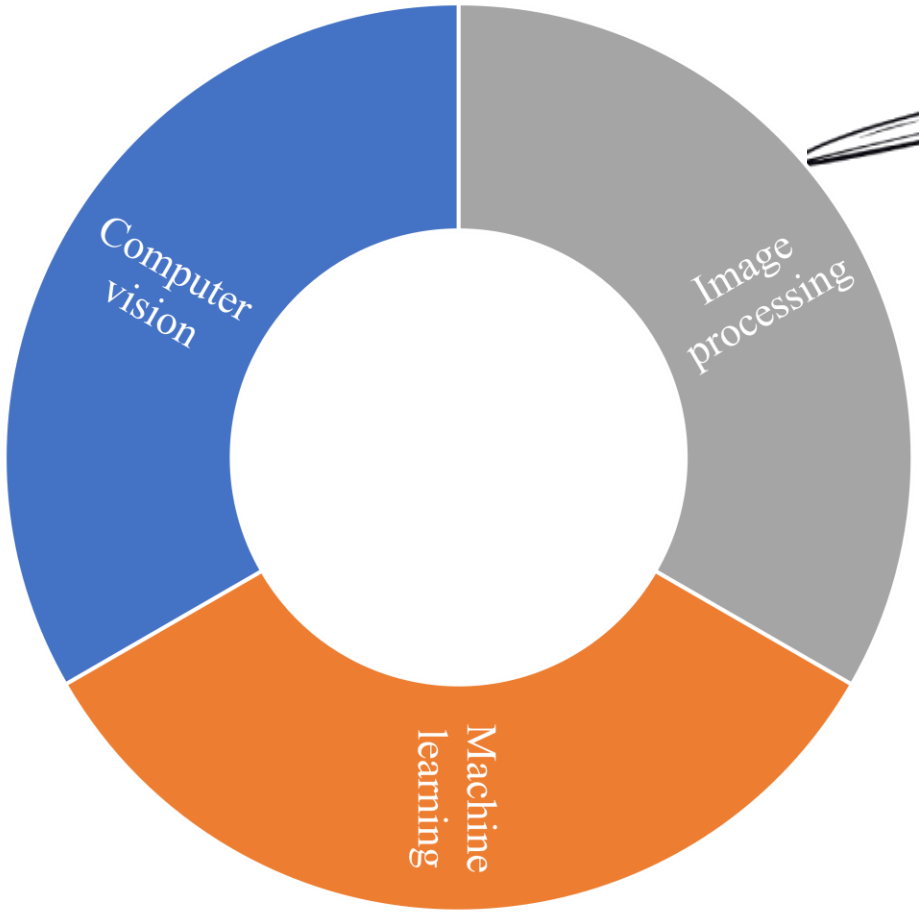
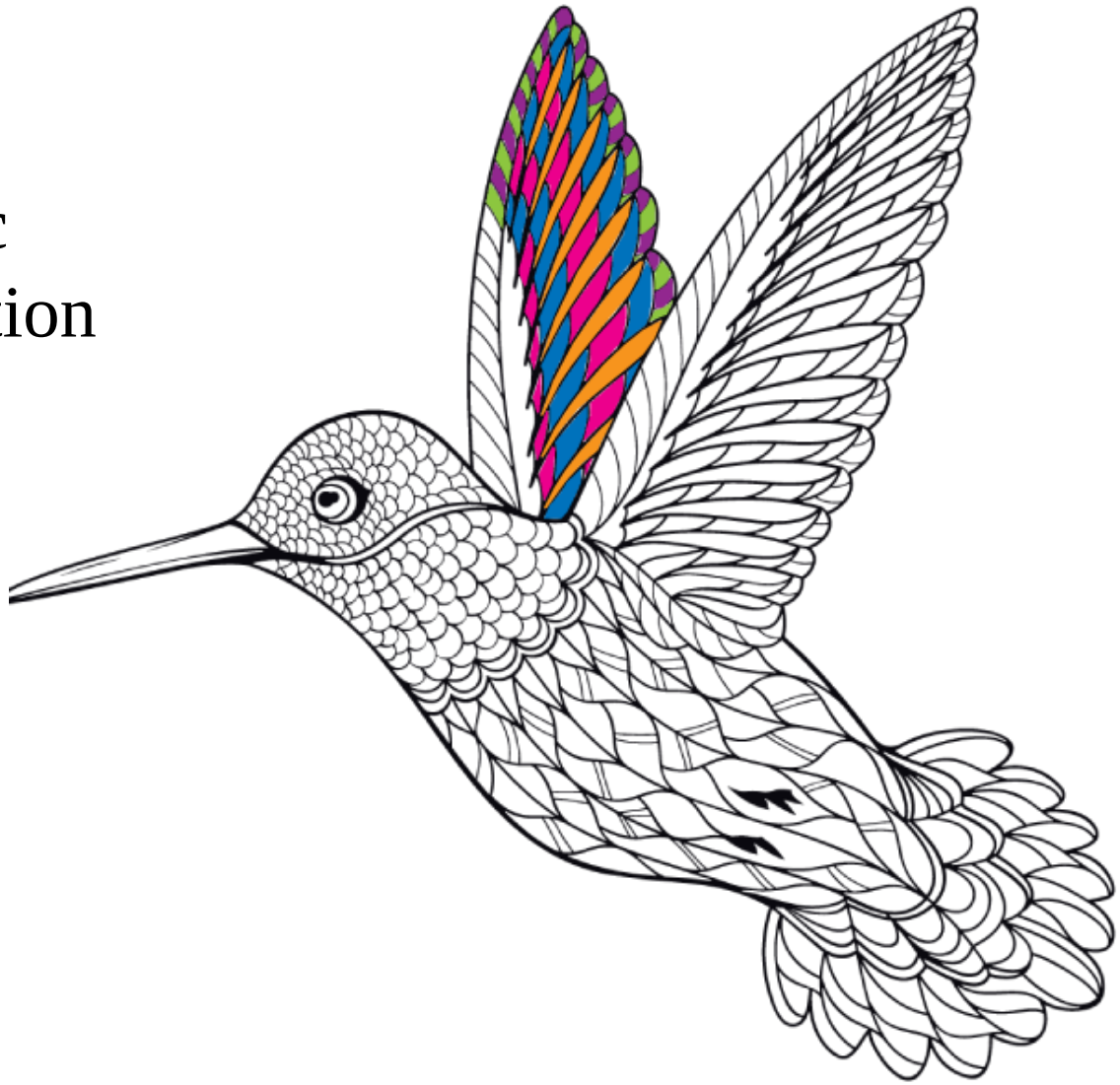
Computer Vision
404 B
Tutorial 1
12/02/20



Eng. Eman Marzban

Bird??

