TOPIC: # CONFIDENCE LEVEL

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INFERENTIAL STATISTICS

Inferential statistics is a branch of statistics that involves using data from a sample to make inferences about a larger population. It is concerned with making predictions, generalizations, and conclusions about a population based on the analysis of a sample of data.

EXAMPLE

Suppose you are cooking some recipe and you want to test it before serving to the guest to get an idea about the dish as a whole. You will never eat the full dish to get that idea. Rather you will taste very little portion of your dish with a spoon.

So here you are only doing exploratory analysis to get idea what you cook with a sample in your hand.
Next if you generalize that your dish required some extra sugar or salt then that making an inference.
To get a valid and right inference your portion of dish that you tested should be representative of your sample. Otherwise conclusion will be wrong.

INFERENTIAL STATISTICS

TYPES

- ESTIMATION
- TESTING OF HYPOTHESIS

ESTIMATION

A process in which we obtain the values of unknown population parameters with the help of sample data

ESTIMATE

An estimate is the numeric value of the estimator.

Estimator is the rule, formula or function that tells how to calculate an estimate.

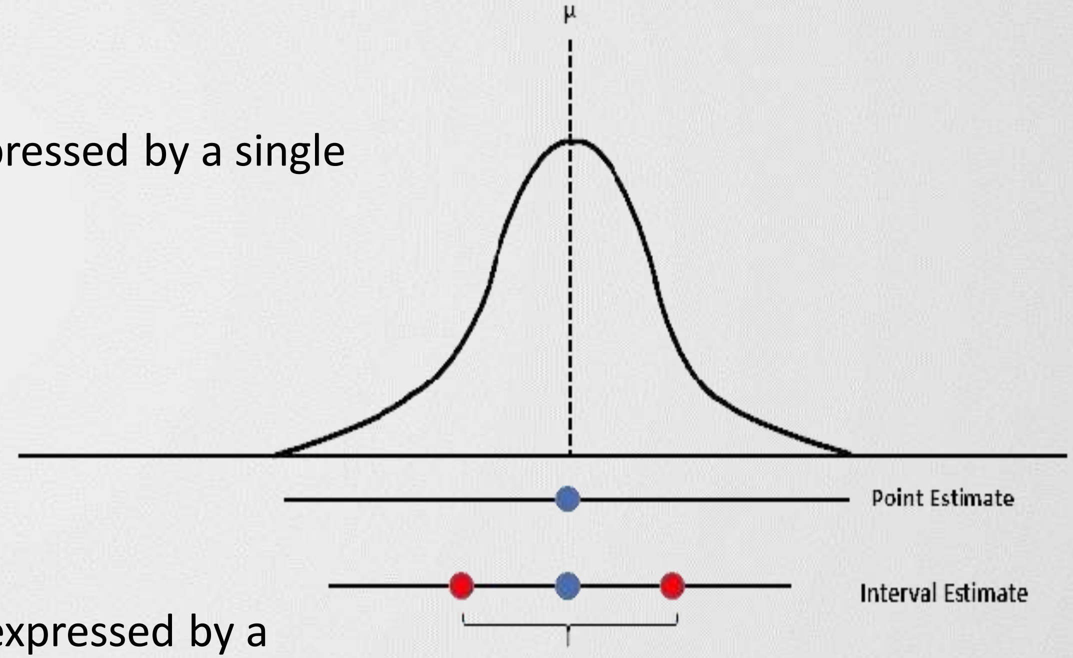
INFERENTIAL STATISTICS

TYPES OF ESTIMATION

- POINT ESTIMATION

When an estimate for the unknown population parameter expressed by a single value it is called point estimate.

e.g: The mean of the height of students is 4’8



- INTERVAL ESTIMATION

When an estimate for the unknown population parameter is expressed by a range of values within which the population parameter is expected to occur is called an interval estimate.

