Binomial Distribution:

Let Y be a binomial random variable based on n trials and success probability q:

Geometric probability distribution:

Y is a random variable with a geometric distribution:

Negative binomial probability distribution:

Y is a random variable with a negative binomial distribution:

Hypergeometric probability distribution:

Y is a random variable with a hypergeometric distribution:

Poisson probability distribution:

Y is a random variable possessing a Poisson distribution with parameter λ:

Tchebysheff’s Theorem:

Random variable Y has density function f(y) and a<b, then the probability that Y falls in the interval [a,b] is:

Provided that the integral exists then the expected value of a continuous random variable Y is:

Uniform probability distribution:

Gamma Distribution:

Discrete bi variate distribution:

Bivariate and Multivariate Probability Distribution:

Let and be discrete random variables. The *joint* (or bivariate) *probability function* for and is given by

Let and be continuous random variables with joint distribution function . If there exists a nonnegative function , such that

for all , then and are said to be *jointly continuous random variables*. The function is called the *joint probability density function*.

If and are random variables with joint distribution function , then

1. and , then

If and are jointly continuous random variables with a joint density function given by , then

1. for all ,

Marginal and Conditional Probability Distribution:

Let and be jointly discrete random variables with probability function . Then the *marginal probability functions* of and , respectively, are given by

Let and be jointly continuous random variables with joint density function . Then the *marginal density functions* of and , respectively, are given by

and

If and are jointly discrete random variables with joint probability function and marginal probability functions and , respectively, then the *conditional discrete probability function* of given is

Provided that

If and are jointly continuous random variables with joint density function , then the *conditional distribution function* of given = is

Let and be jointly continuous random variables with joint density and marginal densities and , respectively. For any such that , the conditional density of given is given by

and, for any such that , the conditional density of given is given by

Independent Random Variables:

Let have distribution function have distribution function , and and have joint distribution function . Then and are said to *independent* if and only if

for every pair of real numbers .

If and are not independent, they are said to be *dependent*

If and are discrete random variables with joint probability function and marginal probability functions and , respectively, then and are independent if and only if

For all pairs of real numbers

If and are continuous random variables with joint density function and marginal density functions and , respectively, then and are independent if and only if

For all pairs of real numbers

Let and have a joint density that is positive if and only if and , for constants *a, b, c,* and *d*; and otherwise. Then and are independent random variables if and only if

Where is a nonnegative function of alone and is a nonnegative function of alone