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APPLICATION OF CORRELATION IN REAL LIFE

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Abstract: Understanding and analyzing various correlations can be beneficial across different industries. Correlation is a statistical method to access a possible linear association between two continuous variables. Here, we have to find the correlation coefficient between the age of the children and the length of their clothes and we have drawn a scatter diagram for Vaccinated details of our college Students. Now, we find the linear relationship between both the variables is measured by using Karl Pearson's coefficient of correlation formula, $\boldsymbol{\gamma} = \sum (\boldsymbol{x_i} - \overline{\boldsymbol{x}})(\boldsymbol{y_i} - \overline{\boldsymbol{y}})/\mathbf{n}\boldsymbol{\sigma_x}\boldsymbol{\sigma_\gamma}$**.** Correlation investigates and quantifies the direction of strength of relationship between variables and Draw the scatter diagram for the number of students and their marks understand the type of correlation between them.

INTRODUCTION:

A linear relationship between two or more variables is called correlation. The measure of correlation called correlation coefficient. Correlation analysis is concerned with measuring the strength **of the relationship between two variables.** The measure of correlation is called Correlation coefficient which shows the direction and degree of correlation. The word correlation implies cause and effect of relationship.

Example:

Relationship between the rainfall and yield of crops.
Relationship between the working time and salary.

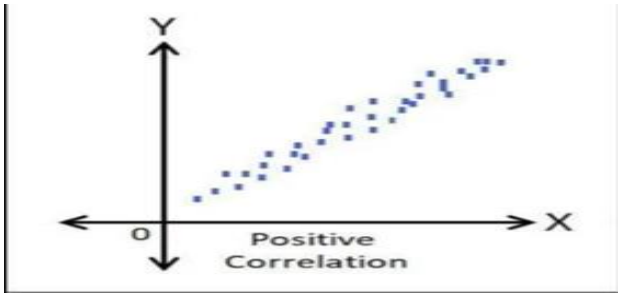
TYPES OF CORRELATION:

1. Positive correlation
2. Negative correlation
3. Zero correlation
4. Simple correlation
5. Multiple correlation
6. Partial correlation
7. Linear correlation
8. Non-linear correlation

POSITIVE *CORRELATION*

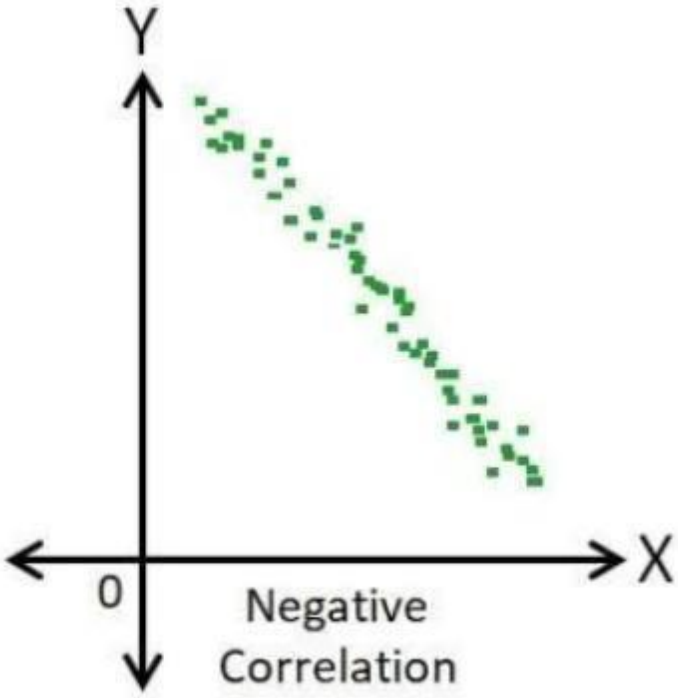
A correlation is a relationship between two variables in which both variables move in the same direction. Therefore, when one variable increases as the other variable increases, or one variable decreases while the other decreases.

Example As the number of trees cut down increases the probability of erosion increases. When working time decreases their salary also Decreases.



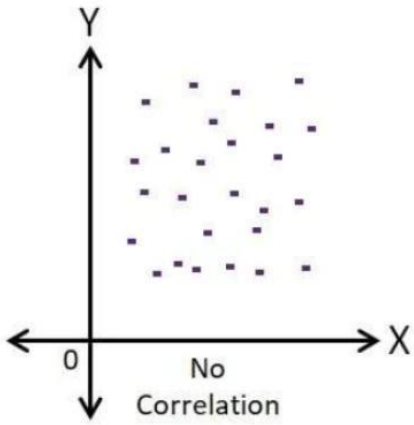
NEGATIVE CORRELATION

A correlation is a relationship between two variables in both the variables move in opposite direction. When one variable increases other variable decreases. *Example*: As the weather gets colder, air conditioning cost decreases. As one exercise more, their body weight Decreases.