e.g: The mean of the height of students between 4’8-5’8

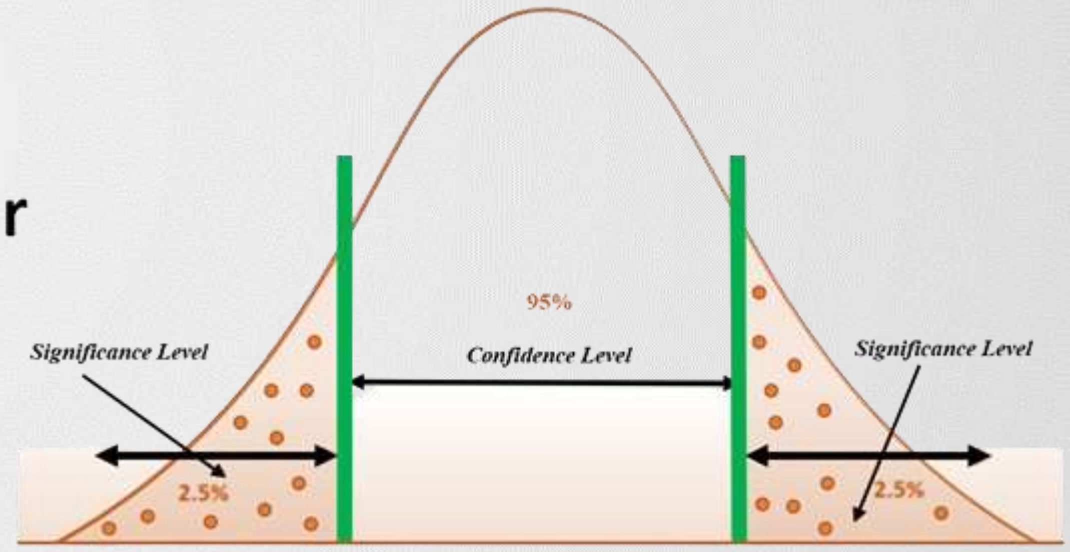
CONFIDENCE LEVEL

- A confidence interval, in statistics, refers to the probability that a population parameter will fall between a set of values for a certain proportion of times.
- Confidence intervals measure the degree of uncertainty or certainty in a sampling method.
- For example, It tells you how confident you can be that the results from a poll or survey reflect what you would expect to find if it were possible to **survey the entire population.**
- They can take any number of probability limits, with the most common being a 95% or 99% confidence level.

CONFIDENCE LEVEL

- Provides Range of Values
  - Based on Observations from 1 Sample
- Gives Information about Closeness to Unknown Population Parameter
- Stated in terms of Probability

Never 100% Sure



LEVEL OF SIGNIFICANCE

- The probability of rejecting the null hypothesis (Ho) when the null hypothesis is true.
- Or the maximum allowable probability of making *type-I error*.
- It is denoted by Greek letter (α)
- Commonly used levels of significance are
  α =0.10, α =0.05, α =0.01

- H_0: There is no relationship between height and shoe size.
- H_a: There is a positive relationship between height and shoe size.

α

LEVEL OF SIGNIFICANCE AND CONFIDENCE LEVEL

- The probability of accepting the null hypothesis (Ho) when the null hypothesis is true.
- It is denoted by 1-α.

Level of Significance	Confidence Level
0.01 → 1%	99% → 0.99
0.05 → 5%	95% → 0.95
0.10 → 10 %	90% → 0.90

Example: If you wanted to find out the Average Age of cigarette smokers. And based on sample survey, 90% confidence interval of average age smokers is between 18years and 25 years.

$$P(L<\theta<U) = 1-\alpha$$

Then confidence interval for the population Average "μ" is written as

$$P(18< \mu <25) = 90\%$$

Where

18 = lower value of the estimator "μ"

