NAME :
SURNAME :

MIDTERM
Each question is 20 points
Duration : 1 hour
You may answer the questions on the back of the paper.

1. What is Variance? (You may explain in plain english, or give the formula of variance, or explain it using an example)

2. What are the complexity reduction strategies (3 strategies are enough)? Give short explanations for each one.

3. Find the time complexity formula of the following algorithm as a function of N matrice's number of columns.

```
def  a_function( square_matrix):  ## add coordinates of the matrix elements to the value in the element.
    N=square_matrix.shape[0]
    for i in range(N):
        for j in range(N):
            square_matrix[i][j]=square_matrix[i][j]+i+j
    return square_matrix
```

4. Draw object oriented design boxes of the following object oriented design :
   I. A vehicle object that has
      1. An engine, four wheels, a chassis, a body, two front lights, two rear lights as attributes.
      2. accelerate(speed), decelerate(speed), set_direction(alfa,beta) as methods.
   II. A car is a vehicle and overrides the accelerate and decelarate methods.
   III. A truck is a vehicle and overrides the set_direction(alfa,beta) method.

5. Matplotlib functions (writing only name is enough):
   I. What is the name of the matplotlib function that draws a list X and it's corresponding list Y as connected lines:

   II. What is the name of the matplotlib function that draws a list X and it's corresponding list Y as individual points or circles:

   III. What is the name of the matplotlib function that draws histogram of the values in a list :

   IV. What is the name of the matplotlib function that draws multiple plots in the same figure :

6. Compare the following complexity functions, and put them in order :
   I. O(n)
   II. O(n.log(n))
   III. $O(n^2)$
   IV. O(log(n))