

1. Define the Bayesian interpretation of probability.

The Bayesian interpretation of probability is a statistical interpretation that views probability as a measure of uncertainty or belief in the occurrence of an event based on available evidence. It incorporates prior knowledge and updates it with new data 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, denoted as $P(A \cup B)$, can be calculated using the following equation: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

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

Joint probability refers to the probability of two or more events occurring simultaneously. It is denoted as $P(A \cap B)$, where A and B are two events. The formula for joint probability is: $P(A \cap B) = P(A) * P(B|A) = P(B) * P(A|B)$

4. What is chain rule of probability?

The chain rule of probability, also known as the multiplication rule, states that the joint probability of multiple events can be calculated by multiplying the conditional probabilities of each event given the preceding events. Mathematically, it can be expressed as: $P(A_1, A_2, \dots, A_n) = P(A_1) * P(A_2|A_1) * P(A_3|A_1, A_2) * \dots * P(A_n|A_1, A_2, \dots, A_{n-1})$

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

Conditional probability is the probability of an event A occurring given that another event B has already occurred. It is denoted as $P(A|B)$, and the formula for conditional probability is: $P(A|B) = P(A \cap B) / P(B)$

6. What are continuous random variables?

Continuous random variables are variables that can take any value within a specified range or interval. They have an infinite number of possible values and are typically associated with measurements or observations, such as height, weight, or time.

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

Bernoulli distribution is a discrete probability distribution that models a random variable with two possible outcomes: success (usually denoted as 1) or failure (usually denoted as 0). The probability mass function (PMF) of the Bernoulli distribution is given by: $P(X = k) = p^k * (1 - p)^{(1 - k)}$, where $k = 0$ or 1

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

Binomial distribution is a discrete probability distribution that models the number of successes in a fixed number of independent Bernoulli trials. It is characterized by two parameters: the number of trials (n) and the probability of success in each trial (p). The probability mass function (PMF) of the binomial distribution is given by: $P(X = k) = C(n, k) * p^k * (1 - p)^{(n - k)}$, where $k = 0, 1, 2, \dots, n$

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

Poisson distribution is a discrete probability distribution that models the number of events occurring in a fixed interval of time or space when the events are rare and independent. It is characterized by a single parameter λ , which represents the average rate of occurrence. The probability mass function (PMF) of the Poisson distribution is given by: $P(X = k) = \frac{e^{-\lambda} \lambda^k}{k!}$, where $k = 0, 1, 2, \dots$

10. Define covariance.

Covariance measures the linear relationship between two random variables. It indicates how changes in one variable are associated with changes in another variable. The formula for covariance between two random variables X and Y is: $\text{Cov}(X, Y) = E[(X - E[X]) * (Y - E[Y])]$

11. Define correlation

Correlation measures the strength and direction of the linear relationship between two variables. It is a standardized measure that ranges from -1 to +1. The formula for correlation between two random variables X and Y is: $\text{Corr}(X, Y) = \text{Cov}(X, Y) / (\sigma_X * \sigma_Y)$

12. Define sampling with replacement. Give example.

Sampling with replacement is a method in statistics where each member of a population has an equal chance of being selected, and after each selection, the selected member is returned to the population before the next selection. This means that the same member can be selected multiple times. For example, randomly selecting a ball from a bag, recording its color, and then returning it to the bag before the next selection.

13. What is sampling without replacement? Give example.

Sampling without replacement is a method in statistics where each member of a population has an equal chance of being selected, but once a member is selected, it is not returned to the population for subsequent selections. This ensures that each member can only be selected once. For example, randomly selecting students from a class to form a study group, ensuring that each student is chosen only once.

14. What is hypothesis? Give example.

A hypothesis is a statement or proposition that is subject to testing and investigation. It is used to make predictions or claims about a population or phenomenon based on available evidence or data. For example, "The new drug treatment is more effective in reducing pain compared to the existing treatment." Hypotheses are typically tested using statistical methods to determine if there is sufficient evidence to support or reject them.