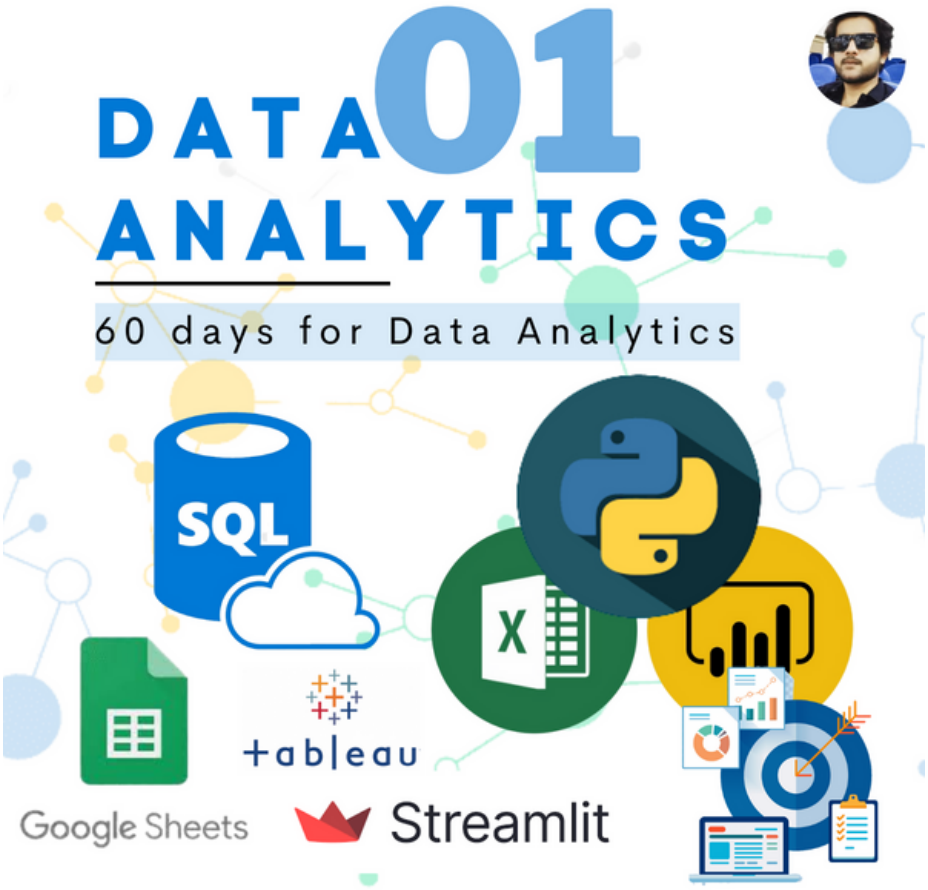


STATISTICS

Statistics has suddenly become one of the most sought-after specializations with the emergence of data science as the best job of the 21st century. It's not that statistics was not important earlier, but today it has reached altogether a new level. In this article, we will talk about the basics of statistics.

Generally, there are types of statistics. 1. **Descriptive statistics** and 2. **Inferential statistic**s. And it is very important, for those who want to make a career in the field of data science or data analytics, to know the difference pretty well.

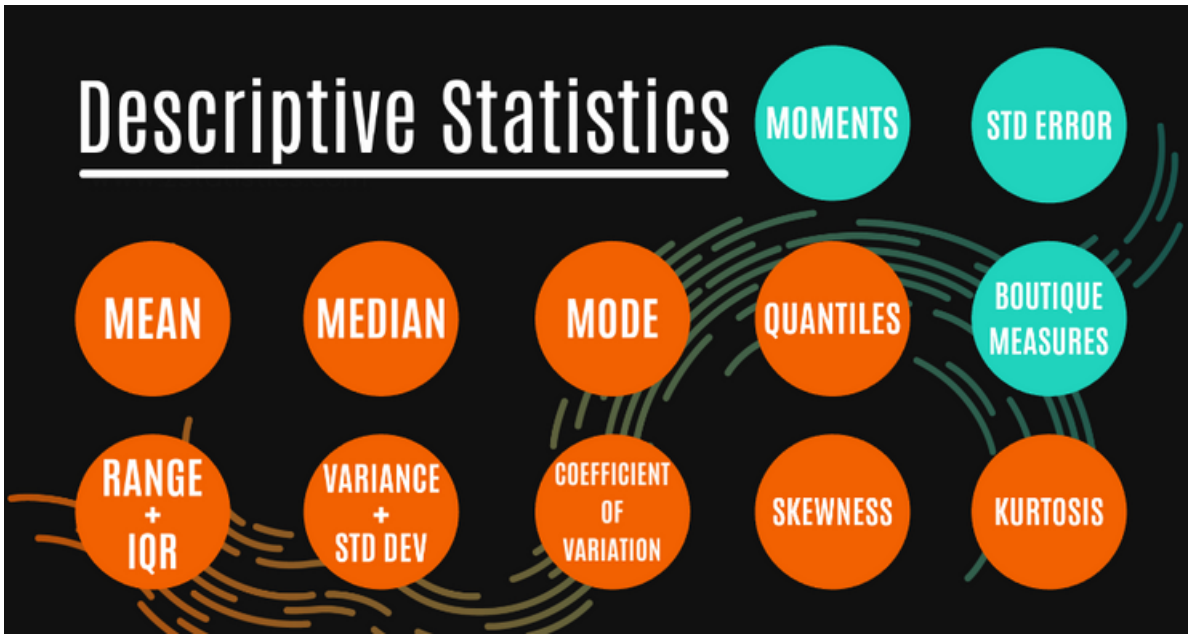
Once we have collected the data, what will we do with it? Data can be analyzed and used in various methods and formats. There are two types of statistical methods widely used for analyzing data.

1. Descriptive statistics
2. Inferential statistics

While analyzing a dataset, We use statistical methods to arrive at a conclusion. Data-driven decision-making also depends on how efficiently we use these methods.
Now, let us dive into these methods deeply.

1. DESCRIPTIVE STATISTICS

The study of **numerical** and **graphical** ways to describe and display your data is called descriptive statistics. It describes the data and helps us understand the features of the data by summarizing the given sample set or population of data. In descriptive statistics, we usually take the sample into account.



Statisticians use graphical representation of data to get a clear picture of the data. Business trends can be analyzed easily with these representations. visual representation is more effective than presenting huge numbers.

