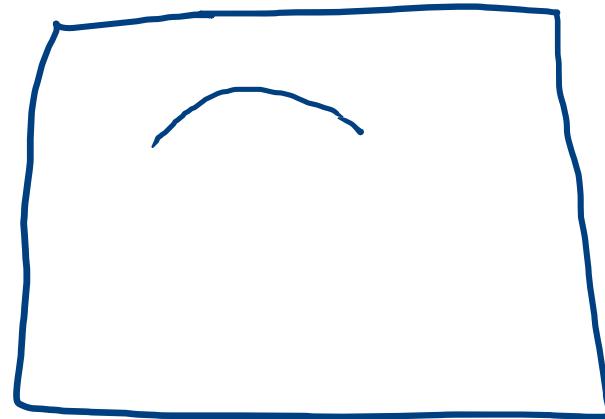
0

impulse.

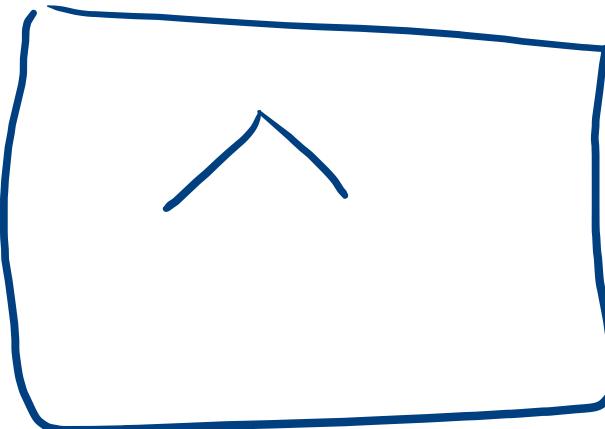
erosion

Salt & pepper

! block



		1		
1	.	1	1	
1	.	1	1	
1	.	1	1	
	1			



		1		
1	1	1		
1	1			
1				

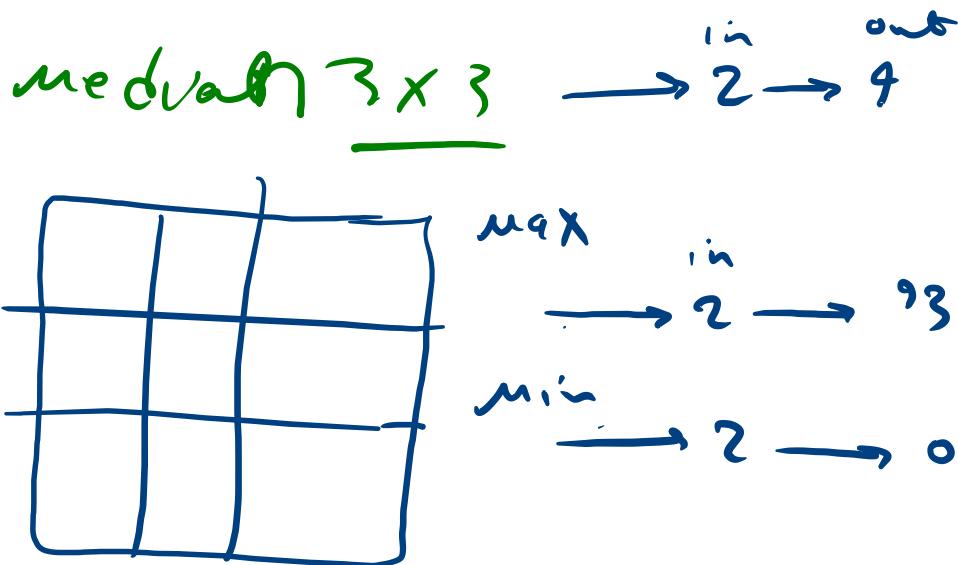
median filter

Input $[19, 8, 23, 87, 250]$

