1. Define the Bayesian interpretation of probability.

Bayesian probability is an interpretation of the concept of probability, in which, instead of frequency or propensity of some phenomenon, probability is interpreted as reasonable expectation representing a state of knowledge or as quantification of a personal belief.

1. Define the probability of a union of two events with an equation.

P(A or B) = P(A) + P(B). The chance of any (one or more) of two or more events occurring is called the union of the events. The probability of the union of disjoint events is the sum of their individual probabilities

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

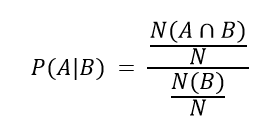
A joint probability is a possibility of occurring one or more independent events simultaneously, denoted as P (A∩B) or P (A and B). One can calculate it by multiplying the probability of both outcomes = P (A)\*P (B).

1. What is the chain rule of probability?

In probability theory, the chain rule (also called the general product rule[1][2]) permits the calculation of any member of the joint distribution of a set of random variables using only conditional probabilities.

1. What does conditional probability mean? What is the formula for it?

Conditional probability is known as the possibility of an event or outcome happening, based on the existence of a previous event or outcome. It is calculated by multiplying the probability of the preceding event by the renewed probability of the succeeding, or conditional, event.



1. What are continuous random variables?

A random variable X is continuous if possible values comprise either a single interval on the number line or a union of disjoint intervals. Continuous random variable is a random variable that can take on a continuum of values. In other words, a random variable is said to be continuous if it assumes a value that falls between a particular interval.

Continuous random variables are used to denote measurements such as height, weight, time, etc. The area under a density curve is used to represent a continuous random variable. In this article, we will learn about the definition of a continuous random variable, its mean, variance, types, and associated examples.

A continuous random variable is defined over a range of values while a discrete random variable is defined at an exact value.

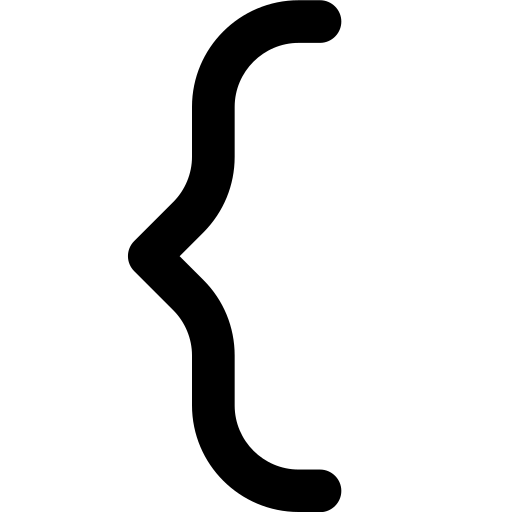
1. What are Bernoulli distributions? What is the formula of it?

The Bernoulli distribution is a special case of the binomial distribution where a single trial is conducted (so n would be 1 for such a binomial distribution). It is also a special case of the two-point distribution, for which the possible outcomes need not be 0 and 1.

Bernoulli Distribution Formula

A binomial random variable, X, is also known as an indicator variable. This is because if an event results in success then X = 1 and if the outcome is a failure then X = 0. X can be written as X ∼ Bernoulli (p), where p is the parameter. The formulas for Bernoulli distribution are given by the probability mass function (pmf) and the cumulative distribution function (CDF).

Probability Mass Function for Bernoulli Distribution

We calculate the probability mass function for a Bernoulli distribution. The probability that a discrete random variable will be exactly equal to some value is given by the probability mass function. The formula for pmf, f, associated with a Bernoulli random variable over possible outcomes 'x' is given as follows:

PMF = f(x, p) = p if x = 1

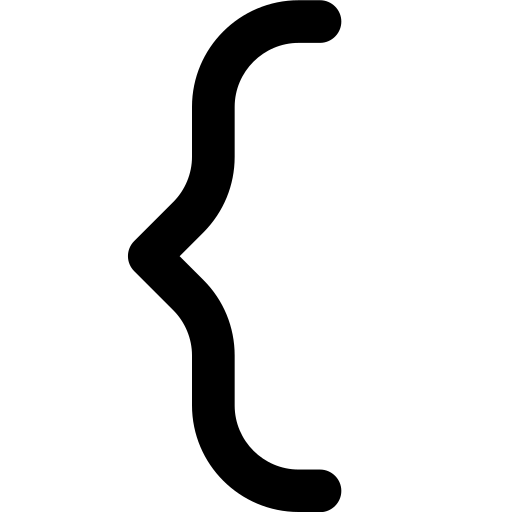
q = 1 − p if x = 0

We can also express this formula as,

f(x, p) = px (1 - p)1 - x, x ϵ {0, 1}

Cumulative Distribution Function for Bernoulli Distribution

The cumulative distribution function of a Bernoulli random variable X when evaluated at x is defined as the probability that X will take a value lesser than or equal to x. The formula is given as follows:

CDF = F(x, p) = 0 if x < 0 

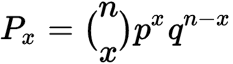
1 − p if 0 ≤ x < 1

1 x ≥ 1

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

binomial distribution is the discrete probability distribution that gives only two possible results in an experiment, either Success or Failure. For example, if we toss a coin, there could be only two possible outcomes: heads or tails, and if any test is taken, then there could be only two results: pass or fail. This distribution is also called a binomial probability distribution.

