ASSIGNMENT - 10

1. Define the Bayesian interpretation of probability.

Ans: In contrast to the frequentist view which sees probability as the likelihood of an event happening in repeated trials, the Bayesian interpretation views probability as a degree of belief or a quantification of our knowledge about an event. It allows us to update these beliefs as we gather new evidence using Bayes' theorem.

2. Define probability of a union of two events with equation.

Ans: The probability of event A or event B happening (denoted by P(AUB)) is:

P(AUB) = P(A) + P(B) - P(A∩B)

where P(A∩B) is the probability of both A and B happening (intersection of events).

3. What is joint probability? What is its formula?

Ans: The joint probability of events A and B (denoted by P(A,B)) represents the likelihood of both A and B occurring together.

Formula: P(A,B) = P(A) \* P(B|A) or P(B,A) = P(B) \* P(A|B)

4. What is chain rule of probability?

Ans: This rule allows us to calculate the probability of a sequence of events (A happening, then B, then C) by multiplying the conditional probabilities:

P(A, B, C) = P(A) \* P(B|A) \* P(C|A,B)

5. What is conditional probability means? What is the formula of it?

Ans: The probability of event B happening given that event A has already occurred (denoted by P(B|A)) is the likelihood of B considering A is true.

Formula: P(B|A) = P(A,B) / P(A)

6. What are continuous random variables?

Ans: These variables can take on any value within a specific range. Examples include height, weight, or time.

7. What are Bernoulli distributions? What is the formula of it?

Ans: This probability distribution describes the outcome of a single trial with only two possible results (often success and failure).

Formula for success probability: P(success) = p

Formula for failure probability: P(failure) = 1 - p

8. What is binomial distribution? What is the formula?

Ans: This distribution applies to experiments with a fixed number of trials, each having only two possible outcomes (like coin flips). It describes the probability of getting a specific number of successes.

Formula: P(k successes in n trials) = (n choose k) \* p^k \* (1-p)^(n-k)

where n is the number of trials, k is the number of successes, p is the probability of success, and (n choose k) is the binomial coefficient.

9. What is Poisson distribution? What is the formula?

Ans: This distribution models the probability of a certain number of events occurring in a fixed interval of time or space, assuming the events occur independently and at a constant rate.

Formula: P(k events) = (e^-λ \* λ^k) / k!

where λ (lambda) is the average rate of events happening.

10. Define covariance.

Ans: Covariance measures the direction and strength of the linear relationship between two variables. A positive covariance indicates both variables tend to move in the same direction, while negative covariance suggests they move in opposite directions.

11. Define correlation

Ans: Correlation is a normalized version of covariance, ranging from -1 to 1. It reflects the strength and direction of the linear relationship between two variables, independent of their units.

12. Define sampling with replacement. Give example.

Ans; In this sampling method, after an item is chosen, it's put back into the population pool before the next selection. This means an item can be chosen multiple times.

Example: Drawing balls with replacement from a bag (the chosen ball is put back after each draw).

13. What is sampling without replacement? Give example.

Ans; Here, once an item is selected, it's not returned to the population. This reduces the pool of choices with each subsequent selection.

Example: Picking candies from a bag without putting them back (each candy can only be chosen once).

14. What is hypothesis? Give example.

Ans; A hypothesis is a statement about a population parameter that can be tested. It serves as a starting point for an investigation and can be either supported or rejected based on the gathered evidence.

Example: Hypothesis: The average height of adults in a country is greater than 170 cm.