- Classification
- Segmentation
- Edge detection
- Eye detection, …etc
- Wing length estimation
- …etc.



Course evaluation

Grading System

-The grade will be mainly based on 4 small programming assignments (4 ~ biweekly) and one grand final project, midterm and final exam (’50’ marks for semester work grade + ’75’ marks for final exam)

- Midterm exam 16/50

-Projects/Assignments 24/50

-Attendance 10/50

-Project grading means to evaluate homeworks (Assignments), lab works, programming contents, presentations, and reports.

- Exams cover everything and design problems that you might never thought of before

-All exams are open book

Attendance

- (20 %) of semester work grade is for attendance.

-Attendance is obligatory to all.

-**Three** unjustified absences are considered fail and dismissal of the course. Course nature is applied (use of knowledge to solve real problems in CV).

This slice is imported from Dr. Badawi’s lectures

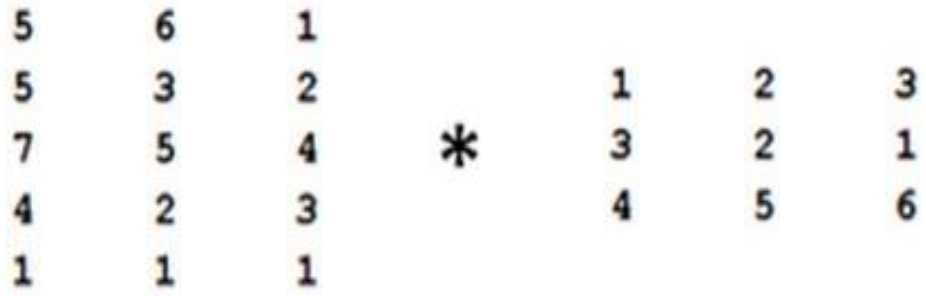
Required to review

Basic Statistics

Vector calculus

References

Jason Brownlee PhD https://machinelearningmastery.com/
http://vision.stanford.edu/teaching/cs131_fall1718/files/cs131-class-notes.pdf



Output will be

5	16	28	20	3
20	41	43	21	7
42	87	116	71	20
45	76	101	53	25
41	72	106	63	30
19	33	52	30	19
4	9	15	11	6

