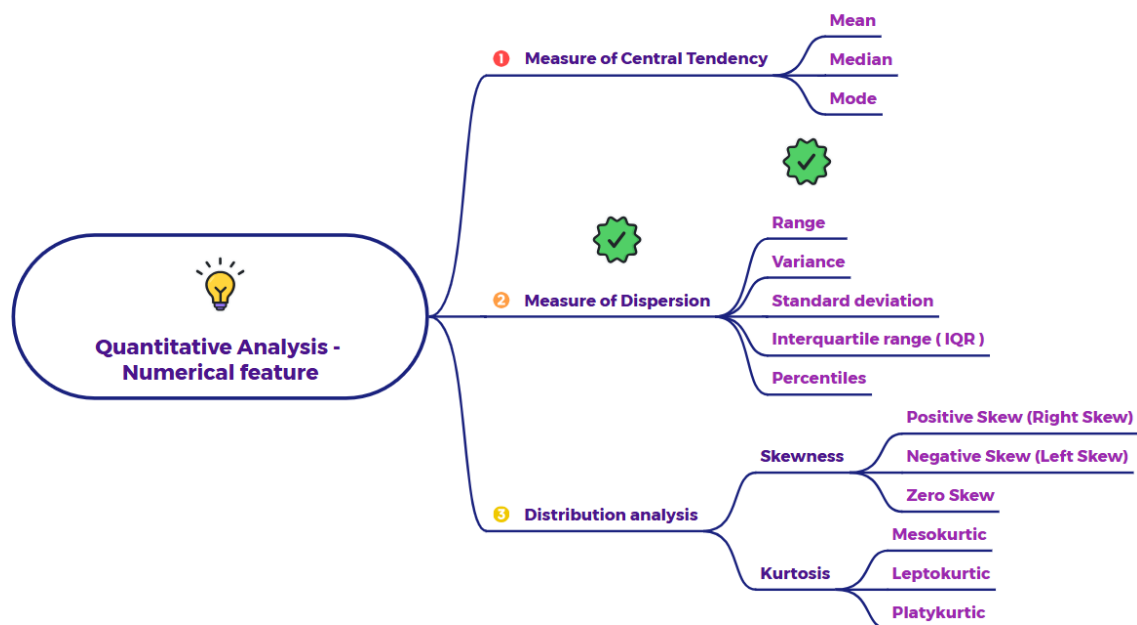


Explain measure of dispersion – Range



Definition:

The **range** is calculated by subtracting the minimum value from the maximum value in a set of numerical data.

Range = Maximum Value - Minimum Value

It essentially tells us the total span covered by the data.

Detailed Examples:

Let's consider a few different scenarios to see how the range works and what it tells us.

Example 1: Daily Temperatures

Suppose we have the following daily high temperatures (in degrees Celsius) recorded over a week in a certain city:

30, 32, 28, 35, 31, 29, 33

Calculation:

- Maximum Value = 35
- Minimum Value = 28

$$\text{Range} = 35 - 28 = 7$$

Interpretation:

The range of daily high temperatures over the week is 7 degrees Celsius. This tells us that the temperatures varied by 7 degrees from the lowest to the highest recorded value during that period.

Example 2: Exam Scores (Revisiting Previous Data)

Let's go back to the math quiz scores of 10 students:

12, 15, 18, 16, 15, 10, 15, 19, 14, 15

Calculation:

- Maximum Value = 19
- Minimum Value = 10

$$\text{Range} = 19 - 10 = 9$$

Interpretation:

The range of scores on the math quiz is 9. This means the difference between the highest and the lowest score achieved by the students was 9 points.

Example 3: Impact of an Outlier

Now, let's see how an extreme value (outlier) can affect the range. Suppose one student performed exceptionally poorly and scored a 2 on the quiz (let's add this to the original 10 scores for this example):

12, 15, 18, 16, 15, 10, 15, 19, 14, 15, 2

Calculation:

- Maximum Value = 19
- Minimum Value = 2

$$\text{Range} = 19 - 2 = 17$$

Interpretation:

With the inclusion of the outlier (the score of 2), the range has increased significantly from 9 to 17. This demonstrates that the range is highly sensitive

to extreme values. A single outlier can dramatically inflate the range and might not accurately represent the typical spread of the majority of the data.

Strengths of the Range:

- **Simplicity:** It's very easy to calculate and understand. You only need to identify the highest and lowest values.
- **Quick Overview:** It provides a quick initial idea of the total spread of the data.

Limitations of the Range:

- **Sensitivity to Outliers:** As seen in Example 3, the range is greatly affected by extreme values and might not be a reliable measure of dispersion when outliers are present.
- **Ignores Intermediate Values:** The range only considers the two extreme values and doesn't take into account the distribution of the data points in between. Two datasets can have the same range but very different patterns of spread within that range.

In summary, the range is a straightforward measure of dispersion that gives you the total span of your data. However, its sensitivity to outliers and its failure to consider the distribution of intermediate values make it less informative than other measures of dispersion like variance or standard deviation when a more detailed understanding of the data's spread is needed.