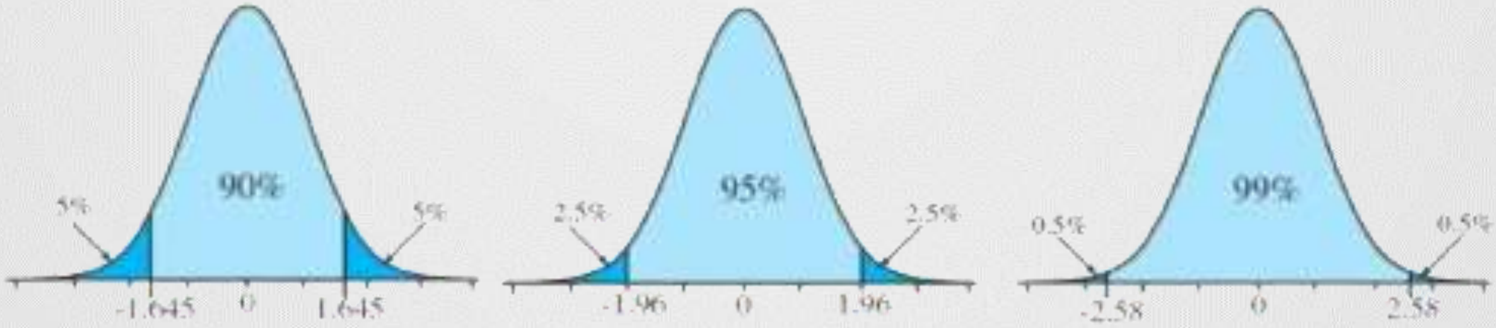
25 = Upper value of the estimator "μ"

And

90% = Level of confidence or Confidence coefficient ($1-\alpha$)

Common Levels of Confidence

Confidence level $1 - \alpha$	Alpha level α	Z value $z_{1-(\alpha/2)}$
.90	.10	1.645
.95	.05	1.960
.99	.01	2.576



- The heights of a random sample of **50** college students show a mean of **174.5** cm and a standard deviation of **6.9** cm.

Solution:

Here

n = 50 $\quad \bar{X} = 174.5 \quad S = 6.9 \quad 1-\alpha = 80\% \quad$ **Z-value = 1.28**

The 80% confidence interval for μ

$$\bar{X} \pm Z_{\alpha/2} \frac{s}{\sqrt{n}}$$

$$174.5 \pm 1.28 \frac{6.9}{\sqrt{50}} = 174.5 \pm \frac{8.832}{7.07} = 174.5 \pm 1.25$$

For Lower Value of μ

174.5 - 1.25 = 173.25

For Upper Value of μ

174.5 + 1.91 = 175.75

So therefor 80% confidence interval for average height of all college students is (173.25, 175.75)

- Find a **80%** and **95%** confidence interval for the mean height of all college students.

Solution:

Here

$n = 50$ $\bar{X} = 174.5$ $S = 6.9$ $1\text{-}\alpha = 80\%$ Z-value = 1.28

The 80% confidence interval for μ

$$\bar{X} \pm Z_{\alpha/2} \frac{s}{\sqrt{n}}$$

$$174.5 \pm 1.28 \frac{6.9}{\sqrt{50}} = 174.5 \pm \frac{8.832}{7.07} = 174.5 \pm 1.25$$

For Lower Value of μ

174.5 - 1.25 = 173.25

For Upper Value of μ

174.5 + 1.91 = 175.75

So therefor 80% confidence interval for average height of all college students is (173.25, 175.75)

Solution:

Here

$n = 50$ $\quad \bar{X} = 174.5$ $\quad S = 6.9$ $\quad 1-\alpha = 95\%$ $\quad$ Z-value = 1.96

The 95% confidence interval for μ

$$\bar{X} \pm Z_{\alpha/2} \frac{s}{\sqrt{n}}$$

$$174.5 \pm 1.96 \frac{6.9}{\sqrt{50}} = 174.5 \pm \frac{13.524}{7.07} = 174.5 \pm 1.91$$

For Lower Value of μ

$174.5 - 1.91 = 172.59$

For Upper Value of μ

$174.5 + 1.91 = 176.41$

So therefor 95% confidence interval for average height of all college students is (172.59, 176.41)

THANK YOU