Formula



P = binomial probability

x = number of times for a specific outcome within n trials

{n \choose x} = number of combinations

p = probability of success on a single trial

q = probability of failure on a single trial

n = number of trials

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

A Poisson distribution is defined as a discrete frequency distribution that gives the probability of the number of independent events that occur in the fixed time.

Assume that, we conduct a Poisson experiment, in which the average number of successes within a given range is taken as λ. In Poisson distribution, the mean of the distribution is represented by λ and e is constant, which is approximately equal to 2.71828. x is the number of occurrences

Then, the Poisson probability is:

P(x, λ ) =(e– λ λx)/x!

* In Poisson distribution, the mean is represented as E(X) = λ.
* For a Poisson Distribution, the mean and the variance are equal.

It means that E(X) = V(X)

Where, V(X) is the variance.

1. Define covariance.

The mean value of the product of the deviations of two variates from their respective means.

covariance is a measure of the joint variability of two random variables.

For two jointly distributed real-valued random variables X and Y with finite second moments, the covariance is defined as the expected value (or mean) of the product of their deviations from their individual expected values



where

E [X] is the expected value of

X , also known as the mean of X

1. Define correlation

Correlation is a statistical measure that indicates the extent to which two or more variables fluctuate in relation to each other.

A correlation coefficient is a statistical measure, of the degree to which changes to the value of one variable predict change to the value of another.

1. Define sampling with replacement. Give example.

When a sampling unit is drawn from a finite population and is returned to that population, after its characteristic(s) have been recorded, before the next unit is drawn, the sampling is said to be “with replacement”

Let’s say you had a population of 7 people, and you wanted to sample 2. Their names are:

John

Jack

Qiu

Tina

Hatty

Jacques

Des

You could put their names in a hat. If you sample with replacement, you would choose one person’s name, put that person’s name back in the hat, and then choose another name. The possibilities for your two-name sample are:

John, John

John, Jack

John, Qui

Jack, Qui

Jack Tina

…and so on.

When you sample with replacement, your two items are independent. In other words, one does not affect the outcome of the other. You have a 1 out of 7 (1/7) chance of choosing the first name and a 1/7 chance of choosing the second name.

P(John, John) = (1/7) \* (1/7) = .02.

P(John, Jack) = (1/7) \* (1/7) = .02.

P(John, Qui) = (1/7) \* (1/7) = .02.

P(Jack, Qui) = (1/7) \* (1/7) = .02.

P(Jack Tina) = (1/7) \* (1/7) = .02.

1. What is sampling without replacement? Give example.

Sampling without Replacement is a way to figure out probability without replacement. In other words, you don’t replace the first item you choose before you choose a second. This dramatically changes the odds of choosing sample items. Taking the above example, you would have the same list of names to choose two people from. And your list of results would similar, except you couldn’t choose the same person twice:

But now, your two items are dependent, or linked to each other. When you choose the first item, you have a 1/7 probability of picking a name. But then, assuming you don’t replace the name, you only have six names to pick from. That gives you a 1/6 chance of choosing a second name. The odds become:

P(John, Jack) = (1/7) \* (1/6) = .024.

P(John, Qui) = (1/7) \* (1/6) = .024.

P(Jack, Qui) = (1/7) \* (1/6) = .024.

P(Jack Tina) = (1/7) \* (1/6) = .024…

1. What is the hypothesis? Give an example.

An idea that is suggested as the possible explanation for something but has not yet been found to be true or correct.

A hypothesis is an assumption that is made based on some evidence. This is the initial point of any investigation that translates the research questions into predictions. It includes components like variables, population and the relation between the variables. A research hypothesis is a hypothesis that is used to test the relationship between two or more variables.

Examples of Hypothesis

Following are the examples of hypotheses based on their types:

* Consumption of sugary drinks every day leads to obesity is an example of a simple hypothesis.
* All lilies have the same number of petals is an example of a null hypothesis.
* If a person gets 7 hours of sleep, then he will feel less fatigue than if he sleeps less. It is an example of a directional hypothesis.