Kenny Vo

Formula Sheet

Definition 1.1

Mean of a sample *n* measured responses

Definition 1.2

Variance

Definition 1.3

Standard Deviation

Empirical Rule

Definition 2.6

Axiom 1

; probability of event cannot be negative.

Axiom 2

; probability of event coming from a set is always 100%

Axiom 3

Probability of pairwise exclusive events, is the sum of the probabilities.

MN Rule Theorem 2.1

Permutation =

Multinomal Coefficients Theorem 2.3

Combination

where =

Conditional Probability

P(A|B) = as long as P(B)>0

Independence if:

P(A|B)=P(A)

P(B|A)=P(B)

, otherwise dependent

Multiplicative Law of Probability

P(A)P(B|A)

P(B)P(A|B)

If A and B are independent,

General Addition Rule

Two arbitrary events A and B:

If A and B are mutually exclusive, :

Theorem 2.7

P(A)= 1-P(A’)

Theorem of Total Probability

Bayes Theorem

If 0<P(B)<1, use the Theorem of total probability

Probability Mass Function

Expectations of Discrete Random Variables: E[Y]

Variance: V[Y]

Binomial Distribution

and p(y)=0 for all other y

Expected

Standard Deviation

Geometric Distribution

E[Y]=

V[Y]=

Extra Formulas, with a probability of success p:

A success occurs on or before the trial.

A success occurs before the trial.

A success occurs on or after the trial.

A success occurs after the trial.

Hyper Geometric Distribution

also

PMF:

E[Y]=

Negative Binomial Probability Distribution

E[Y]=

Poisson Distribution

where

E[Y]=V[Y]=

Tchebysheff’s Theorem

Theorem 4.1 Properties of a Distribution Function

1.

2.

3.

Definition 4.2

A random variable Y with distribution function F(y) is said to be continuous

if F(y) is continuous, for −∞ < y <

Theorem 4.2

If f (y)is a density function for a continuous random variable, then

1.

2.

Definition 4.5

The expected value of a continuous random variable Y is

E(Y)=

Theorem 4.4

Let g(Y ) be a function of Y ; then the expected value of g(Y ) is given by

Theorem 4.5

Let c be a constant and let g(Y ), (Y ), (Y ), . . . , (Y ) be functions of a

continuous random variable Y . Then the following results hold:

1. E(c) = c.

2. E[cg(Y )] = cE[g(Y )].

3. E[ (Y )+ (Y )+· · ·+ (Y )] = E[(Y )]+E[(Y )]+· · ·+E[(Y )].

Definition 4.6

If < , a random variable Y is said to have a continuous uniform probability

distribution on the interval (, ) if and only if the density function of Y is

Theorem 4.6

Definition 4.8

A random variable Y is said to have a normal probability distribution if and

only if, for σ > 0 and −∞ <µ< ∞, the density function of Y is

Theorem 4.7

Definition 5.1

Let and be discrete random variables. The joint (or bivariate) probability

function for and is given by

Theorem 5.1

If and are discrete random variables with joint probability function then

1.

2.

Definition 5.2

For any random variables and , the joint (bivariate) distribution function is

Definition 5.3

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.

Definition 5.4

1. Discrete random variables
2. Continuous random variables

Definition 5.5

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

Definition 5.6

If and are jointly continuous random variables with joint density function

then the conditional distribution function of given is

Definition 5.7

Let and be jointly continuous random variables with joint density f ()

and marginal densities and respectively. For any such that

> 0, the conditional density of given is given by

and, for any such that > 0, the conditional density of given

is given by

Definition 5.8

Let have distribution function (), have distribution function (),

and and have joint distribution function F(). Then and are

said to be independent if and only if

for every pair of real numbers ().

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