M+N-1

116
101
106

M-N+1

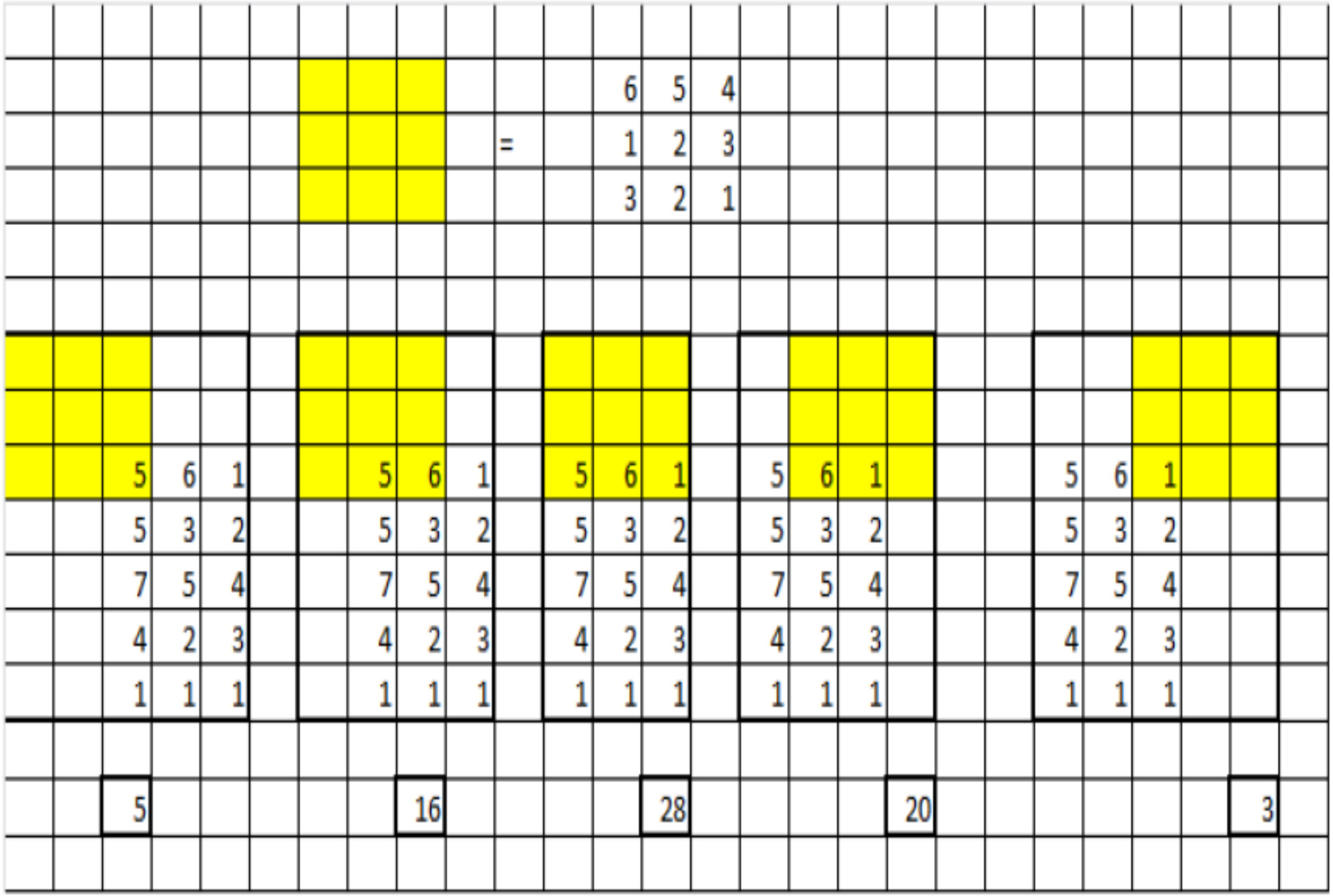
Or

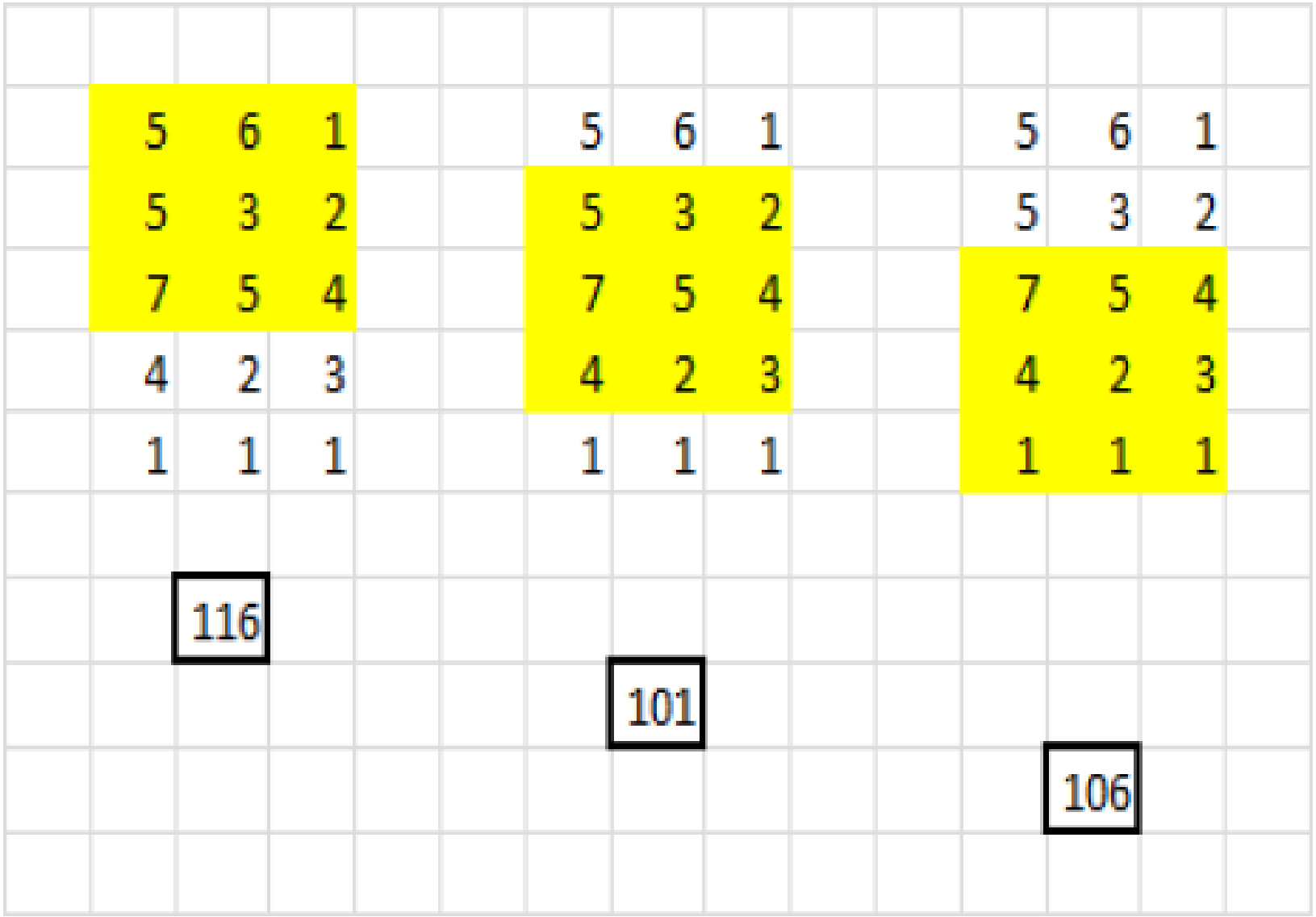
41	43	21
87	116	71
76	101	53
72	106	63
33	52	30

