Kafrelsheikh University
Faculty of Engineering –Fourth year
Subject: Computer vision –Computer Engineering

جامعة كفر الشيخ
كلية الهندسة
Final term–March 2021– Time: 3 hours

Answer All Questions

Question One

1- Explain the following terms: - Image contrast   - Numpy   - RGB color model   – Histogram.

2- For the following training data set (two classes, each class has 5 samples, and each sample has two features).

Class W_1		Class W_2	
X_1	X_2	X_1	X_2
3.406	4.439	-4.306	4.967
3.811	4.893	-4.581	3.527
4.395	3.351	-3.606	3.334
5.340	2.770	-3.640	4.041
4.238	4.093	-2.899	4.127

Predict the class label for the following test samples using.
a. City-block distance
b. Euclidean Distance
c. Mahalanobis distance
d. Cosine distance2

Question Two

1- Write python code to read an image (test.jpg) then:
-   Convert this image from color rgb to gray scale
-   Rotate this image 30 clock wise
-   Perform histogram equalization for this image
-   Perform SIFT to get the local descriptor for the above image

2- An instructor gives the same y vs x data as given below to four students.

x	1	10	20	30	40
y	1	100	400	600	1200

They each come up with four different answers for the straight line regression model. Only one is correct. The correct model is
A) $y = 60x - 1200$

B) $y = 30x - 200$

C) $y = -139.43 + 29.684x$

D) $y = 1 + 22.782x$

Question Three

1- What is the goal used by the k-nearest neighbor method in classification?

2--Cluster the following eight points (with (x, y) representing locations) into three clusters A1(2, 10) A2(2, 5) A3(8, 4) A4(5, 8) A5(7, 5) A6(6, 4) A7(1, 2) A8(4, 9). Initial cluster centers are: A1(2, 10), A4(5, 8) and A7(1, 2). Use k-means algorithm to find the three cluster centers after the second iteration

3- Write in the steps of SIFT or SURIF algorithms in Pseduo code

Question Four

1-Given an affine transformation that maps a viewport shown below (left) to another viewport with the same size shown below (right). Give a matrix that expresses this transformation.
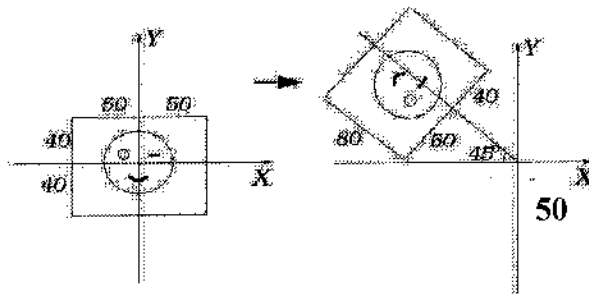
2- Write the equations of Harris corner detector?

3-The performance of the kNN classifier depends on the value of k. Try to vary this number and see how the accuracy changes. Plot the decision boundaries of the 2D point sets to see how they change (show your answer by python code at image called test.jpg)

Question Five

1- Give three types of image features can be used in CBIR?

2- What is the goal used by the k-nearest neighbor method in classification?

3- Let say you are given a task to classify whether a given cell sample is malignant or benign. You have a set of training sample for this task.

Feature 1	Feature 2	Classification
2	4	Object-1
3	8	Object-2
5	9	Object-2
3	7	Object-1
7	10	Object-2
5	4	Object-1
6	8	Object-2

Given a new sample, $x = \begin{bmatrix} 4 \\ 7 \end{bmatrix}$. Use the k-nearest neighbor method with $k = 3$ to classify this sample.