

What is the difference between Interquartile Range and Standard Deviation?

Authored by
stats writer

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The Interquartile Range (IQR) and Standard Deviation (SD) are two measures commonly used in statistics to describe the variability or spread of a data set. The IQR is calculated by finding the difference between the upper and lower quartiles, while the SD is calculated by taking the square root of the average squared deviation from the mean. The main difference between these two measures is that the IQR is less affected by extreme values or outliers in the data, while the SD takes into account all values in the data set. The IQR is more suitable for skewed data sets, while the SD is more appropriate for symmetrical data sets. Additionally, the IQR is a more robust measure and is not influenced by the scale of measurement, while the SD is influenced by the units of measurement. In summary, the IQR and SD provide different perspectives on the variability of a data set and should be used based on the characteristics of the data being analyzed.

Interquartile Range vs. Standard Deviation: What's the Difference?

The interquartile range and the standard deviation are two ways to measure the spread of values in a dataset.

This tutorial provides a brief explanation of each metric along with the similarities and differences between the two.

Interquartile Range

The interquartile range (IQR) of a dataset is the difference between the first quartile (the 25th percentile) and the third quartile (the 75th percentile). It measures the spread of the middle 50% of values.

$$\text{IQR} = Q3 - Q1$$

For example, suppose we have the following dataset:

Dataset: 1, 4, 8, 11, 13, 17, 19, 19, 20, 23, 24, 24, 25, 28, 29, 31, 32

According to the , the interquartile range (IQR) for this dataset is calculated as:

Q1: 12 Q3: 26.5 IQR = Q3 - Q1 = 14.5

This tells us that the middle 50% of values in the dataset have a spread of 14.5.

Standard Deviation

The standard deviation of a dataset is a way to measure the typical deviation of individual values from the mean value. It is calculated as:

$$s = \sqrt{(\sum(x_i - \bar{x})^2 / (n-1))}$$

For example, suppose we have the following dataset:

Dataset: 1, 4, 8, 11, 13, 17, 19, 19, 20, 23, 24, 24, 25, 28, 29, 31, 32

We can use a calculator to find that the sample

standard deviation of this dataset is 9.25. This gives us an idea of how far the typical value lies from the mean.

Similarities & Differences

Both metrics measure the spread of values in a dataset.

However, the interquartile range and standard deviation have the following key difference:

The interquartile range (IQR) is not affected by extreme outliers. For example, an extremely small or extremely large value in a dataset will not affect the calculation of the IQR because the IQR only uses the values at the 25th percentile and 75th percentile of the dataset. The standard deviation is affected by extreme outliers. For example, an extremely large value in a dataset will cause the standard deviation to be much larger since the standard deviation uses every single value in a dataset in its formula.

When to Use Each

You should use the interquartile range to measure the spread of values in a dataset when there are extreme outliers present.

Conversely, you should use the standard deviation to measure the spread of values when there are no extreme outliers present.

To illustrate why, consider the following dataset:

Dataset: 1, 4, 8, 11, 13, 17, 19, 19, 20, 23, 24, 24, 25, 28, 29, 31, 32

Earlier in the article we calculated the following metrics for this dataset:

IQR: 14.5 Standard Deviation: 9.25

However, consider if the dataset had one extreme outlier:

Dataset: 1, 4, 8, 11, 13, 17, 19, 19, 20, 23, 24, 24, 25, 28, 29, 31, 32, 378

We could use a calculator to find the following metrics for this dataset:

IQR: 15 Standard Deviation: 85.02

Notice that the interquartile range barely changes when an outlier is present, while the standard deviation

increase from 9.25 all the way to 85.02.

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