Inferential Statistics Foundations

Agenda

- Inferential Statistics Quiz
- Probability
- Random Variable
- Binomial Distribution
- Normal Distribution
- Probability Functions
- z-score

Let's begin the discussion by answering a few questions on inferential statistics foundations.

Inferential Statistics Quiz

In a population, 150 people have a certain medical condition. Out of these, 90 show symptoms of fever and 60 exhibit fatigue. What's the probability of a person with the medical condition exhibiting symptoms of fever?

A 0.3

B 0.4

C 0.5

D 0.6

Inferential Statistics Quiz

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Probability

Measure of the likelihood or chance of an event occurring

$$\text{Probability of an event occurring} = \frac{\text{\# outcomes associated with the event}}{\text{total \# of outcomes in the sample space}}$$

← 100% Chance (Certainty)

← 50% Chance (Equally Likely)

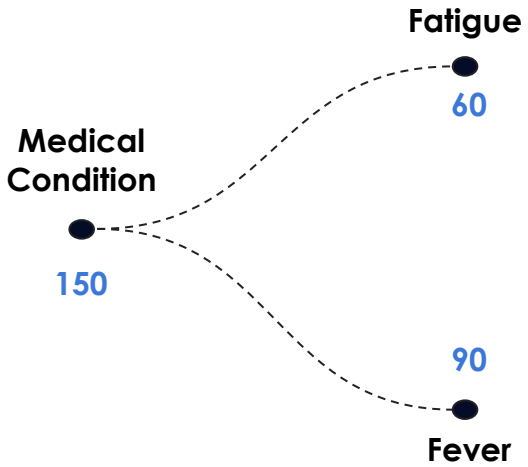
← 0% Chance (Impossibility)

Probability

$$\text{Probability of a person having fever} = \frac{\text{\# person with fever symptoms}}{\text{\# diagnosed with the medical condition}}$$

$$= 90 / 150$$

$$= 0.6 \text{ (or 60\%)}$$



Inferential Statistics Quiz

Which of the following statements are true regarding continuous and discrete random variables?

A. Continuous random variables can take any value in a continuous range

B. Discrete random variables are represented by smooth curves

C. Discrete random variables take specific values from a countable set

D. Continuous random variables can take whole number and fractional values

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Random Variables

A rule that assigns a numerical value to each outcome of an experiment

Assumes different values with different probability

Random Variable	Description	Examples
Continuous	Infinitely many values can be considered within a specified range	Speed of an aircraft
Discrete	Finitely many values can be considered within a countable set of values	Number of employees getting promoted in an organization

Inferential Statistics Quiz

In a Binomial Distribution, as the number of trials increases, what happens to the shape of the distribution?

A. It becomes more symmetric.

B. It becomes narrower.

C. It remains the same.

D. It becomes wider.

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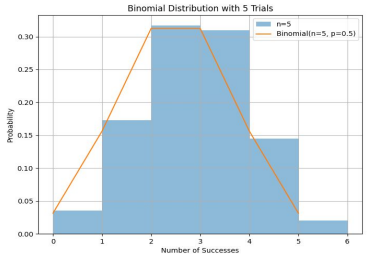
Binomial Distribution

The probability distribution of a success or failure outcome of an experiment that is conducted multiple times

Example: Probability of getting a head after tossing a coin 10 times

As the number of trials increase, the shape of the distribution becomes narrower and more symmetric



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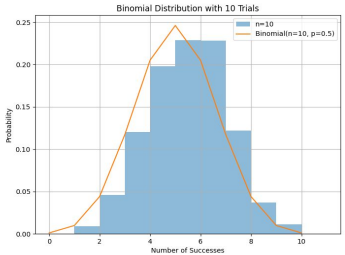

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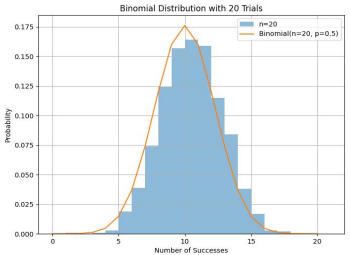

