Confidence Interval

A range computed using sample statistics to estimate an unknown population parameter with a stated level of confidence.

The most common value for α is 0.05 and typically 95% confidence intervals is constructed.

Confidence interval provides an interval, or a range of values, which is expected to cover the true unknown parameter. This provides richer information in comparison to point estimate, where we have only a single value, thus exposing vulnerability in the single estimate.

Confidence Interval Calculation With example:

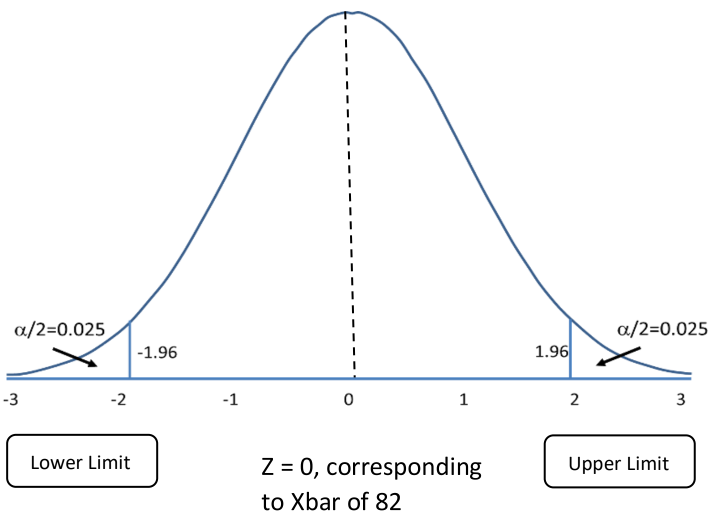
Confidence Interval is calculated as **Xbar +- Z * (sigma/sqrt(n))**

Where **Xbar** is the sample mean, **sigma** is the population standard deviation, and **n** is the sample size.
Sigma/sqrt(n) is the **Standard Error**. Standard Error is the Standard Deviation in a Sampling Distribution.
Z value for 95% confidence level from the Z distribution table is **1.96.**

Example:

Assume for a sample size of 1000 students, their average marks are 82 with a population standard deviation of 10 marks.

Solution - Here, n = 1000
Xbar = 82
Sigma = 10



Step 1: Calculate the Standard Error

Standard Error, S.E = 10/sqrt (1000) => **0.316**

Step 2: Calculate the Margin of Error

Margin of Error, M.o.E => +- (1.96 * 0.316)
M.o.E => **+0.619 and -0.619**

Step 3: Add the Sample mean to Margin of Error

Lower Confidence Interval, C.I Lower = 82-0.619 => **81.381**
Upper Confidence Interval, C.I Upper = 82+0.619 = > **82.619**

Conclusion:

We are 95% confident that the mean of the student's marks will be between 81.4 and 82.6
Note: For a T-test, instead of Population Standard deviation, we take the sample standard deviation, and by calculating the degrees of freedom (n-1), we can get the corresponding T value at 95% confidence level instead of Z value.