We can describe these data in various dimensions. **Various dimensions of describing data are**

1. Central Tendency of Data

2. Dispersion of Data

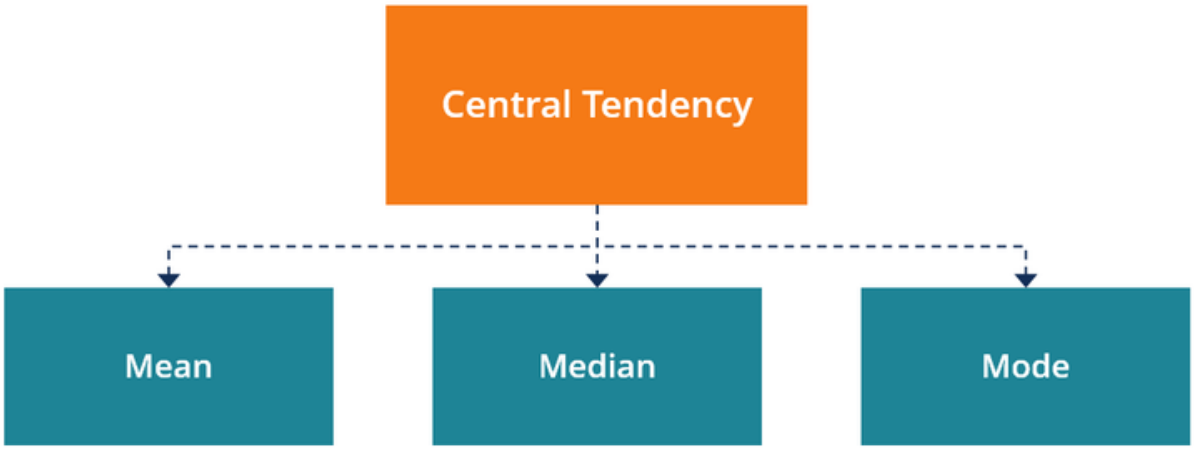
3. Shape of the Data

1. CENTRAL TENDENCY OF DATA

This is the center of the distribution of data. It describes the location of data and concentrates where the data is located.
The three most widely used measures of the “center” of the data are

1.1 Mean
1.2 Median
1.3 Mode

Let us see these measures in detail,



MEAN

The “Mean” is the average of the data.

Average can be identified by summing up all the numbers and then dividing them by the number of observations.

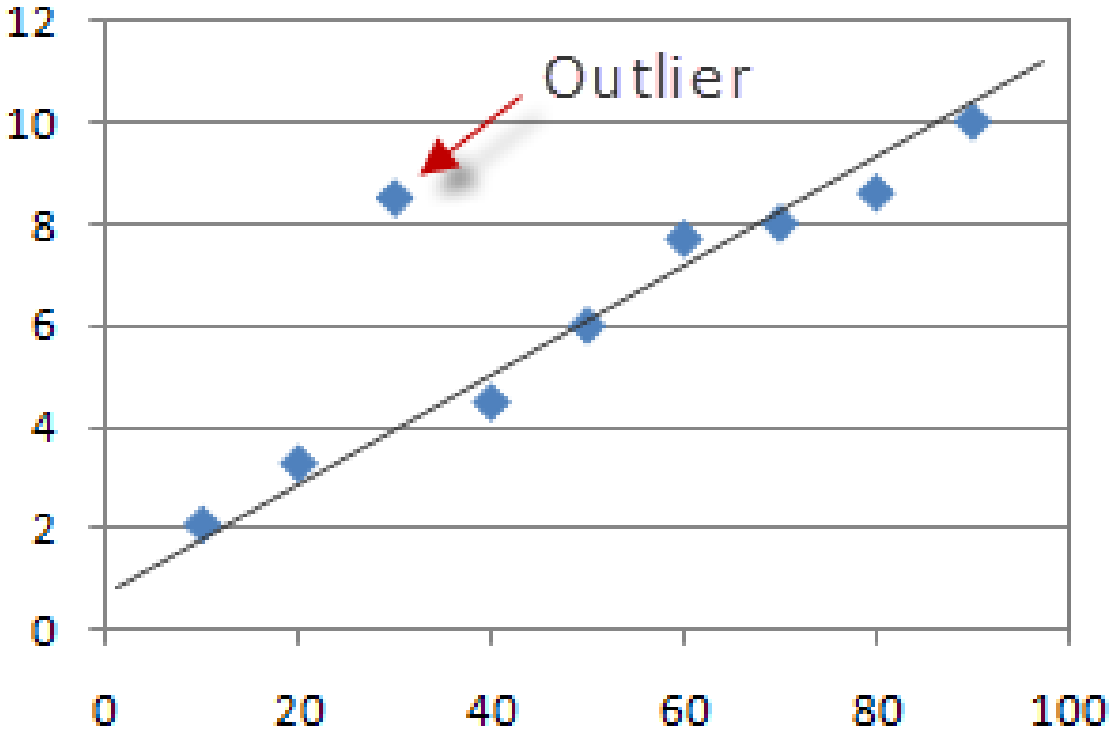
Mean = X1 + X2 + X3 +... + Xn / n

Example:

Data – 10,20,30,40,50 and Number of observations = 5
Mean = [10+20+30+40+50] / 5
Mean = 30

Outliers influence the central tendency of the data.

What are Outliers?
Outliers are extreme behaviors. An outlier is a data point that differs significantly from other observations. It can cause serious problems in analysis.



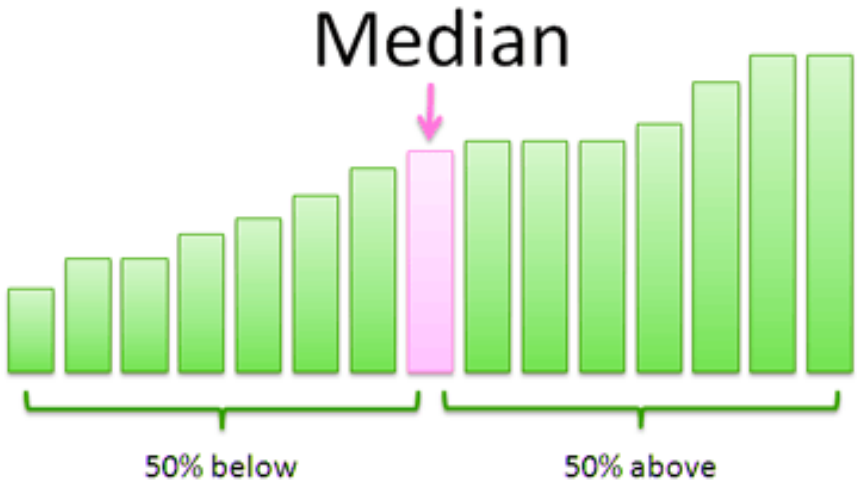
Example :
Data – 10,20,30,40,200
Mean = [10+20+30+40+200] / 5
Mean = 60

MEDIAN

The Median is the 50%th percentile of the data. It is exactly the center point of the data.

Median can be identified by ordering the data and splitting the data into two equal parts and finding the number. It is the best way to find the center of the data.

Because the central tendency of the data is not affected by outliers. Outliers don't influence the data.



Example:

Odd number of Data – 10,20,30,40,50
The Median is 30.

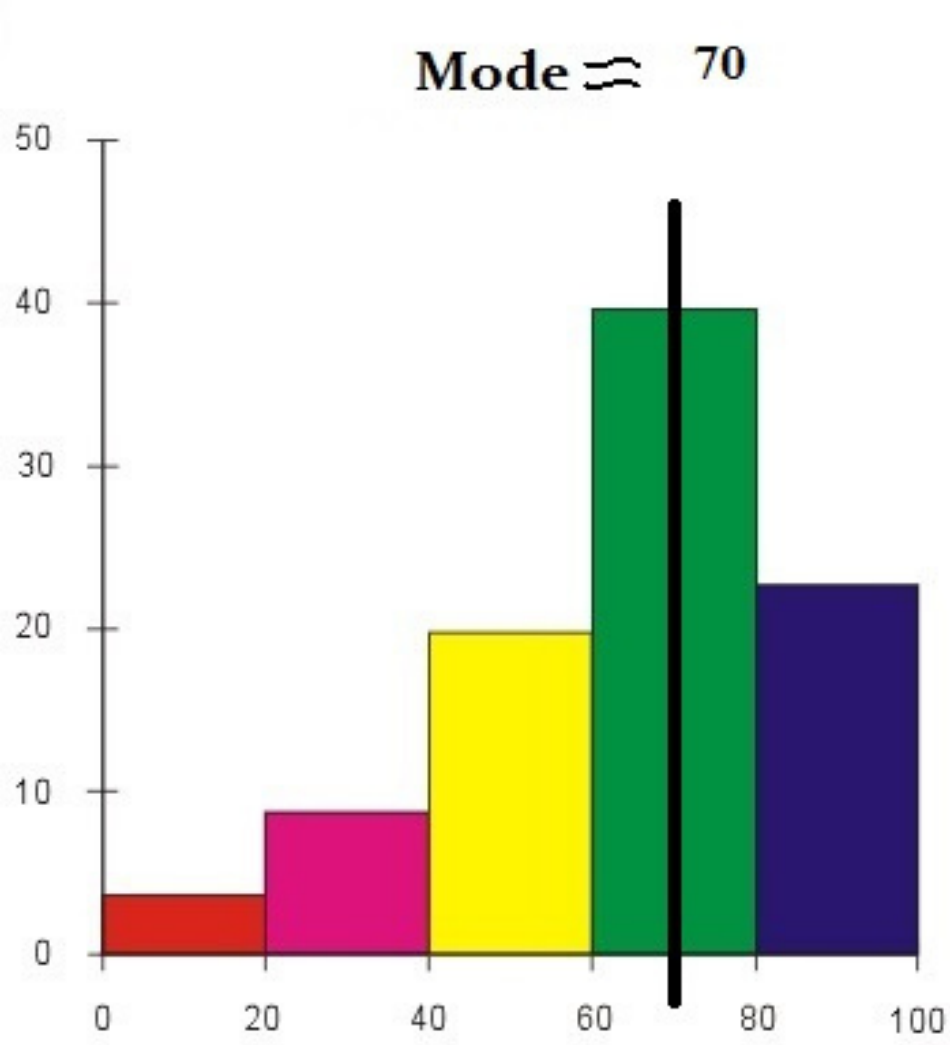
Even number of data – 10,20,30,40,50,60
Find the middle 2 data and take the mean of that two values.
Here 30 and 40 are middle values.
30+40 / 2 =35
Median is 35

MODE

Mode is frequently occurring data or elements.

If an element occurs the highest number of times, it is the mode of that data. If no number in the data is repeated, then there is no mode for that data. There can be more than one mode in a dataset if two values have the same frequency and also the highest frequency.

Outliers don’t influence the data.
The mode can be calculated for both quantitative and qualitative data.

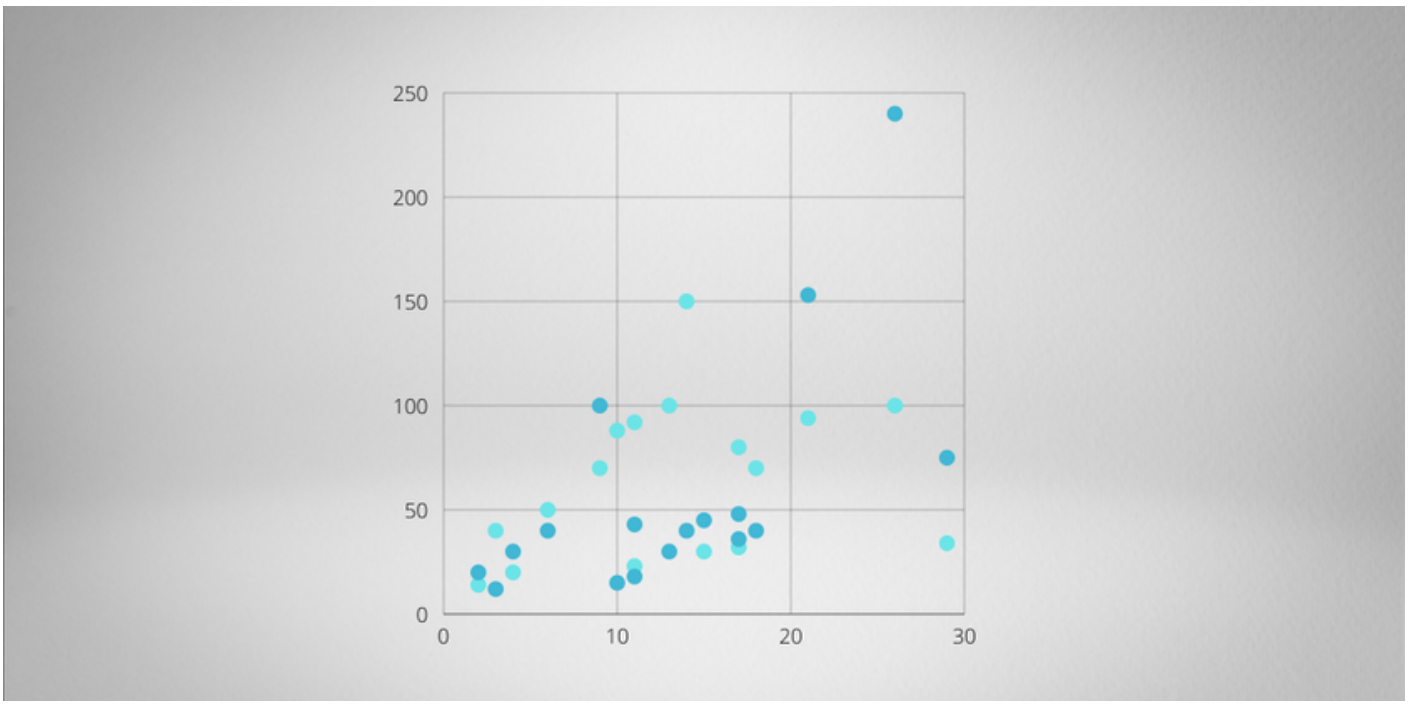


Example

Data – 1,3,4,6,7,3,3,5,10, 3

Mode is 3
because 3 has the highest frequency (4 times)

2. DISPERSION OF DATA



The dispersion is the “**Spread of the data**”. It measures how far the data is spread.