ZERO CORRELATION

A correlation of zero means there is no relationship between the two variables.
In other words, as one variable moves one way, the other moved in another unrelated direction.
Example: There is no relationship between the amount of tea drunk and level of intelligence. Weight and Exam scores.



SIMPLE CORRELATION
Correlation among two variables is known as a simple correlation.
Example: Rainfall and yield of crops.

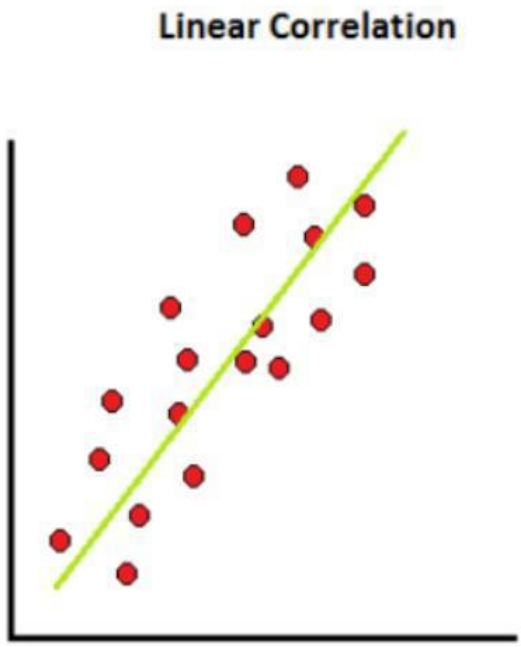
MULTIPLE CORRELATIONS
The study of the association between three or more variables together is known as multiple correlations.
Example: Price of cola drink, Temperature, Income and demand of cola.

PARTIAL CORRELATION

When more than two variable are considered as when the study of correlation between two variables together and keeping other variables constant is called partial correlation.
Example: Price of cola remains constant, the correlation between temperature and demand for cola.

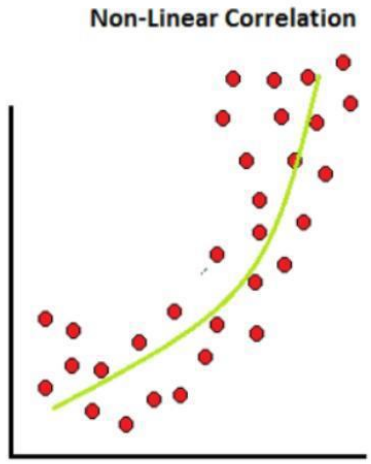
LINEAR CORRELATION
If the ratio of change between two variables is the same, it means one variable moves with a constant ratio to the amount of change in the ratio of another variable.

The graph is in straight line.



NON-LINEAR CORRELATION

If the ratio of change between two variables is not the same, then it is non-linear or curvilinear .The graph is not in a straight line.



SCATTER DIAGRAM METHOD

This is the simplest method of finding out whether there is an relationship present between two variables by plotting the values on a chart, known as Scatter diagram. In this method, the given data are plotted on a graph paper in the form of dots.

MERITS

- ✓ Scatter diagram is simple and attractive method of finding out the nature of correlation between two variable
- ✓ It is a non-mathematical method of studying correlation. It is easy to understand.
- ✓ We can get a rough idea at a glance whether it is positive or negative correlation.

