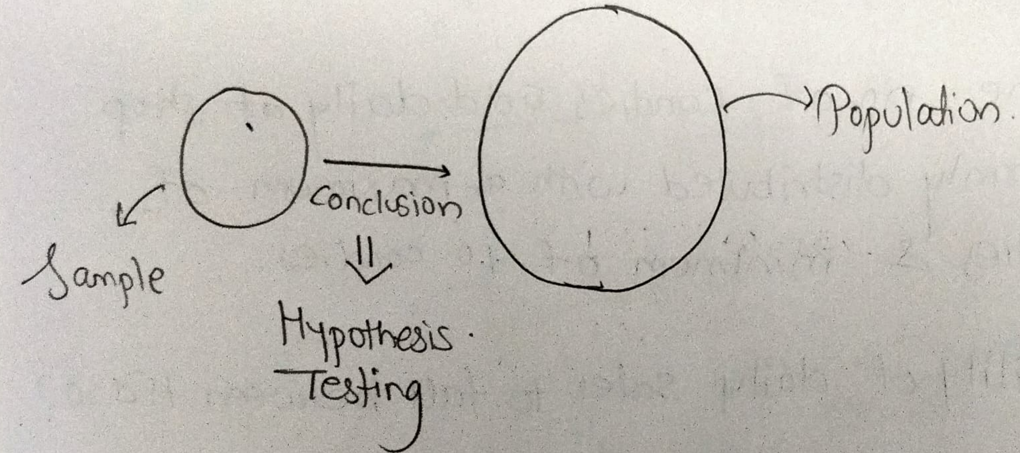
Inferential Stats & Hypothesis Testing

* Inferential Stats :- Conclusion or Inference.



Hypothesis testing Mechanism :-

1] Null Hypothesis (H_0) → Person is not guilty.
→ It is the assumption you beggin with.

2] Alternate Hypothesis (H_1) → person is guilty.
→ Opposite of Null Hypothesis.

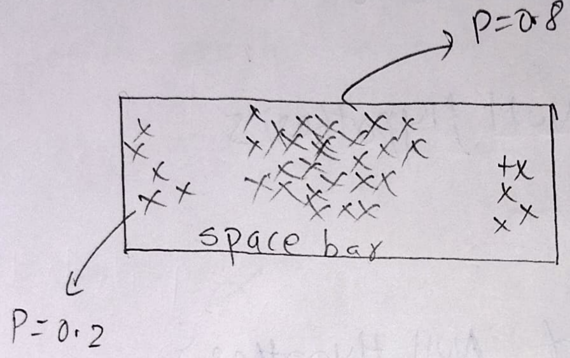
3] Experiment → Statistical Analysis.
→ collect proofs.

4] Accept Null Hypothesis or Reject Null Hypothesis.

p Value

The p value is a number, calculated from a statistical test, that describes how likely you are to have hypothesis testing to help decide whether to reject the Null hypothesis.

eg 1



Suppose this is spacebar and "X" shows average number times of clicks in the particular region.

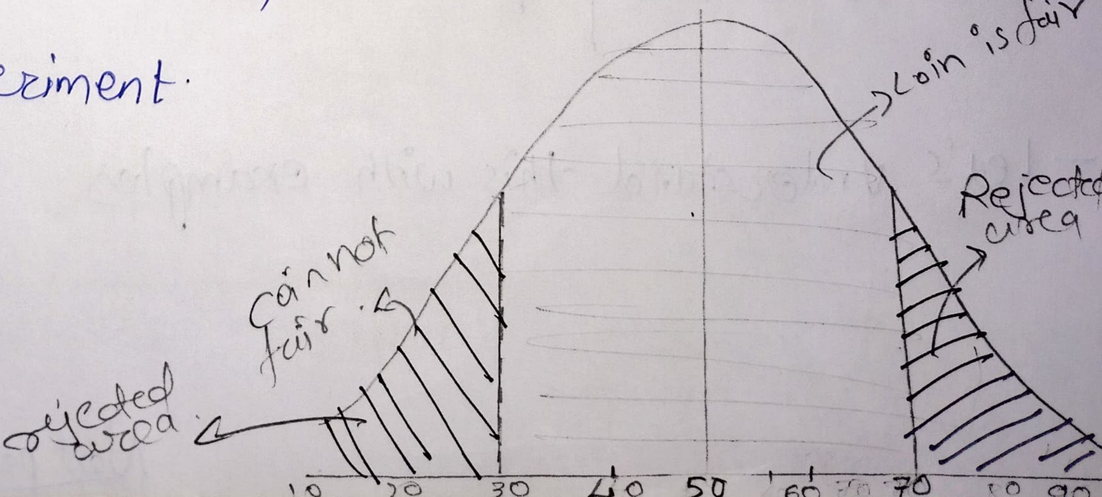
eg2 Lets assume the coin & we toss it 100 times. {100 times}

Hypothesis testing

1] Null Hypothesis → Coin is fair.

2] Alternative Hypothesis → Coin is not fair.

3]. Experiment.



4] Significance Value $\alpha = 0.05$.

$$CI = 1 - 0.05 = 0.95$$

This are the value setted by domain expert
different problemes have diffrent value setted.

5] Conclusion

P < significance value.

Reject the Null Hypothesis

else:

fail to Reject Null Hypothesis

☆ Z-test Hypothesis testing

- We use Z-test when population Standard Deviation is Known.
- Sample size is Large ($n \geq 30$)
- Data is Normally Distributed.

