School of Computer Science Engineering and Technology

Course- BTech   Type- AI Core-1
Course Code- **CSET211**   Course Name- **Statistical Machine Learning**
Year- Second   Semester- ODD
Date- 09/08/2022   Batch- CSE 3rd Semester

Lab Assignment (5th Sep to 9th Sep 2022)

Lab 4 Set 1 – (Bayes theorem and Bayesian Classifier)

CO-Mapping:

Exp. No.	Name	CO1	CO2	CO3
04	Bayes theorem and Bayesian Classifier		✓	✓

Objective: Finding probability by applying Bayes theorem and applying Bayesian Classifier on dataset for finding probability of an event and accuracy of model.

Total: 2 Marks

Question-1: (20 Minutes)   **1 Mark**

A patient goes to see a doctor. The doctor performs a test with 99 percent reliability--that is, 99 percent of people who are sick test positive and 99 percent of the healthy people test negative. The doctor knows that only 1 percent of the people in the country are sick.

(a) If the patient tests positive, what are the chances the patient is sick?

Solution:

Question-2: (20 Minutes)   **1 Mark**

Three identical boxes contain red and white balls. The first box contains 3 red and 2 white balls, the second box has 4 red and 5 white balls, and the third box has 2 red and 4 white balls. A box is chosen very randomly and a ball is drawn from it. If the ball that is drawn out is red.

(a) What will be the probability that the second box is chosen?

Solution:

Question-3: (40 Minutes)   1 Mark

Consider the data set shown in Table 1

Record	A	B	C	Class
1	0	0	0	+
2	0	0	1	−
3	0	1	1	−
4	0	1	1	−
5	0	0	1	+
6	1	0	1	+
7	1	0	1	−
8	1	0	1	−
9	1	1	1	+
10	1	0	1	+

(a) Calculate the conditional probabilities for P (A|-), P (B|-), P (C|-), P (A|+), P (B|+), and P (C|+).

Answer:

(b) Use the estimate of conditional probabilities given in the previous question to predict the class label for a test sample (A = 0, B = 1, C = 0) using the naıve Bayes approach.

Answer:

Question-4: (Self Practice)

Suppose you are given the following set of data with three Boolean input variables a, b, and c, and a single Boolean output variable K.

a	b	c	K
1	0	1	1
1	1	1	1
0	1	1	0
1	1	0	0
1	0	1	0
0	0	0	1
0	0	0	1
0	0	1	0

For parts (a) and (b), assume we are using a naive Bayes classifier to predict the value of K from the values of the other variables.

(a) According to the naive Bayes classifier, what is $P(K = 1 | a = 1 \wedge b = 1 \wedge c = 0)$?
    Solution:

(b) According to the naive Bayes classifier, what is $P(K = 0 | a = 1 \wedge b = 1)$?
    Solution: