1. Define the Bayesian interpretation of probability.

The Bayesian interpretation of probability is a measure of belief or certainty regarding an event, updated as new evidence is available, using Bayes' theorem.

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

The probability of the union of two events \(A\) and \(B\) is given by:

\[ P(A \cup B) = P(A) + P(B) - P(A \cap B) \]

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

Joint probability is the probability of two events occurring together. The formula is:

\[ P(A \cap B) \]

4. What is chain rule of probability?

The chain rule of probability expresses the joint probability of a sequence of events:

\[ P(A, B, C) = P(A) \cdot P(B|A) \cdot P(C|A, B) \]

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

Conditional probability is the probability of an event given that another event has occurred. The formula is:

\[ P(A|B) = \frac{P(A \cap B)}{P(B)} \]

6. What are continuous random variables?

Continuous random variables can take an infinite number of values within a given range. Examples include height, weight, and temperature.

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

Bernoulli distributions represent two possible outcomes, success (1) or failure (0). The formula is:

\[ P(X=k) = p^k (1-p)^{1-k} \]

where \(k \in \{0,1\}\) and \(p\) is the probability of success.

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

Binomial distribution models the number of successes in a fixed number of independent Bernoulli trials. The formula is:

\[ P(X=k) = \binom{n}{k} p^k (1-p)^{n-k} \]

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

Poisson distribution models the number of events in a fixed interval of time or space. The formula is:

\[ P(X=k) = \frac{\lambda^k e^{-\lambda}}{k!} \]

10. Define covariance.

Covariance measures the degree to which two variables change together. Positive covariance indicates they increase together, while negative indicates inverse relationship.

11. Define correlation.

Correlation measures the strength and direction of the linear relationship between two variables, ranging from -1 to 1.

12. Define sampling with replacement. Give example.

Sampling with replacement allows each selected item to be returned to the population before the next draw. Example: Drawing a card from a deck and returning it before the next draw.

13. What is sampling without replacement? Give example.

Sampling without replacement means each selected item is not returned to the population. Example: Drawing a card from a deck and not returning it before the next draw.

14. What is hypothesis? Give example.

A hypothesis is a testable statement about a population parameter. Example: "The average height of adult men in a city is 175 cm."