Sort $\rightarrow [8, 19, \underline{23}, 87, 250]$

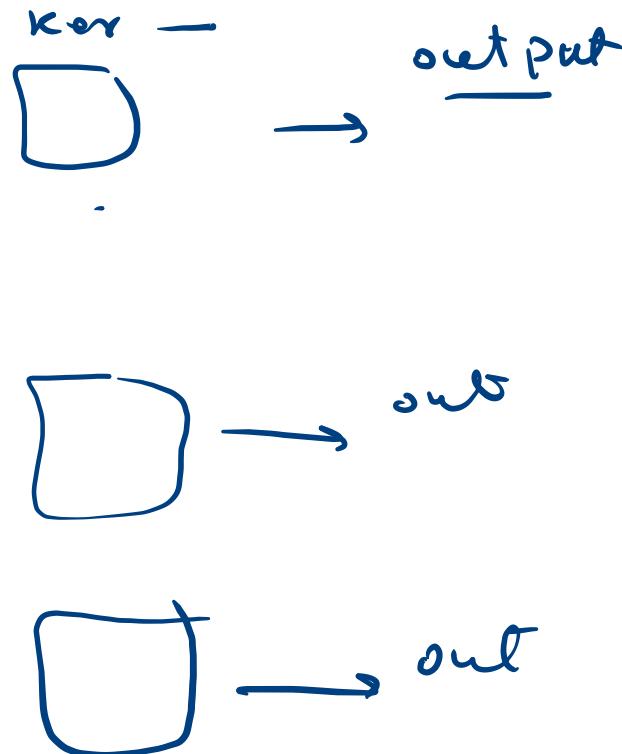
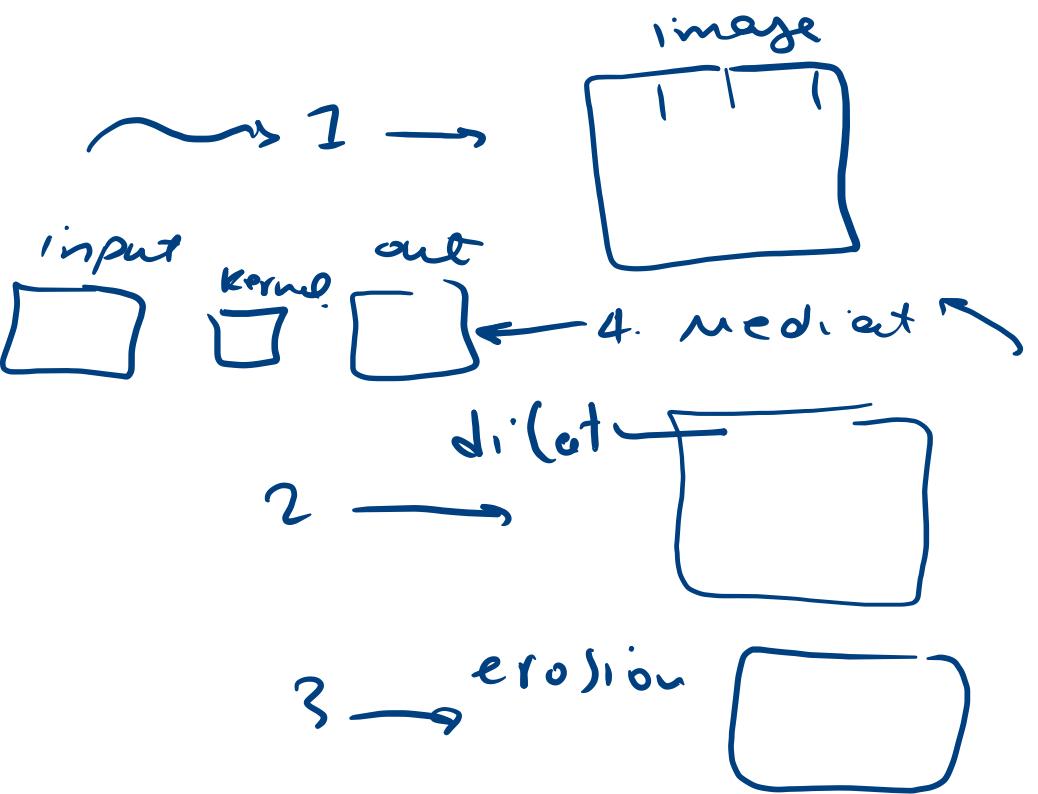
median
is 23

8	9	0	
1	29	25	
32	80	93	



Sort $[0, 1, 2, 8, \underline{9}, \text{median}, 25, 32, 80, 93]$

$\overleftarrow{4}$ median $\overline{4}$



End