In most of the datasets, the data values are closely located near the mean. On some other datasets, the values are widely spread out of the mean. These dispersions of data can be measured by

2.1 Inter Quartile Range (IQR)
2.2 Range
2.3 Standard Deviation
2.4 Variance

Let us see these measures in detail,

1. INTER QUARTILE RANGE (IQR)

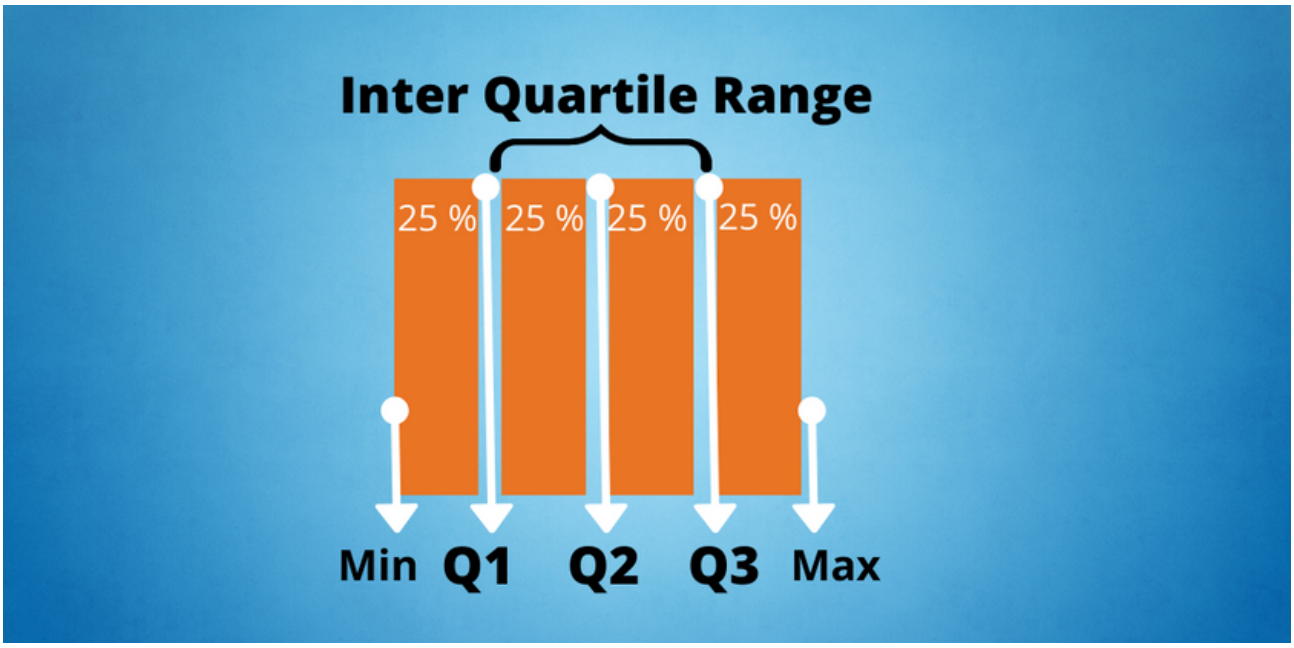
Quartiles are special percentiles.

1st **Quartile Q1** is the same as the 25th percentile.
2nd **Quartile Q2** is the same as the 50th percentile.
3rd **Quratile Q3** is the same as the 75th percentile

Steps to find quartile and percentile
–The data should be sorted and ordered from the smallest to the largest.
–For Quartiles, ordered data is divided into 4 equal parts.
–For Percentiles, ordered data is divided into 100 equal parts.

Inter Quartile Range is the difference between the third quartile(Q3) and the first Quartile (Q1)

IQR = Q3- Q1



Inter Quartile range

It is the spread of the middle half(50%) of the data

2.2 RANGE

The range is the difference between the largest and the smallest value in the data.

Max – Min = Range

2.3 STANDARD DEVIATION

The most common measure of spread is the standard deviation.

The Standard deviation is the measure of how far the data deviates from the mean value.

The standard deviation formula varies for population and sample. Both formulas are similar, but not the same.

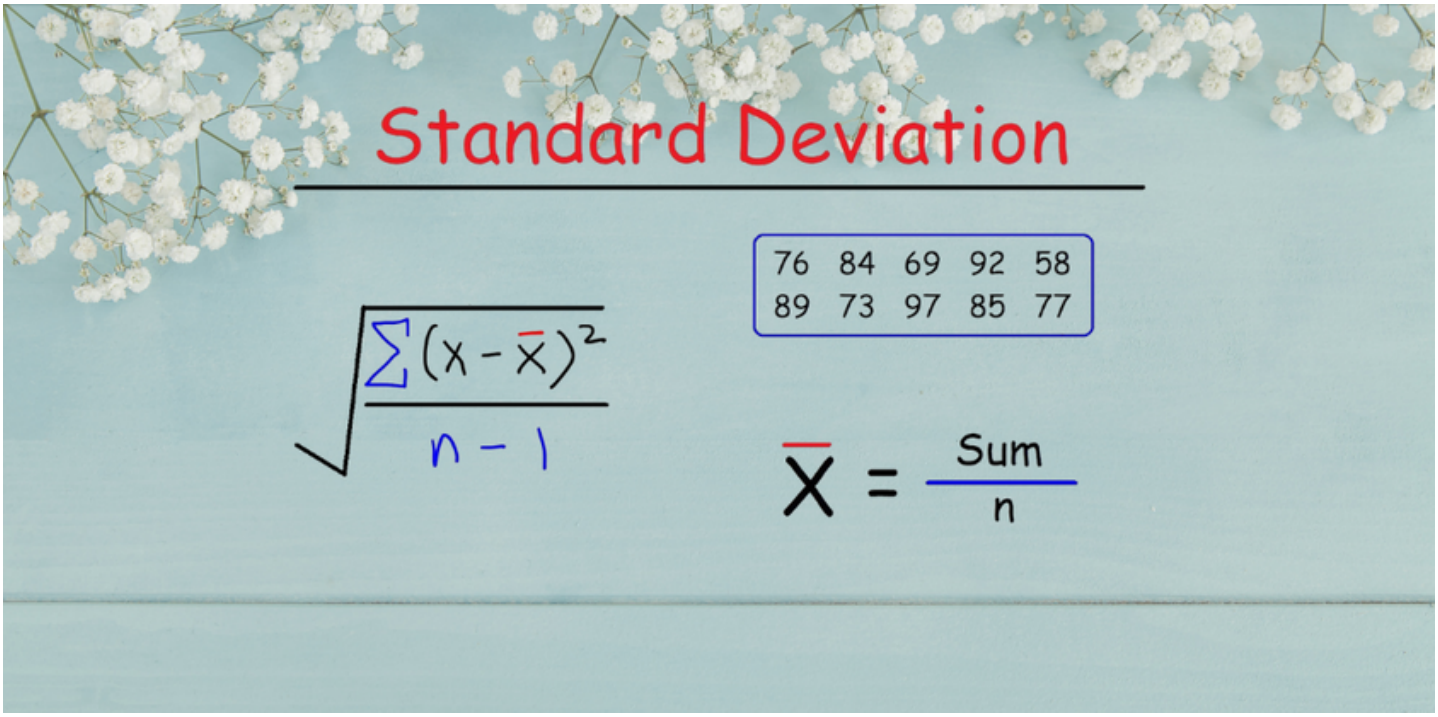
- The symbol used for **Sample Standard Deviation** – "s" (lowercase)
- Symbol used for **Population Standard Deviation** – "σ" (sigma, lower case)

Steps to find Standard deviation

If x is a number, then the difference "x – mean" is its deviation. The deviations are used to calculate the standard deviation.

