What is the difference between Confidence Level and Confidence Interval?

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Confidence level and confidence interval are two statistical measures that are used to determine the reliability or uncertainty of a sample data. The confidence level refers to the probability or degree of certainty that the true value of a population parameter falls within a specific range. It is typically expressed as a percentage, such as 95% or 99%, and is based on the confidence level chosen by the researcher.

On the other hand, the confidence interval is a range of values within which the true population parameter is likely to fall with a given confidence level. It is calculated from the sample data and is used to estimate the precision of the sample data in representing the entire population. A narrower confidence interval indicates a more precise estimate, while a wider interval indicates more uncertainty.

In summary, the main difference between confidence level and confidence interval is that the former is a measure of certainty about the population parameter, while the latter is a range of values that provides an estimate of the true value of the parameter with a certain level of confidence.

Confidence Level vs. Confidence Interval: What's the Difference?

Often in statistics we're interested in measuring - numbers that describe some characteristic of an entire .

For example, we might be interested in measuring the mean height of males in a certain country.

Since it's too costly and time-consuming to collect data on the height of every male in the country, we would instead collect data on a of males. We would then use the mean height of males in this sample to estimate the mean height of all males in the country.

Unfortunately, the mean height of males in the sample is not guaranteed to exactly match the mean height of males in the whole population. For example, we might just happen to pick a sample full of shorter men or perhaps a sample full of taller men.

In order to capture our uncertainty around our estimate of the true population mean, we can create a confidence interval.

Confidence Interval: A range of values that is likely to contain a population parameter with a certain level of confidence.

A confidence interval is calculated using the following general formula:

Confidence Interval = (point estimate) +/- (critical value)*(standard error)

For example, the formula to calculate a confidence interval for a is as follows:

Confidence Interval = x +/- z*(s/√n)

where:

x: sample meanz: the z critical values: sample standard deviationn: sample size

The z critical value that you will use in the formula is dependent on the confidence level that you choose.

Confidence Level: The percentage of all possible samples that are expected to include the true population parameter.

The most common choices for confidence levels include 90%, 95%, and 99%.

The following table shows the z critical value that corresponds to these popular confidence level choices:

Confidence Level	z critical value
0.90	1.645
0.95	1.96
0.99	2.58

Sample size n = 25Sample mean height x = 70 inchesSample standard deviation s = 1.2 inches

Here is how to find calculate a confidence interval for the true population mean height using a 90% confidence level:

90% Confidence Interval: 70 +/- 1.645*(1.2/√25) =

This means that if we used the same sampling method to select different samples and calculated a confidence interval for each sample, we would expected the true population mean height to fall within the interval 90% of the time.

Now suppose we instead calculate a confidence interval using a 95% confidence level:

95% Confidence Interval: 70 +/- 1.96*(1.2/√25) =

Notice that this confidence interval is wider than the previous one. This is because the higher the confidence level, the wider the confidence interval.

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This should make sense intuitively: A wider confidence level has a higher probability of containing a true population parameter.

Summary

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A confidence interval is a range of values that is likely to contain a population parameter with a certain level of confidence. It uses the following basic formula:

Confidence Interval = (point estimate) +/- (critical value)*(standard error)

The confidence level determines the critical value to use in that formula. The higher the confidence level, the larger the critical value and thus the wider the confidence interval.