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- P-value -
  - Prob. of getting observed result (or something more extreme) assuming Null hypothesis is true

eg In exp. 1 coin is tossed 100 times

H_0 : $P(H) = P(T)$

H_a : $P(H) \neq P(T)$

→ We tossed coin 100 times and suppose we get 53 head

Suppose p-value is 0.3 then it means If we do exp (tossing 100 times) 100 times then 30 times we will get 53 heads

- p value is measure of strength of the evidence against Null hypothesis

→ If $P \leq \alpha$ then reject H_0

→ If we don't have ~~p value~~ α -

- $p < 0.01$ strong evidence against null hypothesis
- $0.01 \leq p < 0.05$ moderate evidence against null hypothesis
- $0.05 \leq p < 0.1$ weak evidence "
- $p \geq 0.1$ No evidence "

- 2 Questions of p-value test

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T test -

- It is used to compare means of two samples or to compare mean to known population mean.
- Based on t-distr
- when populatn standard deviatn is unknown
- Sample size is small

It is of 3 types-

- One sample test -
  - compare mean of single sample to known sample populatn mean
  - Null hypothesis → No signi. diff b/w Sample mean & populat" mean
  - Alter " → Significant diff.

- Indep. two sample test -
  - compare mean of two sample
  - Null hypo - No sig. diff b/w mean of two samples
  - Alter. " → There is signi. diff

- Paired t-test (dependent two sample)
  - compare mean of two depen. sample (like pre or post test)

1) Single sample test -

Assumption -

- Normality - Sample or populat" must be normally dist

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- Independence - Sample must be indep.
- Random Sampling -
- Unknown pop. std. deviation.
- Pvalue $< \alpha$ → reject null hypothesis

⇒ If sample size is less than 30 then we can do Shapiro-Wilk test to check whether given sample is normally distributed or not

p-value < 0.05 not normal
p-value > 0.05 normal

2/ Independent 2 Sample t-test

Assumptions

→ Independent
→ Normally distributed - both samples
→ Equal variance (Homoscedasticity)

$$\sigma_A^2 = \sigma_B^2$$

↳ If this assumptn fails we can use welch's t-test

→ Random Sampling

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \qquad df = n_1 + n_2 - 2$$

→ for checking Equivalence of variance we can use levene's test.

↳ if $p > 0.05 \Rightarrow \sigma_A^2 = \sigma_B^2$

$p < 0.05 \Rightarrow \sigma_A^2 \neq \sigma_B^2$.

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3) Paired 2 sample t-test.

Assumption -

→ Paired observatn - two sets of observatn must be selected

→ Normality - The diff. b/w paired observatn must be normal

→ Independence of pair -
Each pair should be independent of other pair

$$t = \frac{\bar{X}_{diff} - \mu_{diff}}{S_{diff}/\sqrt{n}}$$

$\mu_{diff} = \mu_{before} - \mu_{after}$
$= 0$