

HYPOTHESIS TESTING

- In hypothesis testing, evaluates 2 or more exclusive statement on a population using sample data.

Steps in hypothesis testing -

- 1) Make Initial Assumption (H_0). $H_0 \rightarrow$ Null hypothesis, $H_1 \rightarrow$ Alternate hypothesis
- 2) Collect Data. (evidences)
- 3) Gather evidences to reject the Null hypothesis or not reject null hypothesis.

This lead us to Confusion Matrix -

		H_0	H_1
Accept / Do not refuse	OK	Type 2 Error	
	Type 1 Error	OK	

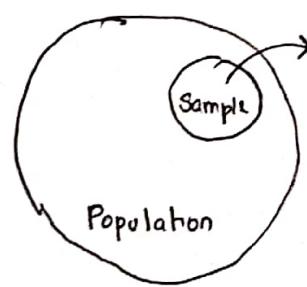
Type 1 error - Due to lack of evidence we have to reject NULL hypothesis/ H_0 .

For example, we all know Salman Khan killed street side vendor by his car, but due to lack of evidence we have to reject Salman Khan is guilty. But due to this Type 1 error, we lost the justice to the life of people killed in the crash.

Type 2 error - When we reject the alternate hypothesis and accept the null hypothesis even if null hypothesis is wrong.

Type 1 error, in which you mistakenly conclude an effect is real, when it is really just due to chance
Type 2 error, in which you mistakenly conclude than an effect is not real, (due to chance), when it really is real

$H_0 \rightarrow$ Null hypothesis, $H_1 \rightarrow$ Null hypothesis, α - Significance level



$$P(\text{Statistic} | H_0 \text{ true})$$

p-value.

$p\text{-value} < \alpha \rightarrow$ reject H_0 , $p\text{-value} \geq \alpha \rightarrow$ Fail to reject H_0

Reality check \Rightarrow Reality.

		H_0 true	H_0 false
Reject H_0	Type 1.	correct conclusion	
	Fail to reject H_0	correct conclusion	Type 2.

Type 1 error because in reality H_0 is true but we reject it. It cannot happen.

Type 2 error is H_0 is false but we failed to reject H_0 . This is partially

Example - Consider a website. Suppose it is of white background and avg time spent by customer is equal or less than 20 minutes. Someone said if we change the colour, mean avg spend time will be more than 20 minutes.

Step 1 - $H_0: \mu \leq 20$ minute after change $H_1: \mu > 20$ minute after change.

Step 2 - Significance level : $\alpha = 0.05$ Step 3 - Take sample $n = 100$. Suppose Sample mean $\bar{x} = 25$ minutes.

Step 4 - p value : $P(\bar{x} \geq 25 \text{ minutes} | H_0 \text{ true})$

Step 5 - p value $< \alpha \Rightarrow$ Reject H_0 , suppose Pvalue = 0.03.
p value $> \alpha \Rightarrow$ Do not reject H_0 , suppose Pvalue = 0.5.