United International University (UIU)
Dept. of Computer Science & Engineering (CSE)
***Class Test I*: :Trimester: Summer - 2019**

Course Code: CSI 415, Course Title: Pattern Recognition, Sec: B
Total Marks: **20** Duration: **45 Minutes**

Answer all questions. Figures are in the right-hand margin indicates full marks.

Question 1: 5

What is Pattern Recognition? Write the basic steps for designing a pattern classification system.

Question 2: 15

Classify the following new unlabeled flower using kNN classifier from Table 1:

Sepal.Length = 5.2 and Sepal.Width = 3.1, Species =?

Where k = 3 and distance function is Euclidean Distance. Please show the step-by-step process of k-nearest-neighbor (kNN) classifier.

Table 1

Sepal.Length	Sepal.Width	Species
5.3	3.7	Setosa
5.1	3.8	Setosa
7.2	3	Virginica
5.4	3.4	Setosa
5.1	3.3	Setosa
5.4	3.9	Setosa
7.4	2.8	Virginica
6.1	2.8	Versicolor
7.3	2.9	Virginica
6	2.7	Versicolor
5.8	2.8	Virginica
6.3	2.3	Versicolor
5.1	2.5	Versicolor
6.3	2.5	Versicolor
5.5	2.4	Versicolor

Pattern CT→01
Solve | section-B

Ans To The Q.No→1

Pattern Recognition:

Pattern recognition means extracting Pattern / knowledge from big data.

Basic steps for designing a Pattern classification system

a. Data collection / collecting Patterns
b. Data PrePrecessing / Feature engineering
c. Features selection
d. Classify design
e. Evaluate the system.

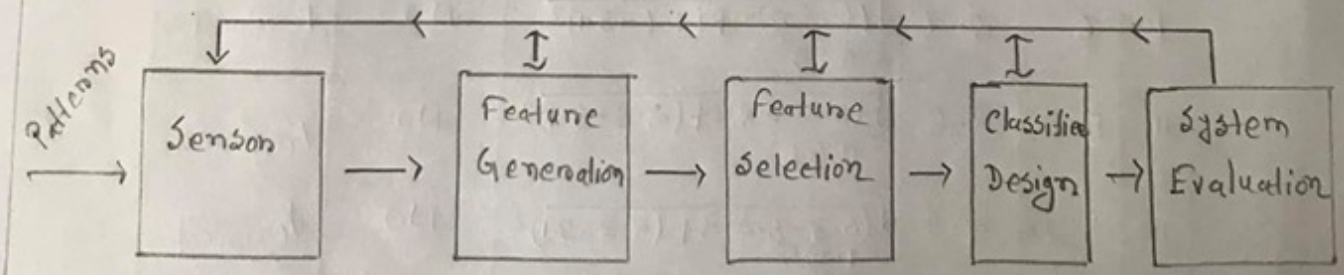

Fig: Pattern classification system design diagram

Ans To The Q.No→2

Euclidean Distance $= \sqrt{(a-x)^2 + (b-y)^2}$; $x = 5.2$, $y = 3.1$

Serial	Sepal Length	Sepal Width	Distance	Nearest Neighbors	Class	Majority Voting
1	5.3	3.7	$\sqrt{(5.3-5.2)^2+(3.7-3.1)^2} = 0.60$	Yes	Setosa	
2	5.1	3.8	$\sqrt{(5.1-5.2)^2+(3.8-3.1)^2} = 0.70$	No	Setosa	
3	7.2	3	$\sqrt{(7.2-5.2)^2+(3-3.1)^2} = 2.00$	No	Virginica	
4	5.4	3.4	$\sqrt{(5.4-5.2)^2+(3.4-3.1)^2} = 0.36$	Yes	Setosa	
5	5.1	3.3	$\sqrt{(5.1-5.2)^2+(3.3-3.1)^2} = 0.22$	Yes	Setosa	
6	5.4	3.9	$\sqrt{(5.4-5.2)^2+(3.9-3.1)^2} = 0.82$	No	Setosa	Setosa
7	7.4	2.8	$\sqrt{(7.4-5.2)^2+(2.8-3.1)^2} = 2.22$	No	Virginica	
8	6.1	2.8	$\sqrt{(6.1-5.2)^2+(2.8-3.1)^2} = 0.94$	No	Versicolor	
9	7.3	2.9	$\sqrt{(7.3-5.2)^2+(2.9-3.1)^2} = 2.10$	No	Virginica	
10	6	2.7	$\sqrt{(6-5.2)^2+(2.7-3.1)^2} = 0.89$	No	Versicolor	
11	5.8	2.8	$\sqrt{(5.8-5.2)^2+(2.8-3.1)^2} = 0.67$	No	Virginica	
12	6.3	2.3	$\sqrt{(6.3-5.2)^2+(2.3-3.1)^2} = 1.36$	No	Versicolor	
13	5.1	2.5	$\sqrt{(5.1-5.2)^2+(2.5-3.1)^2} = 0.60$	No	Versicolor	
14	6.3	2.5	$\sqrt{(6.3-5.2)^2+(2.5-3.1)^2} = 1.25$	No	Versicolor	
15	5.5	2.4	$\sqrt{(5.5-5.2)^2+(2.4-3.1)^2} = 0.76$	No	Versicolor	

As, k = 3, Majority Voting = Setosa.

So Sepal. Length = 5.2 & Sepal. Width = 3.1 would be classified as Setosa.