

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
Reject	Type 1 Error.	OK

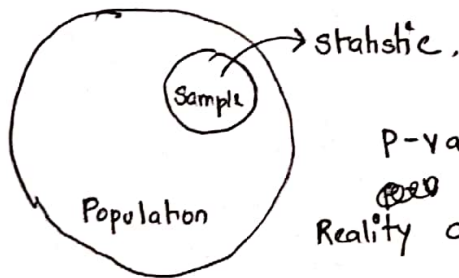
Type 1 error - Due to lack of evidence we have to reject NULL hypothesis / H_0 .

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 alterate 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.

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

Reality check \rightarrow .

	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 partiality.

Example - Consider a website. Suppose it is of white background and avg time spent by customer is equal or less than 20 minutes. Some one said if we change the colour, the 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 - $p\text{value} < \alpha \Rightarrow \text{Reject } H_0$, suppose $P\text{value} = 0.03$.
 $p\text{value} > \alpha \Rightarrow \text{Do not reject } H_0$, suppose $P\text{value} = 0.5$.