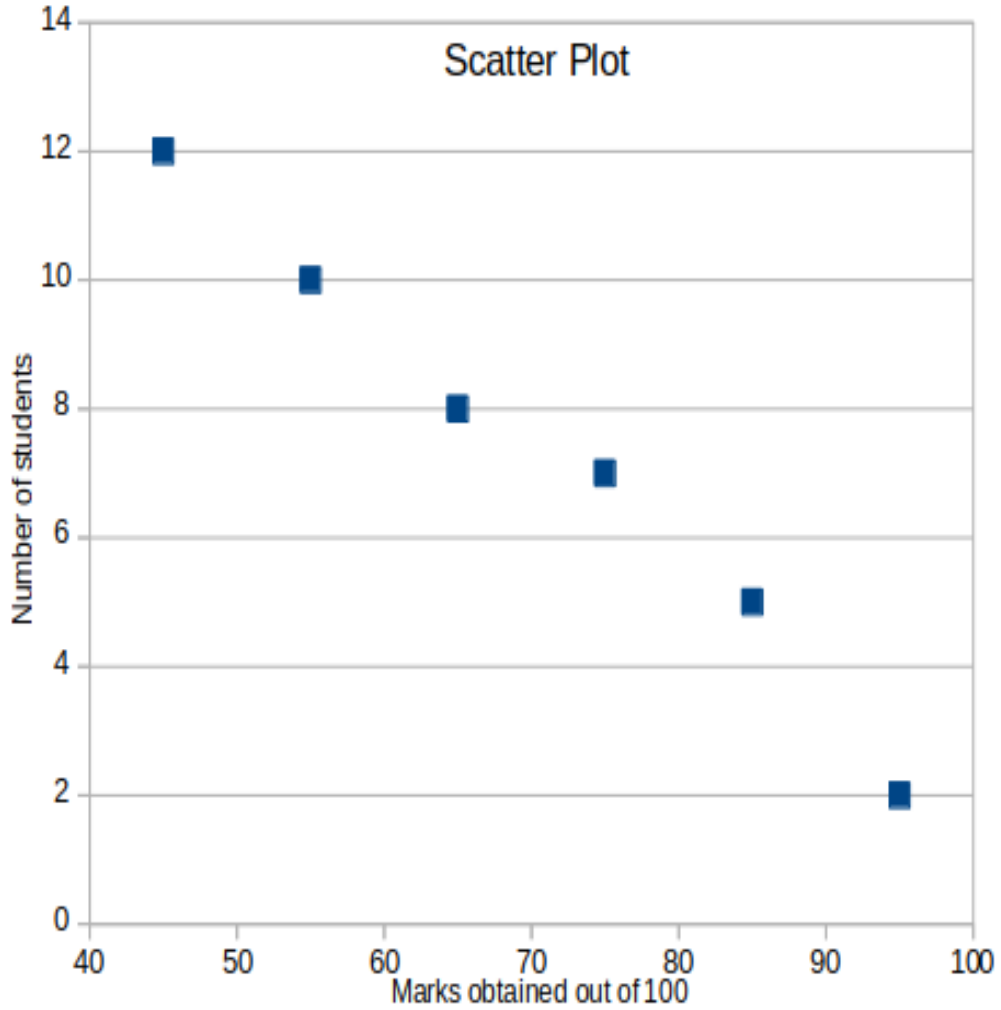
DEMERITS

- ✓ By this method we cannot get the exact degree or correlation between two variables.
- ✓ It gives only a rough idea.
- ✓ A scatter diagram does not measure the precise extent of correlation.

Example 1: Draw the scatter diagram for the marks obtained by students in a class and understand the type of correlation between them.

No. of Students	Marks obtained (out of 100)
12	40-50
10	50-60
8	60-70
7	70-80
5	80-90
2	90-100

Scatter diagram:-



GRAPHICAL METHOD

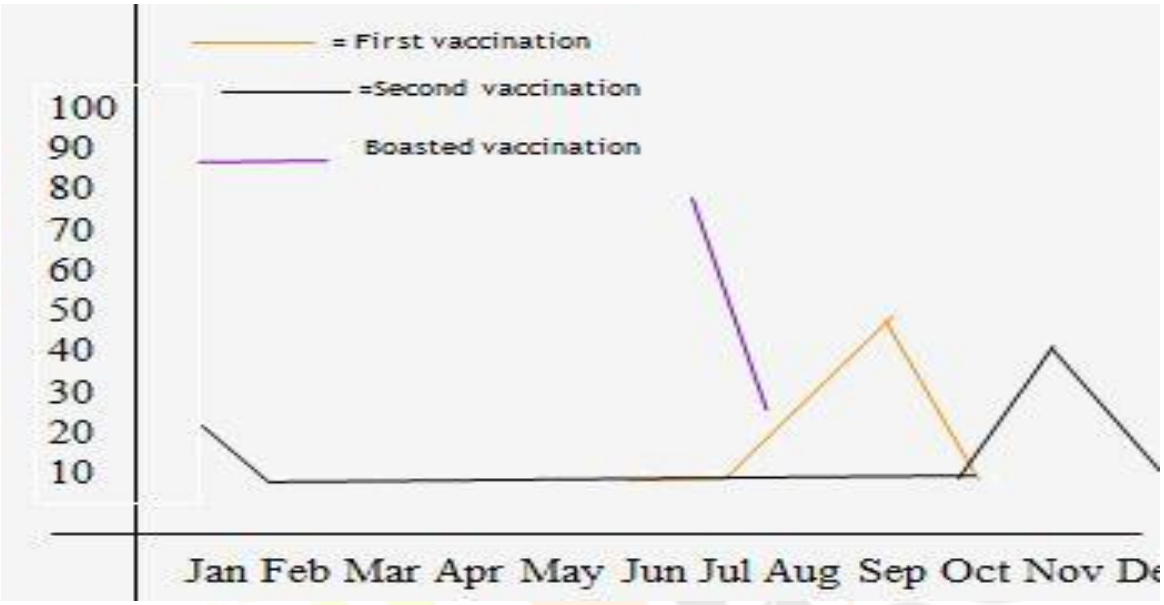
- ✓ The values of the two variables are plot on a graph paper.
- ✓ We get two curves, one for X variables and other for Y variables.
- ✓ These two curves reveal the direction and closeness of the two curves and reveal whether or not the variables are related.

