Data Science Workshop-2 (CSE 2196)
ASSIGNMENT-1(PROB AND STAT, LINEAR ALGEBRA)

1. An Earphone manufacturing company claims that the average life of its product is 2.1 years. If the standard deviation is 0.17 and the significance level is set to 0.05. Do hypothesis testing to see if company's claim is right or wrong? We have the following 10 samples.

Serial No	Battery life
1	1.9
2	2.3
3	2.1
4	2.2
5	1.9
6	2.4
7	2.1
8	2.3
9	2.2
10	2.0

2. What can you say if the company had claimed that the average life of it's batteries are 4.1 with a standard deviation of 0.1

3. What are random variables? Discuss about continuous and discrete random variables with examples.

4. Write a program

    a. To compute the mean, median and mode of a python list.

    1. To compute the variance and standrad deviation of a vector(list).

    2. To compute the covariance and correlation between two vectors(list).

5. State central limit theorem. Demonstrate CLT with an example. Use python programming for the following steps. Consider a population which satisfies binomial distribution. Draw random samples from the population, find each sample mean. What can you say about the list containing sample means.

6. What is Baye's theorem. What are some real-world applications of Bayes' theorem in fields such as medicine and machine learning?

7. A certain disease affects 1 in every 500 people. A diagnostic test for the disease is 99% accurate when a person has the disease and 95% accurate when a person does not have the disease. If a person tests positive for the disease, what is the probability that they actually have it?

8. In a spam detection system, 1% of emails are actually spam. The spam filter correctly identifies 95% of spam emails but also incorrectly marks 3% of legitimate emails as spam. If an email is flagged as spam by the filter, what is the probability that it is actually spam?

9. Consider two vectors of length n(input from the user). Take the vectors as input from the user. Write a python program to find the

    a. It's dot product

    b. Distance between two vectors.

    c. Sum of the two vectors.

    d. Normalize a vector

10. Take two 2×2 matrices as user input. Write a python program to find the sum of the two matrices.