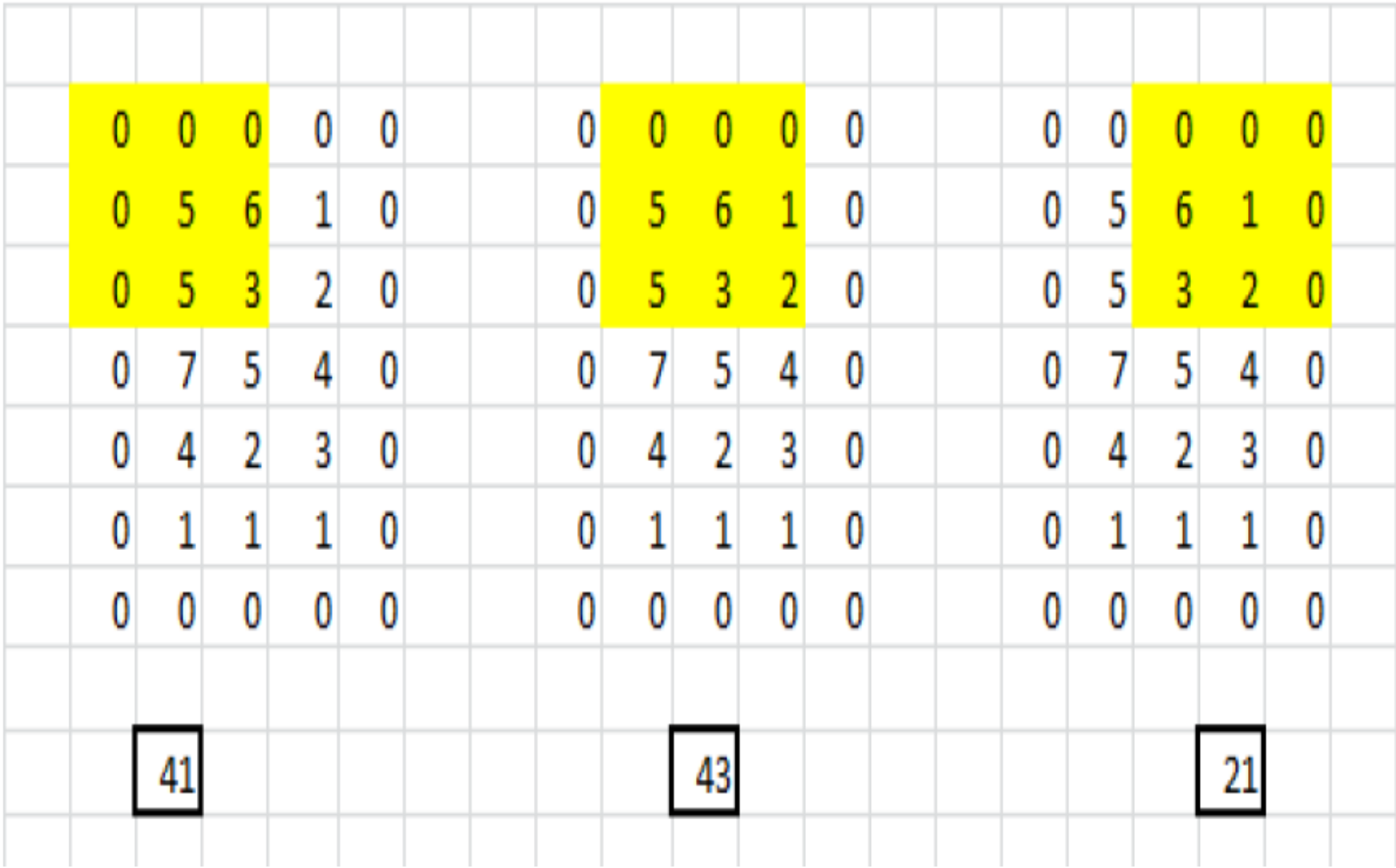
M

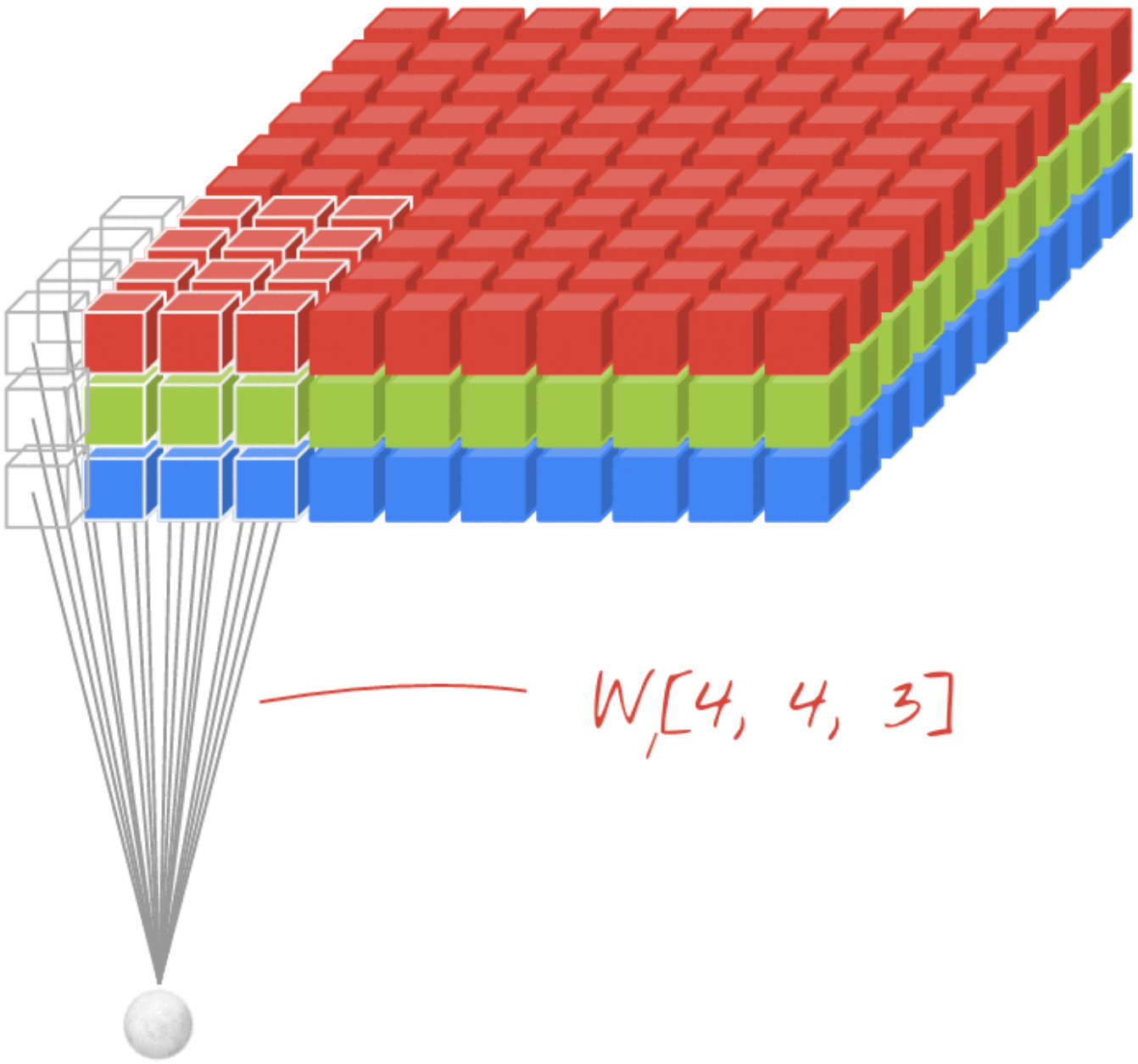
First: Flip the kernel around its horizontal and vertical axes or rotate be 180 degrees

6	5	4
1	2	3
3	2	1


6 5 4
=
1 2 3
3 2 1
5 6 1
5 3 2
7 5 4
4 2 3
1 1 1
5 6 1
5 3 2
7 5 4
4 2 3
1 1 1
5 6 1
5 3 2
7 5 4
4 2 3
1 1 1
5 6 1
5 3 2
7 5 4
4 2 3
1 1 1
5
16
28
20
3


5 6 1
5 3 2
7 5 4
4 2 3
1 1 1
116
5 6 1
5 3 2
7 5 4
4 2 3
1 1 1
101
5 6 1
5 3 2
7 5 4
4 2 3
1 1 1
106


0 0 0 0 0
0 5 6 1 0
0 5 3 2 0
0 7 5 4 0
0 4 2 3 0
0 1 1 1 0
0 0 0 0 0
41
0 0 0 0 0
0 5 6 1 0
0 5 3 2 0
0 7 5 4 0
0 4 2 3 0
0 1 1 1 0
0 0 0 0 0
43
0 0 0 0 0
0 5 6 1 0
0 5 3 2 0
0 7 5 4 0
0 4 2 3 0
0 1 1 1 0
0 0 0 0 0
21



https://stats.stackexchange.com/questions/240926/how-are-convolutional-layers-connected-in-theano

Sobel masks

$$\begin{bmatrix} 1 & 0 & -1 \\ 2 & 0 & -2 \\ 1 & 0 & -1 \end{bmatrix} \qquad \begin{bmatrix} 1 & 2 & 1 \\ 0 & 0 & 0 \\ -1 & -2 & -1 \end{bmatrix}$$

Prewitt masks

$$\begin{bmatrix} 1 & 0 & -1 \\ 1 & 0 & -1 \\ 1 & 0 & -1 \end{bmatrix} \qquad \begin{bmatrix} 1 & 1 & 1 \\ 0 & 0 & 0 \\ -1 & -1 & -1 \end{bmatrix}$$

Roberts masks

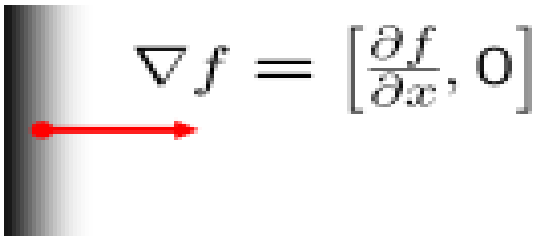
−1	0
0	1

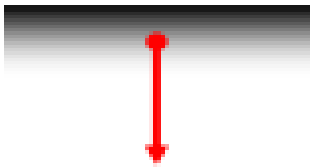
0	−1
1	0

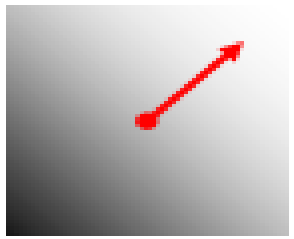
Image gradient

$$\nabla f = \left[\frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}\right]$$

It points in the direction of most rapid change in intensity







The gradient direction is given by:

$$\theta = \tan^{-1}\left(\frac{\partial f}{\partial y} / \frac{\partial f}{\partial x}\right)$$

- how does this relate to the direction of the edge?

$$\|\nabla f\| = \sqrt{\left(\frac{\partial f}{\partial x}\right)^2 + \left(\frac{\partial f}{\partial y}\right)^2}$$

The *edge strength* is given by the gradient magnitude

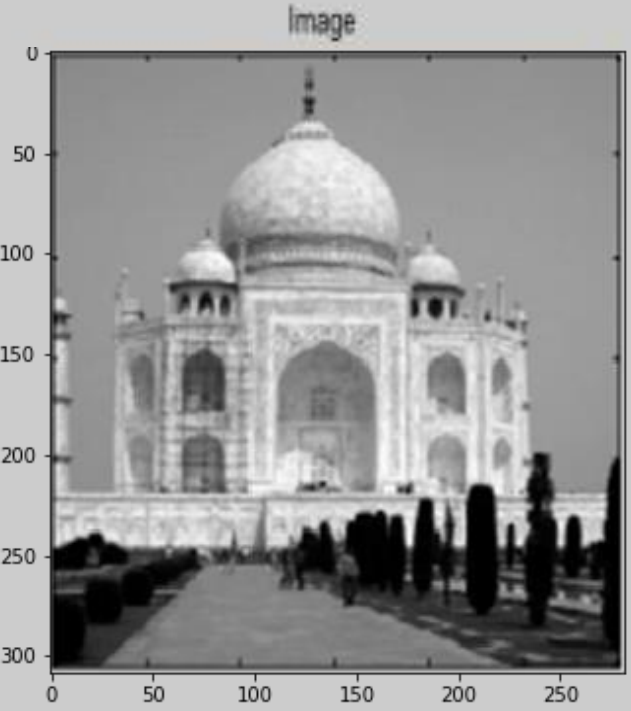
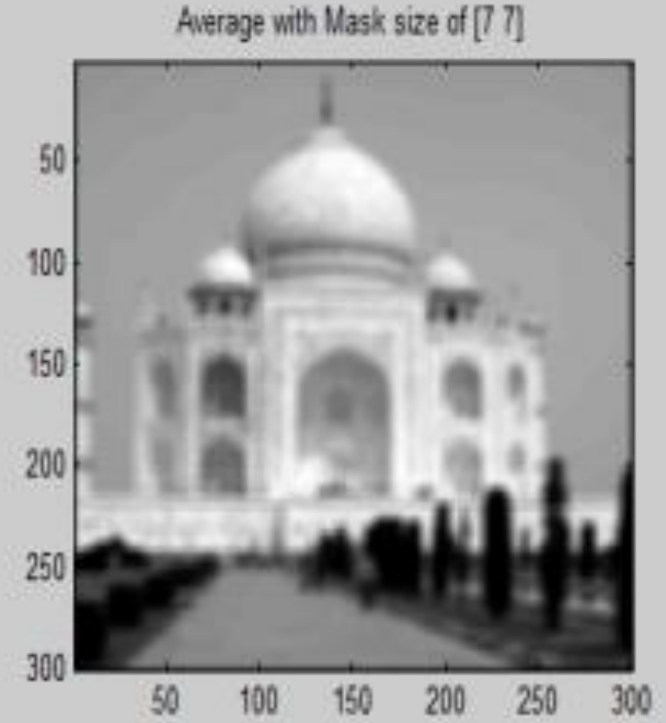
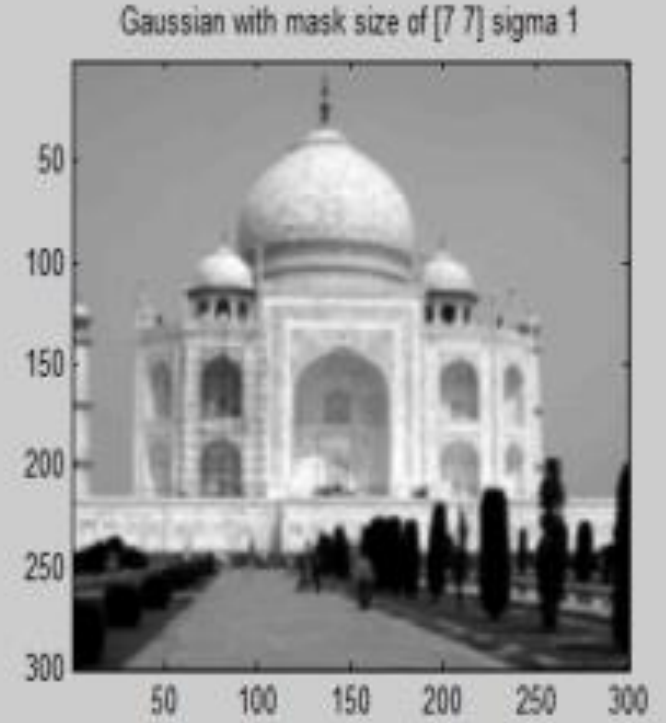