Example 2:

Draw a correlation graph for the Vaccination status of our college students:

Month	**First vaccination**	**Second vaccination**	**Boasted vaccination**
January	-	20	-
February	-	10	-
March	-	-	-
April	-	-	-
May	-	10	-
June	10	-	-
July	10	-	75

August	20	-	25
September	50	-	-
October	10	10	-
November	-	40	-
December	-	10	-



METHODS OF DETERMINING CORRELATION

The Karl Pearson coefficient of correlation is most commonly used for measuring the degree of association between two variables.
•This is also referred to as the product-moment correlation coefficient or the simple correlation coefficient.
•It is calculated using the arithmetic mean and standard deviation.
•It is a mathematical expression that measures the strength and direction of a linear relationship between two variables.
The correlation coefficient(r)is also called the linear correlation coefficient.
•The value of ranges from–1to1.
•Karl Pearson's correlation coefficient is calculated by using the formula,
Where,

$$\gamma = \frac{\sum(X-\bar{X})(Y-\bar{Y})}{\sqrt{\sum(X-\bar{X})^2}\sqrt{\sum(Y-\bar{Y})^2}}$$

$\bar{X}$ is the mean value of X.
$\bar{Y}$ is the mean value of Y.

USES OF CORRELATION

It is used in determining the degree and direction of the relationship between variables.
It helps in analyzing economic activities.
It is used for determining the quality of predictions or estimates.
It also helps in concluding the research and statistical investigations.
It is used to study the strength of the association between the variables.

EXAMPLE PROBLEM -1

Find the correlation coefficient of 9 children between age and length of clothes.

Age (Years)	4	5	6	7	8	9	10	11	12
Length(cm)	104	110	116	122	128	134	140	146	152

Solution

Given,

$\sum X_i$ = 4,5,6,7,8,9,10,11,12

$\sum Y_i$=104,110,116,122,128,134,140,146,152

Using Karl Pearson's coefficient of correlation,

$\gamma = \Sigma(x_i-\bar{x})(y_i-\bar{y})/n\boldsymbol{\sigma}_x\boldsymbol{\sigma}y$ ----------(1)

$\bar{X} = \Sigma x_i/n$

=45+6+7+8+9+10+11+12/9

=72/9

=8

$\bar{y} = \Sigma y_i/n$

=104+110+116+122+128+134+140+146+152/9

= 1152/9

= 128

X_i	Y_i	$X_i-\bar{X}$	$Y_i-\bar{y}$	$(X_i-\bar{X})^2$	$(Y_i-\bar{y})^2$	$(X_i-\bar{X})(Y_i-\bar{y})$
4	104	-4	-24	16	576	96
5	110	-3	-18	9	324	54
6	116	-2	-12	4	144	24
7	122	-1	-6	1	36	6
8	128	0	0	0	0	0
9	134	1	6	1	36	6
10	140	2	12	4	144	24
11	146	3	18	9	324	54
12	152	4	24	16	576	96
Total=72	1152	0	0	60	2160	360

$\boldsymbol{\sigma}_x = \sqrt{\Sigma(X_i-\bar{X})^2/n} = \sqrt{60/9} = \sqrt{6.67} = 2.583$

$\boldsymbol{\sigma}_\gamma = \sqrt{\Sigma Y_i-\bar{y})^2/n} = \sqrt{2160/9} = \sqrt{240} = 15.49$

Substitute in equation (1)

$=\Sigma(X_i-\bar{X})(Y_i-\bar{y})/n\boldsymbol{\sigma}_x\boldsymbol{\sigma}_\gamma$

=360/(9)(2. 583)(15. 49)

=360/(23. 247*15. 49)

=360/360. 09603

=0.999

The result 0. 9997 indicates that the correlation between Ages and length of the clothes is positively correlated.

CONCLUSION

Correlation investigates and quantifies the direction and strength of relationships between variables. Correlation knowledge allows us to predict the direction and intensity of change in a variable when the correlated variable changes. Positive, negative, zero, simple, multiple, partial, linear, and non-linear correlations are some of the frequently used types of correlations.

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