Sample Standard Deviation, s = Square root of sample variance

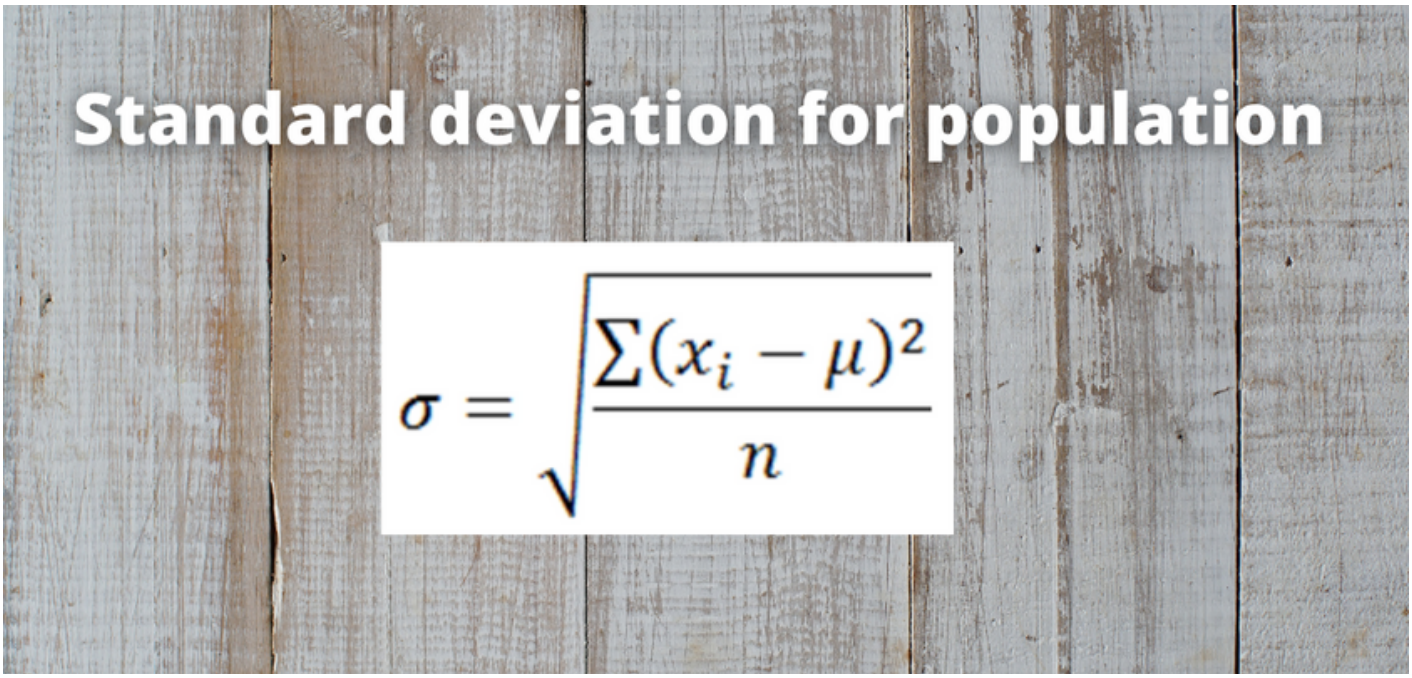
Sample Standard Deviation, s = Square root of $[\sum(x - \bar{x})2/ n-1]$ where $\bar{x}$ is average and n is no. of samples



Standard Deviation for sample

Population Standard Deviation, σ = Square root of population variance

Population Standard Deviation, σ = Square root of [∑(x – μ)2 / N] where μ is Mean and N is no.of population.



The standard deviation for the population

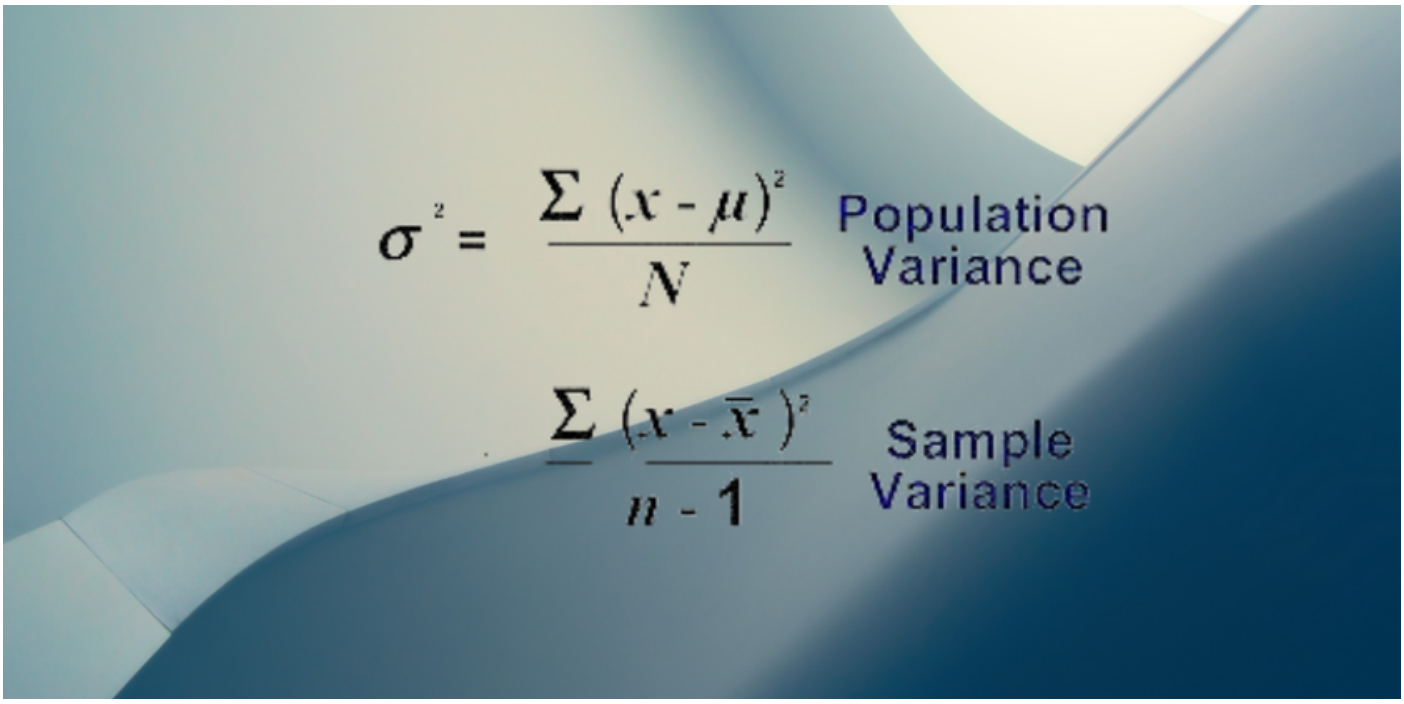
The standard deviation is always positive or zero. It will be large when the data values are spread out from the mean.