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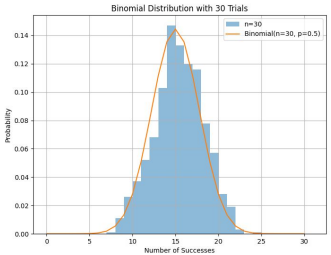

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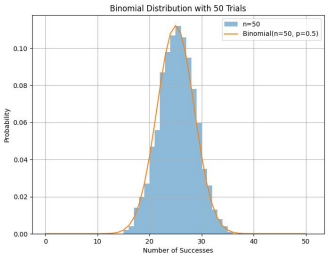

N= 50

Inferential Statistics Quiz

What percentage of data falls within one standard deviation of the mean in a Normal Distribution?

A ~25%

B ~98%

C ~95%

D ~68%

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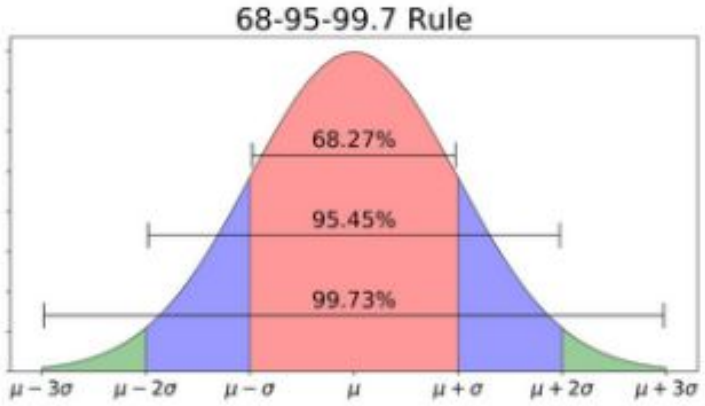
Normal Distribution

A continuous probability distribution that is symmetric, bell-shaped, and characterized by its mean (μ) and standard deviation (σ)

Also known as the Gaussian distribution

One of the most important distributions in statistics and probability theory

Many natural phenomena follow a normal distribution



Inferential Statistics Quiz

Great Learning
POWER AHEAD

Consider a retailer selling electronic devices. They want to answer the following questions:

1. What is the probability that a customer will spend less than $200 in the store?
2. What is the probability that a randomly selected customer has purchased exactly two electronic devices from the retailer?
3. If the retailer aims to achieve a monthly revenue of $15,000 from smartphone sale, what is the minimum monthly revenue needed to achieve 95% of the target?

Consider the following functions:

A. Cumulative Distribution Function (CDF)
B. Probability Mass Function (PMF)
C. Percent Point Function (PPF)

Which of the following is the correct combination of question and function to use to answer the question?

A. 1-A, 2-C, 3-B

B. 1-B, 2-A, 3-C

C. 1-A, 2-B, 3-C

D. 1-C, 2-A, 3-B

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B. 1-B, 2-A, 3-C

C. 1-A, 2-B, 3-C

D. 1-C, 2-A, 3-B

Probability Functions

Function	Description	Examples
Cumulative Distribution Function	Provides the cumulative probability that a random variable takes on a value less than or equal to a given threshold	CDF helps us get the probability of a stock price being below a certain price point
Percent Point Function	Inverse of the CDF, providing the value corresponding to a specified percentile of the distribution	In a race, if you finish at the 90th percentile, the PPF tells you the exact position you achieved out of 100 runners
Probability Mass Function	Provides the probability of a discrete random variable taking on a particular value	Rolling a fair six-sided die, the PMF tells you the probability of getting each number on a single roll

Inferential Statistics Quiz

Which of the following statements about z-scores are true?

A. Represents the number of standard deviations a data point is from the mean of a distribution

B. Represents the probability of a data point occurring within a distribution

C. It is always a positive value

D. It is always a whole number

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z-score

A statistical measurement that describes a data point relationship to the mean of a group of values

Measured in terms of standard deviations from the mean

$$Z = \frac{x - \mu}{\sigma}$$

Z **-** z-score, ***x*** **-** observed data point, ***μ*** **-** mean of the sample, ***σ*** **-** standard deviation of the sample

Example: In investing and trading, z-scores are measures of an instrument's variability and can be used by traders to help determine volatility.

Great Learning

Happy Learning !