- Let's understand this with examples

Next page →

Q] The average heights of all residents in a city is 168 cm. A doctor ~~a~~ believes the mean to be different. He measured the height of 36 individuals and found the average height to be 169.5 cm.

a) State null & Alternate hypothesis

b) At a 95% confidence level, is there enough evidence ~~of~~ to reject the null hypothesis.

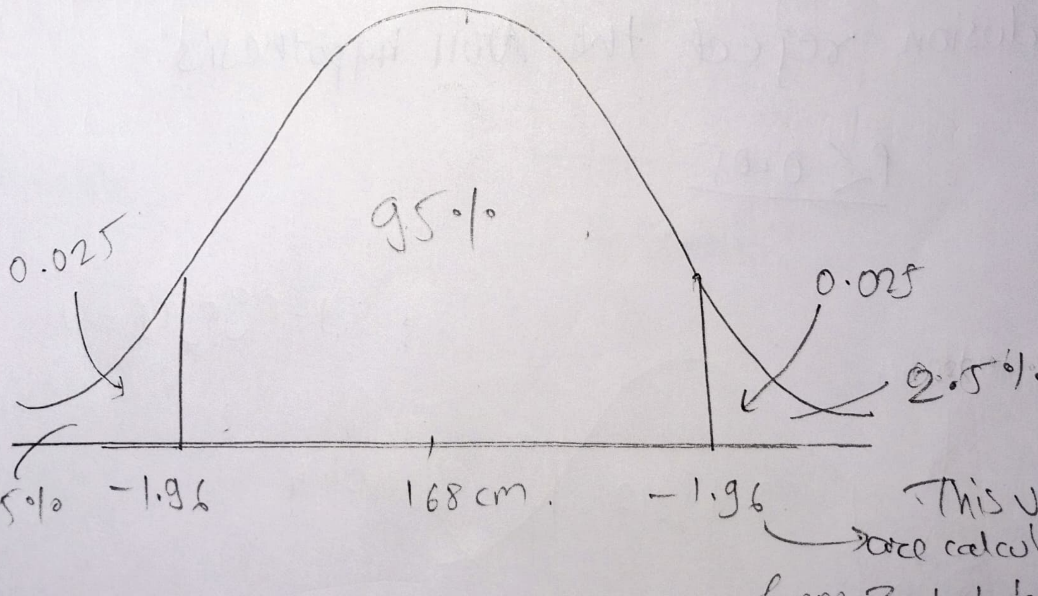
→ Given ($\sigma = 3.9$, $\mu = 168cm$ $n = 36$. $\bar{x} = 169.5$

$CI = 0.95$ $\alpha = 1 - CI = 0.95 = \underline{0.05}$

1) Null Hypothesis : $H_0 = \mu = 168 cm$

2) Alternative Hypothesis $H_1 = \mu \neq 168 cm.$

3) Based on C.I. We will draw Decision Boundry.



This values are calculated from Z-test table online.

$1 - 0.025 = 0.9750 \rightarrow$ Z-Score → using this 1.96 is calculated

↓

area → 1.96 from Z-score table.

If Z is less than ~~1.69~~ 1.96 or -1.96 then Reject Null Hypothesis.

Z-test

$$Z_d = \frac{\bar{X} - \mu}{\sigma / \sqrt{n}}$$

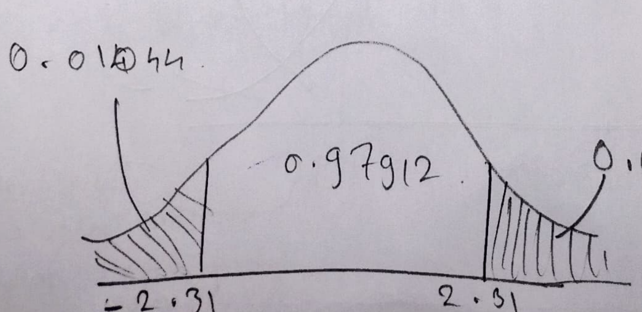
$$= \frac{169.5 - 168}{3.9 / \sqrt{36}}$$

$$Z_d = \frac{1.5}{0.65} = 2.31$$

Conclusion reject the Null hypothesis.

$P < 0.05$

$1 - 0.98956 = 0.$



P value $= 0.01044 + 0.01044$

$= 0.02088$

$P < 0.05$

Reject the Null Hypothesis

Student t distribution

- In Z. stats when we perform any analysis using Z-score we require σ (population standard deviation)

Then How do we perform any analysis when we don't know the population standard deviation?

$\Downarrow$

Student t distribution

$$Z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$$

Z~table

$$\boxed{t = \frac{\bar{x} - \mu}{s / \sqrt{n}}}$$

s = sample std deviation

t~table.

Type1 & Type2 Error

Reality : Null hypothesis is True or Null Hypothesis is false.

Decision : Null hypothesis is True or Null Hypothesis is false.

outcome1 : we reject Null hypothesis when in reality it is false → Good

outcome2 : we reject Null hypothesis when in reality it is True → Type 1 Error.

outcome3 : we retain the Null Hypothesis when in reality it is false → Type2 Error.

outcome4 : we retain the Null hypothesis, when in reality it is True → Good.

Bayes theorem

$$\boxed{Pr(B/A) = \frac{Pr(B) * Pr(A/B)}{Pr(A)}}$$

→ Baye's theorem

$$\Downarrow$$

$$\boxed{Pr(A|B) = \frac{Pr(A) * Pr(B/A)}{Pr(B)}}$$

Both formula for Baye's theorem are correct.