2.4 VARIANCE

The variance is a measure of variability. It is the **average squared deviation from the mean.**
The symbol σ2 represents the population variance and the symbol for s2 represents sample variance.

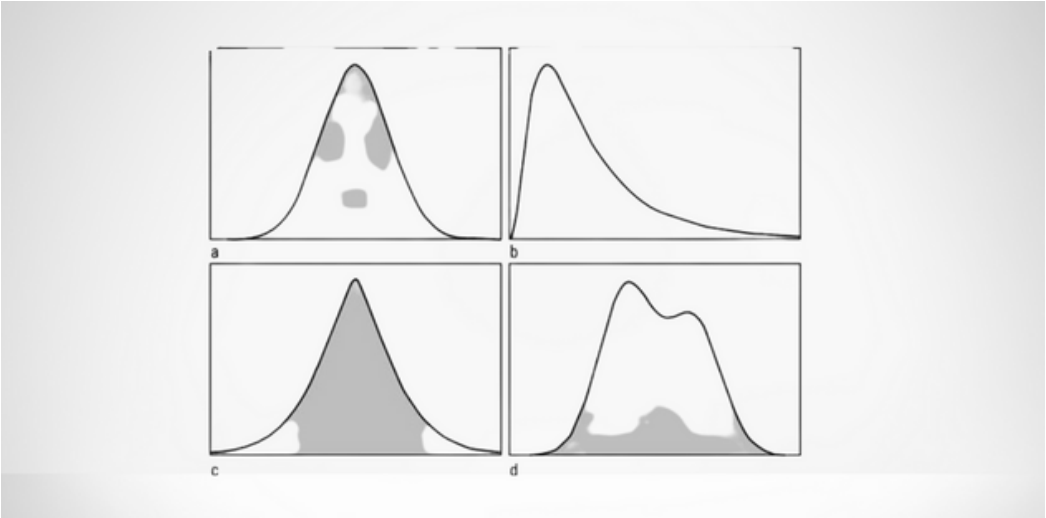
Population variance $\sigma 2 = [\sum(x - \mu)2 / N]$

Sample Variance s2 $= [\sum(x - \bar{x})2 / n-1]$



3. SHAPE OF THE DATA

The shape describes the type of the graph.
The shape of the data is important because making a decision about the probability of data is based on its shape.



The shape of the data can be measured by two methodologies.

3.1 Symmetric

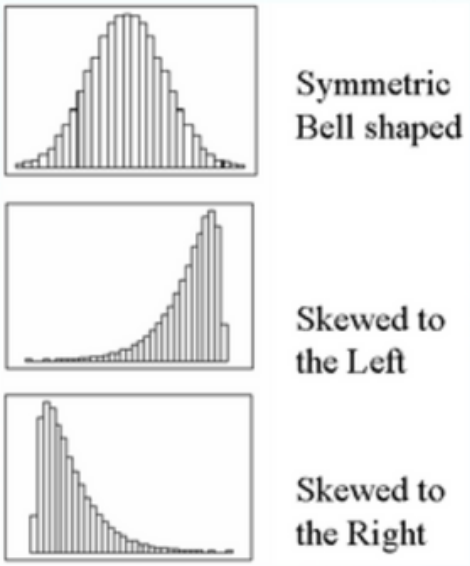
3.2 Skewness

3.3 Kurtosis

Let us discuss in detail,

3.1 SYMMETRIC

In the symmetric shape of the graph, the data is distributed the same on both sides.
In symmetric data, the mean and median are located close together.



The curve formed by this symmetric graph is called a normal curve.

3.2 SKEWNESS

Skewness is the measure of the asymmetry of the distribution of data.
The data is not symmetrical (i.e) it is skewed towards one side.
Skewness is classified into two types.

1. Positive Skew
2. Negative Skew

let us see that,

1. POSITIVELY SKEWED

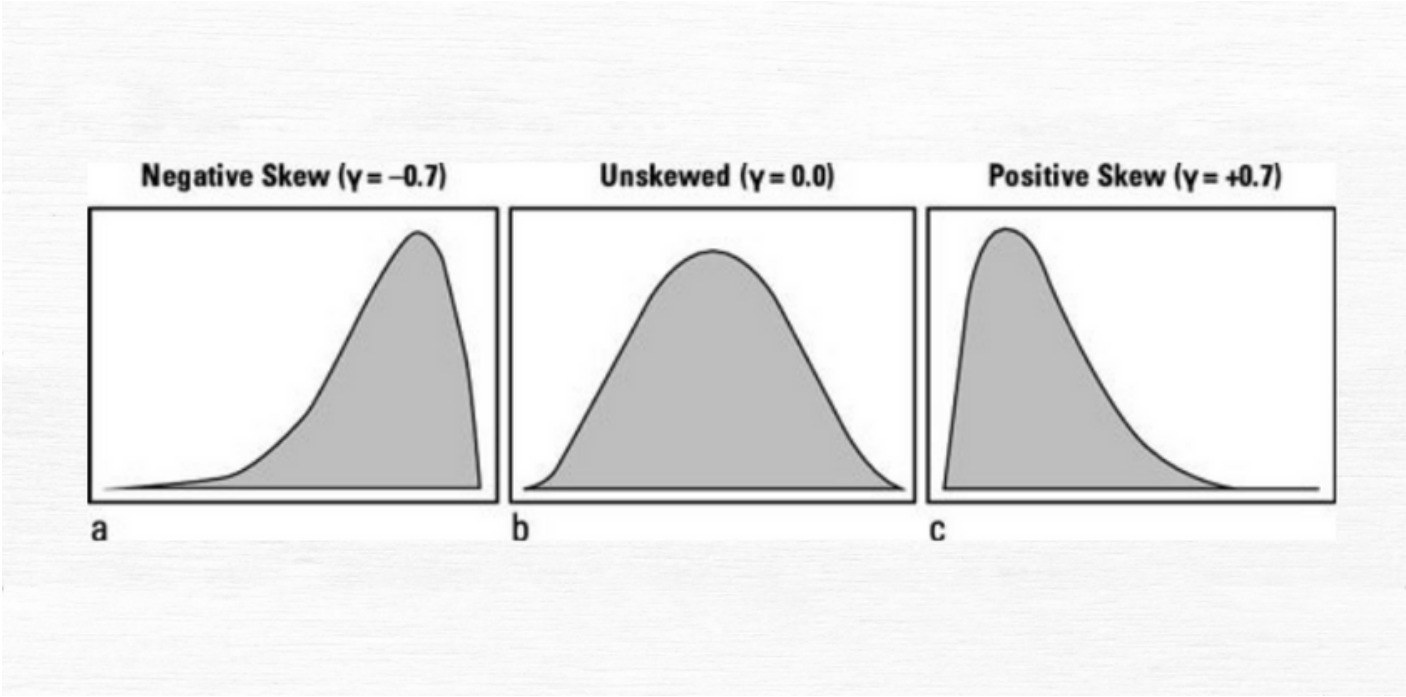
In a Positively skewed distribution, the data values are clustered around the left side of the distribution and the right side is longer.