Image
0
50
100
150
200
250
300
0
50
100
150
200
250


Average with Mask size of [7 7]
50
100
150
200
250
300
50
100
150
200
250
300


Gaussian with mask size of [7 7] sigma 1
50
100
150
200
250
300
50
100
150
200
250
300

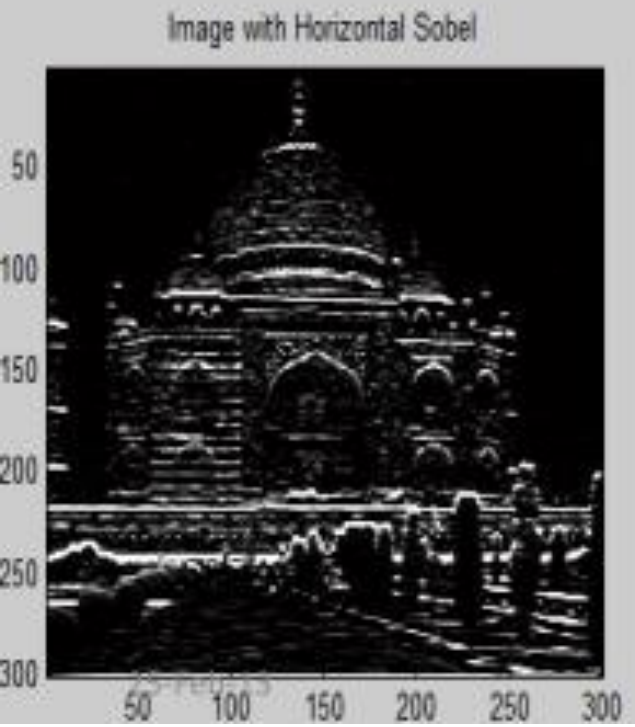


Image with Horizontal Sobel
50
100
150
200
250
300
50
100
150
200
250
300

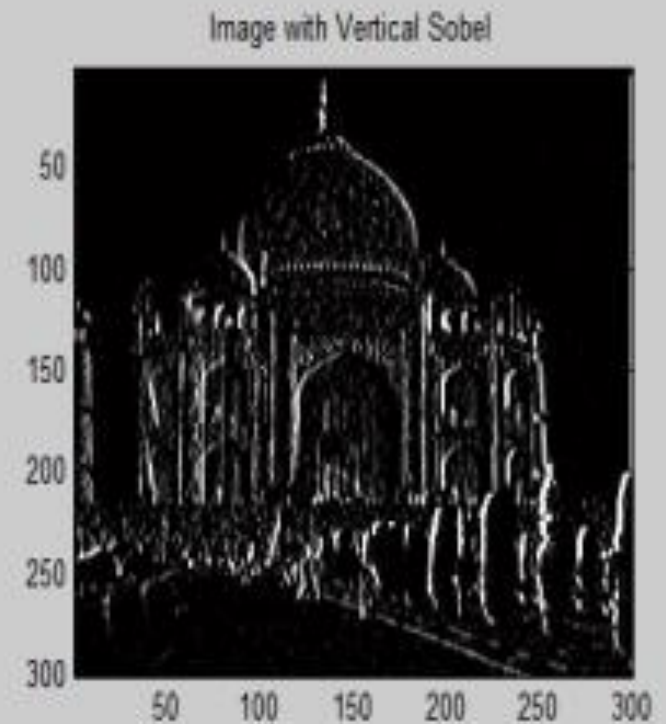
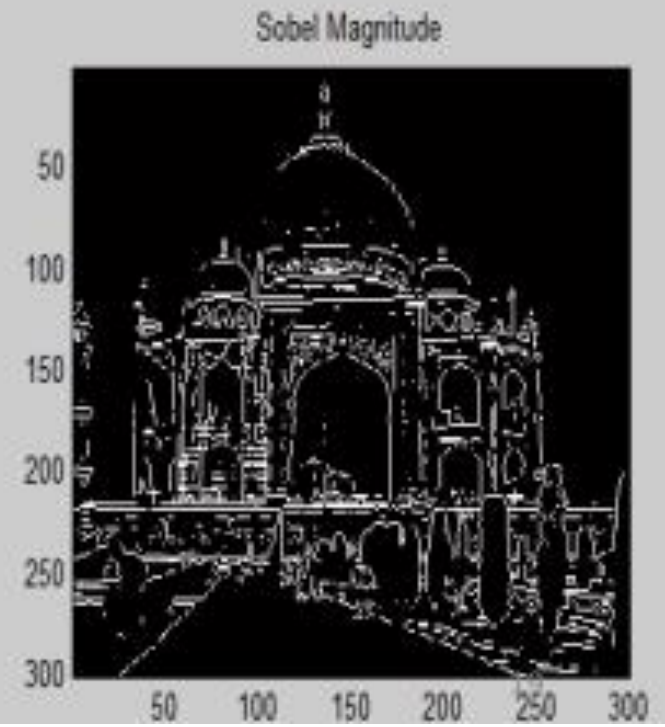
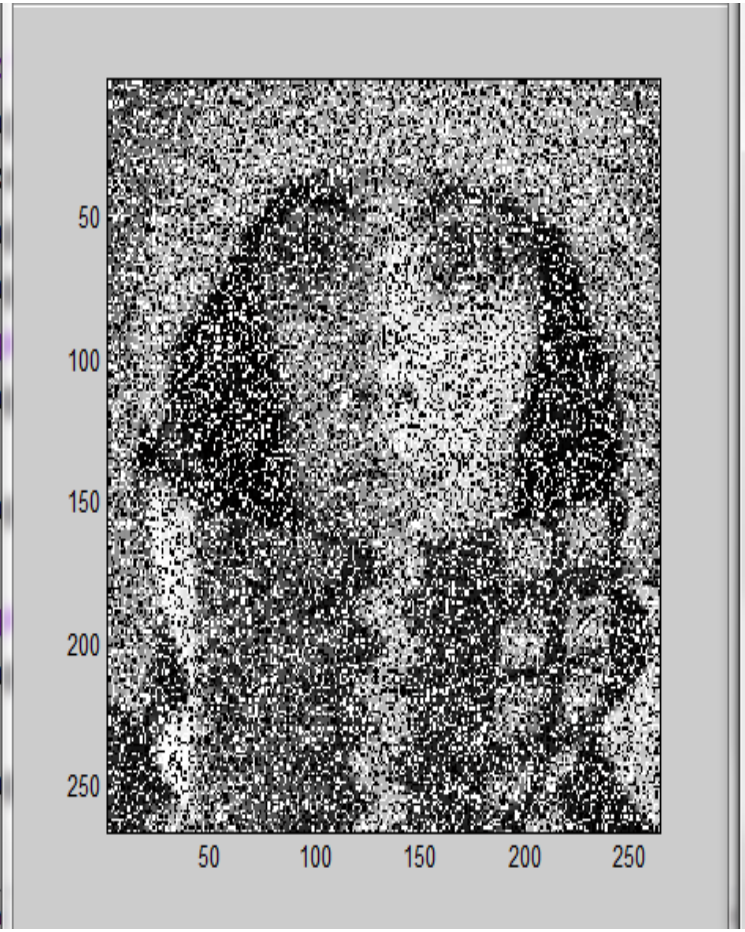


