

**CARDAMOM PLANTERS' ASSOCIATION
COLLEGE**



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DEPARTMENT OF COMPUTER SCIENCE

Subject: Statistical Methods

Concept: Rank Correlation

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RANK CORRELATION

Introduction:

Rank correlation is a statistical method that measures the relationship between the rankings of two variables or datasets. It's used to determine the degree of similarity between two rankings, and can be used to assess the significance of the relation between them.

Rank correlation is useful when the data is not available in numerical form but information is sufficient to rank the data. It focuses on the ordinal properties of the data, making it useful for non-parametric data.

Two popular methods for calculating rank correlation are Spearman's Rank Correlation Coefficient and Kendall's Tau.

Examples:

- Create a table with columns for the scores and their ranks.
- Label the score with the highest value as "1" and the lowest score as "10".
- If there are any identical values in the data, take the average of the ranks that they would have otherwise occupied.

Spearman's Rank Correlation

Correlation is a statistical measure that determines how closely two variables fluctuate. A positive correlation shows the extent to which those variables increase or decrease in parallel. A negative correlation shows the range in which one variable increases as the other decreases. In this article, we will discuss one such correlation i.e Spearman's Rank Correlation.

What Is Monotonic Function?

To understand Spearman's rank correlation, it is important to understand monotonic function. A monotonic function is one that either never increases or never decreases as its independent variable changes.

The following graph illustrates the monotonic function:

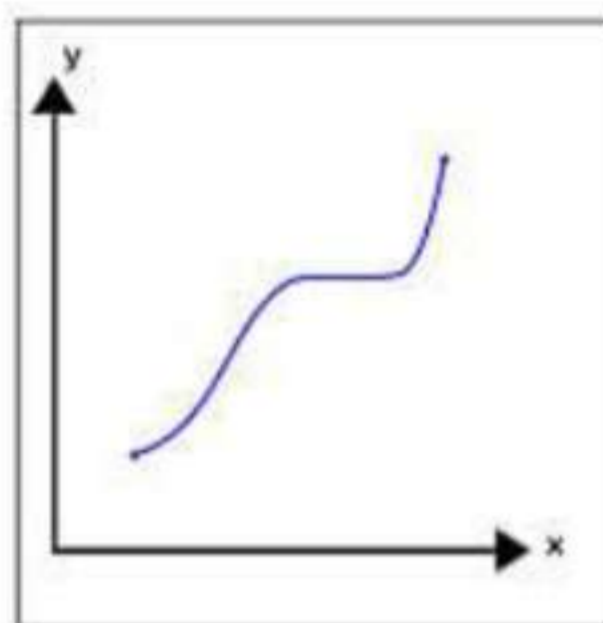


Figure 1 - A Monotonically Increasing function

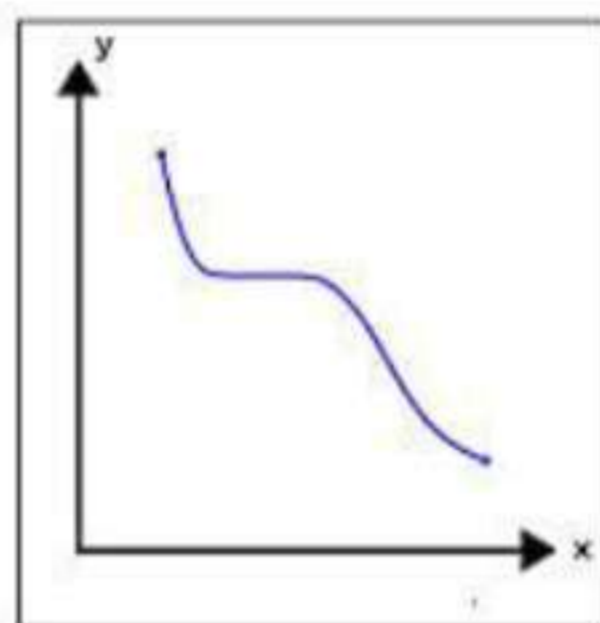


Figure 2 - A Monotonically decreasing function

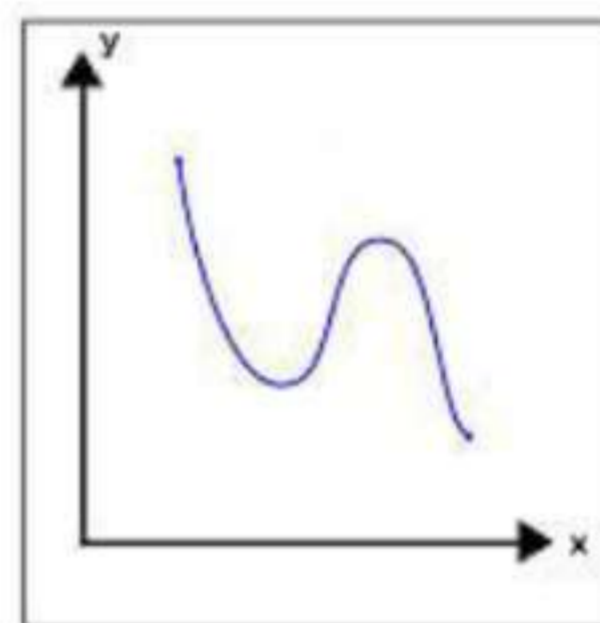


Figure 3 - A function that is not Monotonic

- Monotonically Increasing: As the variable X increases, the variable Y never decreases.
- Monotonically Decreasing: As the variable X increases, the variable Y never increases.
- Not Monotonic: As the X variable increases, the Y variable sometimes decreases and sometimes increases.

Spearman's Rank Correlation

Spearman's rank correlation measures the strength and direction of association between two ranked variables. It basically gives the measure of

monotonicity of the relation between two variables i.e. how well the relationship between two variables could be represented using a monotonic function.

The formula for Spearman's rank coefficient is:

$$\rho = 1 - \frac{6 \sum d^2}{n(n^2 - 1)}$$

ρ = Spearman's rank correlation coefficient

d_i = Difference between the two ranks of each observation

n = Number of observations

The Spearman Rank Correlation can take a value from +1 to -1 where,

- A value of +1 means a perfect association of rank
- A value of 0 means that there is no association between ranks
- A value of -1 means a perfect negative association of rank