The mean and median will be greater than the mode in the positive skew.

2. NEGATIVELY SKEWED

In a Negatively skewed distribution, the data values are clustered around the right side of the distribution and the left side is longer.

The mean and median will be less than the mode.



Positive.Negative skewed and unskewed

3.3 KURTOSIS

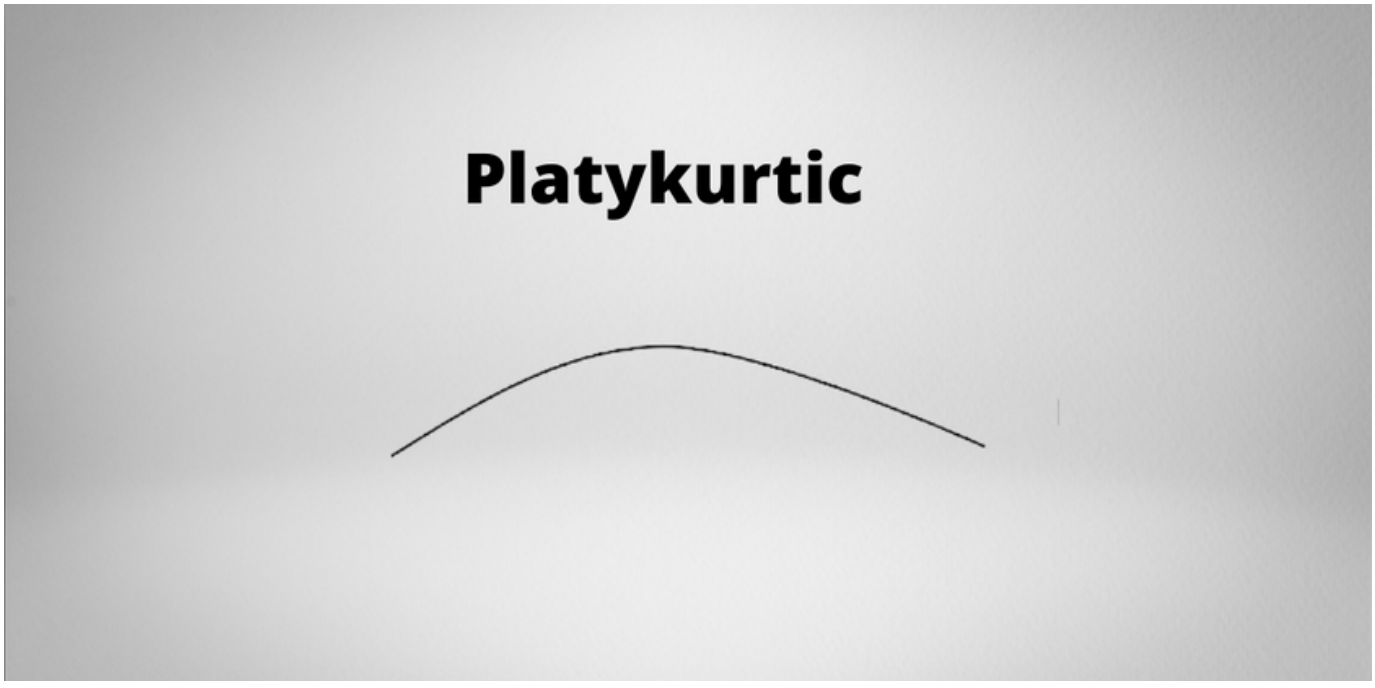
Kurtosis is the measure of describing the distribution of data.
This data is distributed in different ways. They are,

1. **Platykurtic**
2. **Mesokurtic**
3. **Leptokurtic**

Let us discuss in detail,

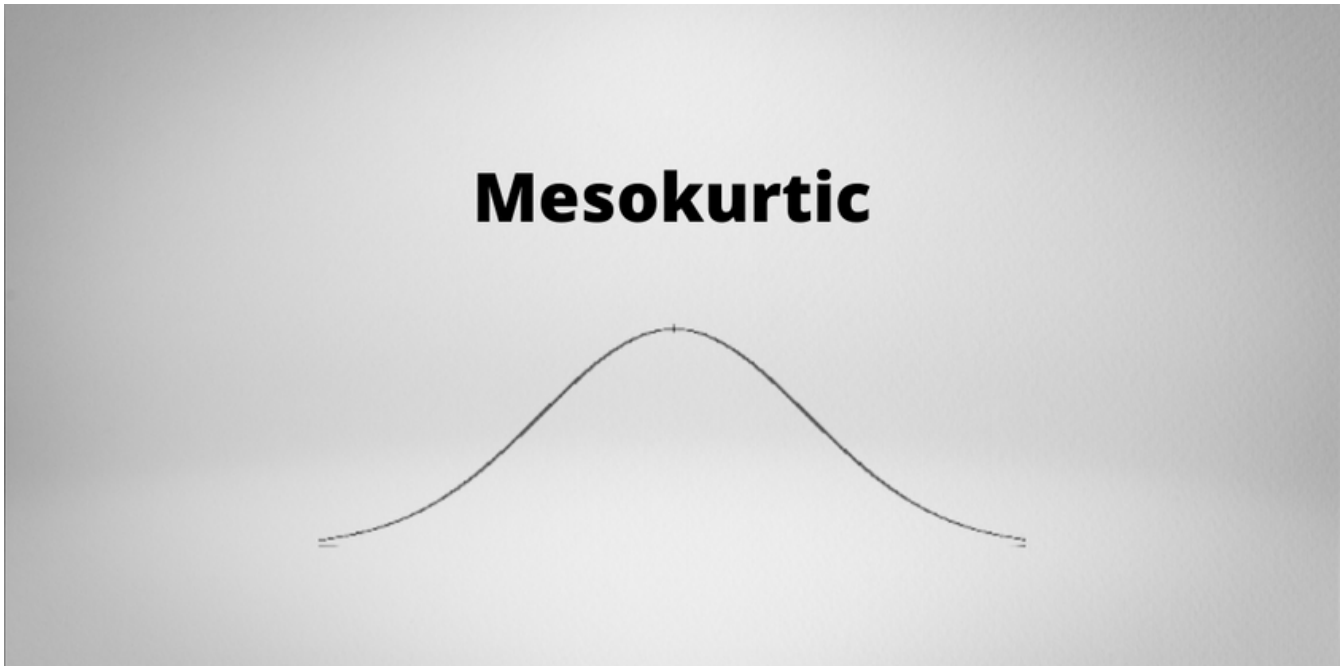
1. PLATYKURTIC

The platykurtic shows a distribution with flat tails. Here the data is distributed faltly . The flat tails indicated the small outliers in the distribution.