Image with Vertical Sobel
50
100
150
200
250
300
50
100
150
200
250
300

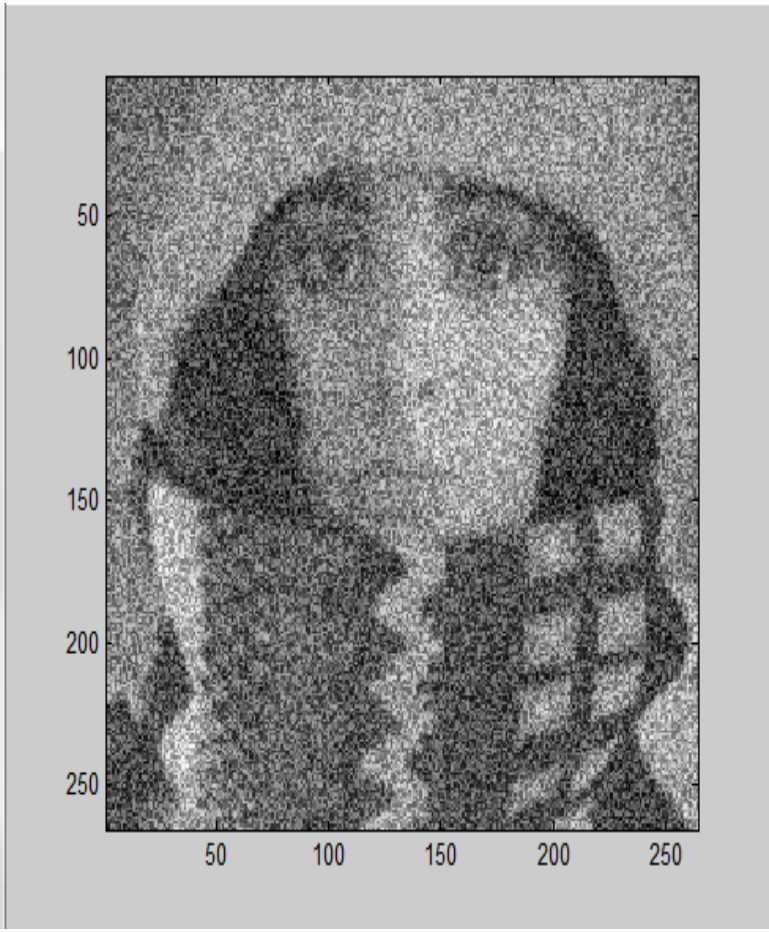

Sobel Magnitude
50
100
150
200
250
300
50
100
150
200
250
300

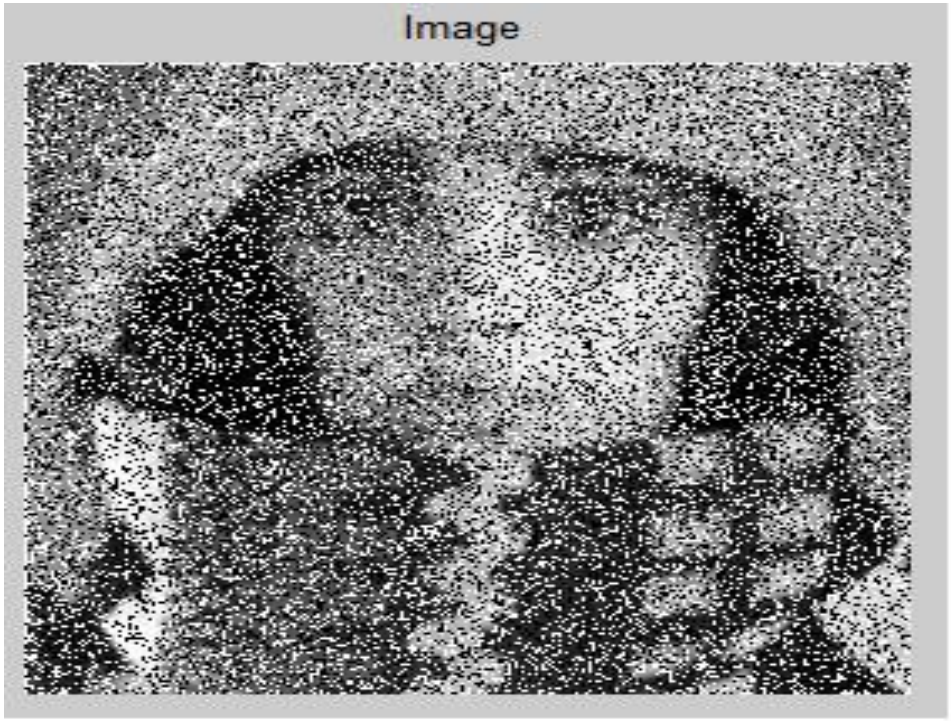
Gaussian

salt n Pepper

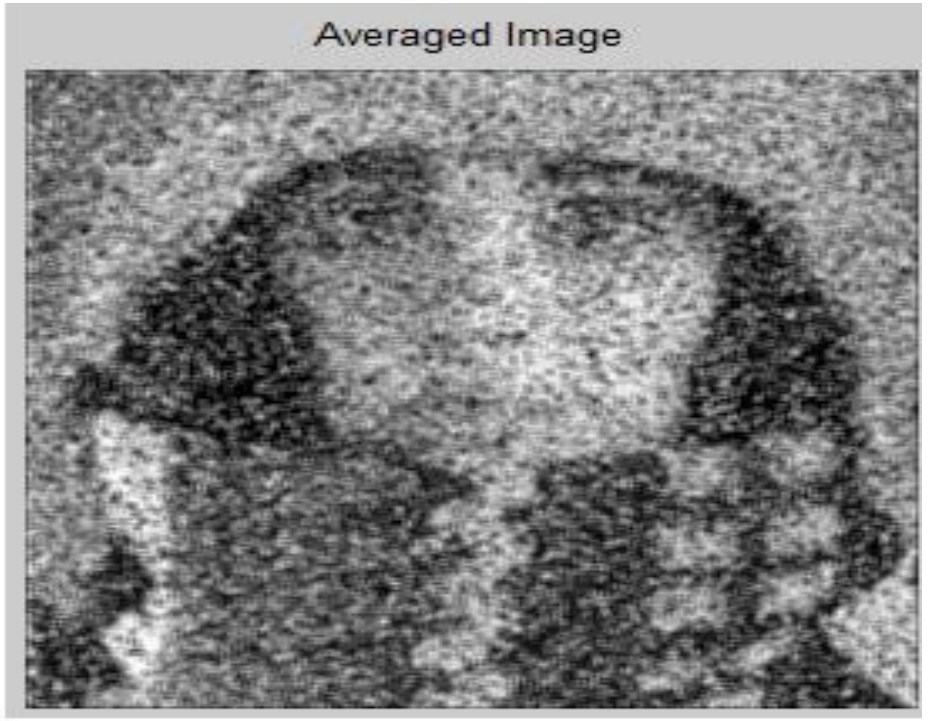


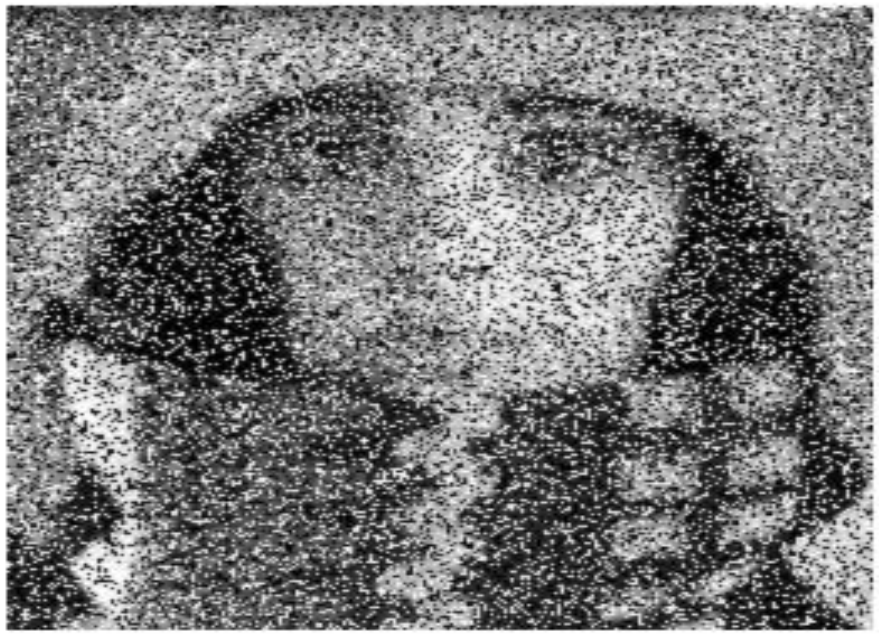
Uniform





Image


Averaged Image




Median-filtered Image

Let's proceed with some coding …