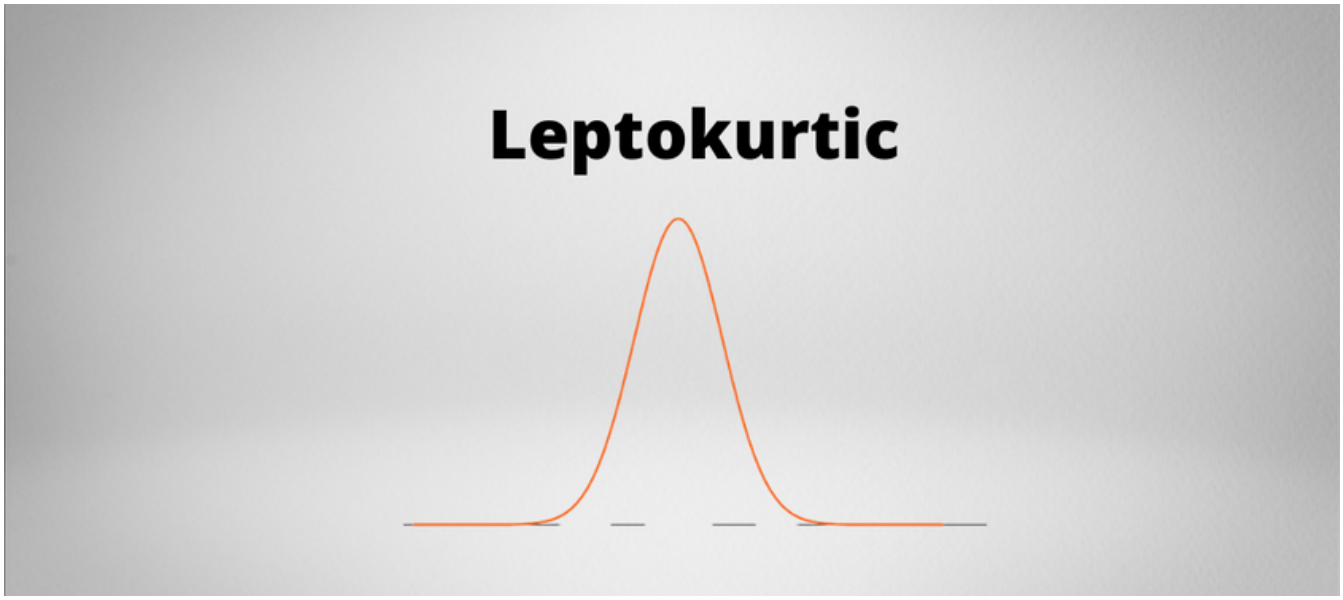
2. MESOKURTIC

In Mesokurtic, the data is widely distributed. It is normally distributed and it also matches normal distribution.

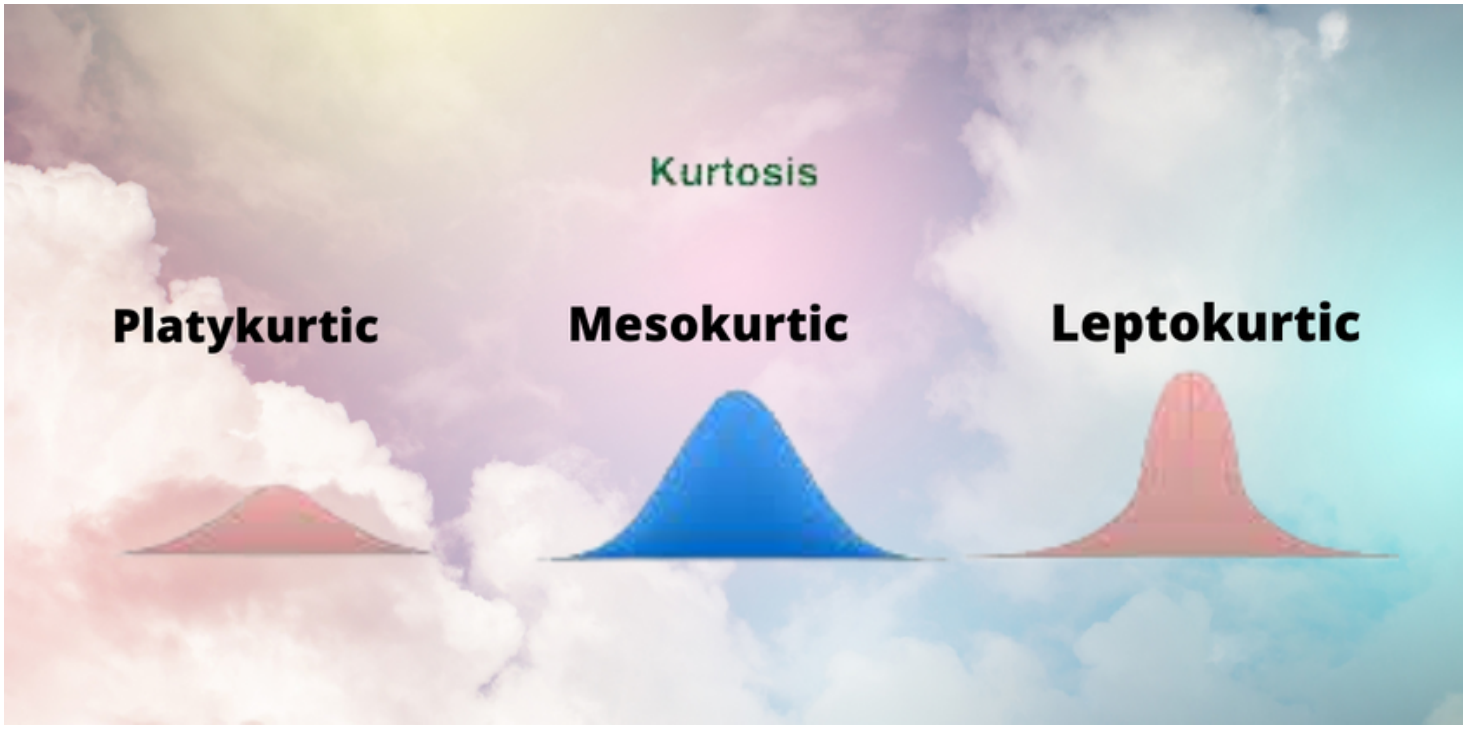


3. LEPTOKURTIC

In leptokurtic, the data is very closely distributed. The height of the peak is greater than width of the peak.



DIFFERENCES



Endnotes

We have seen some basic descriptive stat concepts.

Thanks for reading!

I hope you enjoyed the

Resources

Descriptive statistics | A Beginners Guide!

The study of numerical and graphical ways to describe and display your data is called descriptive statistics. Let's see some important concepts.

What is Descriptive Statistics? - Data Science and Data Analytics

Statistics are of two types, Descriptive and Inferential statistics. And it's a key for career building in the field