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STATISTICAL METHODS FOR DECISION MAKING (Week 3)

LET'S SET SOME GROUND RULES

- Come prepared for these sessions by watching the videos.
  - Concepts will be covered in the videos.
  - Hands-On Application will be covered in Mentor Sessions.

- Submit all assignments on time.

- Let's be punctual & respect each others' time.

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LEARNING OBJECTIVE OF THIS MODULE

- Descriptive Statistics

- Inferential Statistics

- Hypothesis Testing

Content

- Population vs Sample
  - Why Sample & not entire population?
  - Population Parameter vs Sample statistic
  - Examples
- Terms related to sampling
  - Multiple samples of a particular size from same population
  - Sample Mean
  - Sampling Distribution of the mean
  - Standard Error
  - Sampling Error
- Central Limit Theorem & how it helps
- Hypothesis Testing
  - What is it & Why we make them
  - What is null hypothesis & alternate hypothesis
  - Points to ensure then formulating null & alternate hypothesis
  - What is Type 1 error, Type 2 error, alpha & beta
  - Alpha never calculated. It is a given or assumed value.
  - How to identify, if the test to be conducted is a 1 tailed or 2 tailed test and if 1 tailed then right tailed or left tailed
  - How to identify which test to be used to test hypothesis
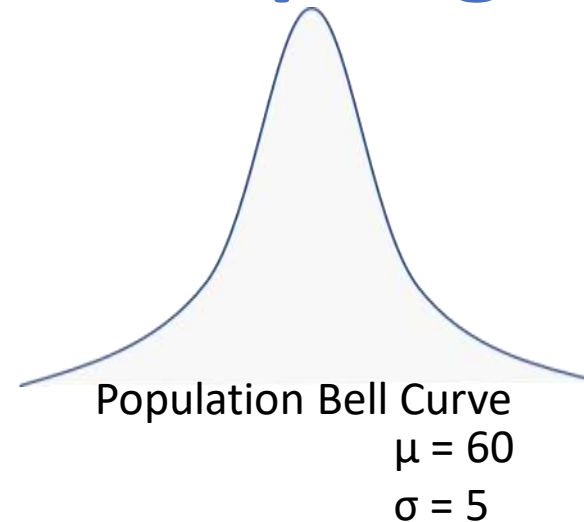
Population vs Sample

- Why Sample & not entire population
- Population = not only people, can be goods, processes, services etc.,
- Variable of interest
  - In population → called population parameter
  - In sample → called sample statistic
- Examples
  - Mean weight of adult population in India
  - Average volume(ml) in a 300ml soft drink bottle/can
  - Average call holding time at a call center for inbound calls
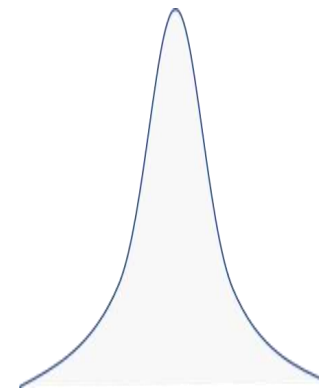
Important Terms related to Sampling

- Sampling Distribution (of mean) & its shape

- Standard Error → std. dev of sampling dist

- Sampling Error

Take a "particular" sample e.g. S_4 and its sample mean X_4 bar for eg 58.
The difference between the sample mean and population mean = 2, in this case ,is called the sampling error for that sample.

S_1 → X_1 bar
S_2 → X_2 bar
S_3 → X_3 bar
….
S_N → X_N bar

N samples each of size 100

Population Bell Curve
$\mu = 60$
$\sigma = 5$

Sampling Distribution of means

$\mu \sim 60$, $s = \sigma / \_/100 = 0.5$

# Central Limit Theorem

What does it say?

When & How is it useful?

Hypothesis Testing

- Why we hypothesize?

- What is null hypothesis & alternate hypothesis

- Rules for correctly formulating null & alternate hypothesis
  - Only null hypothesis can have equality sign
  - Alternate cannot have equality sign
  - Null & alternate should be mutually exclusive

- Hypothesis testing process flow
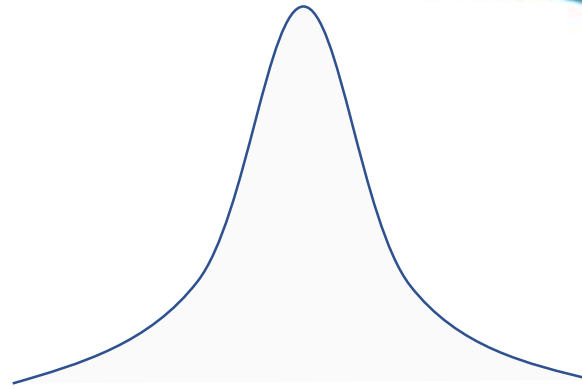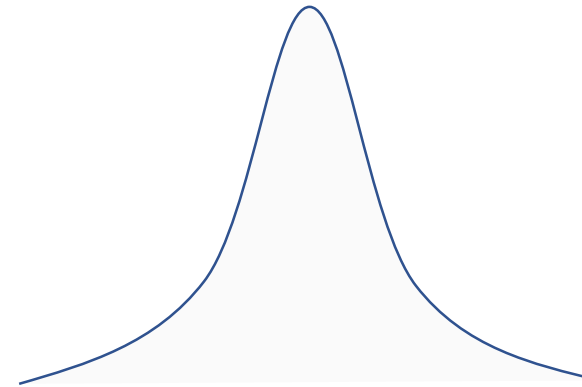
Hypothesis Testing – Process flow
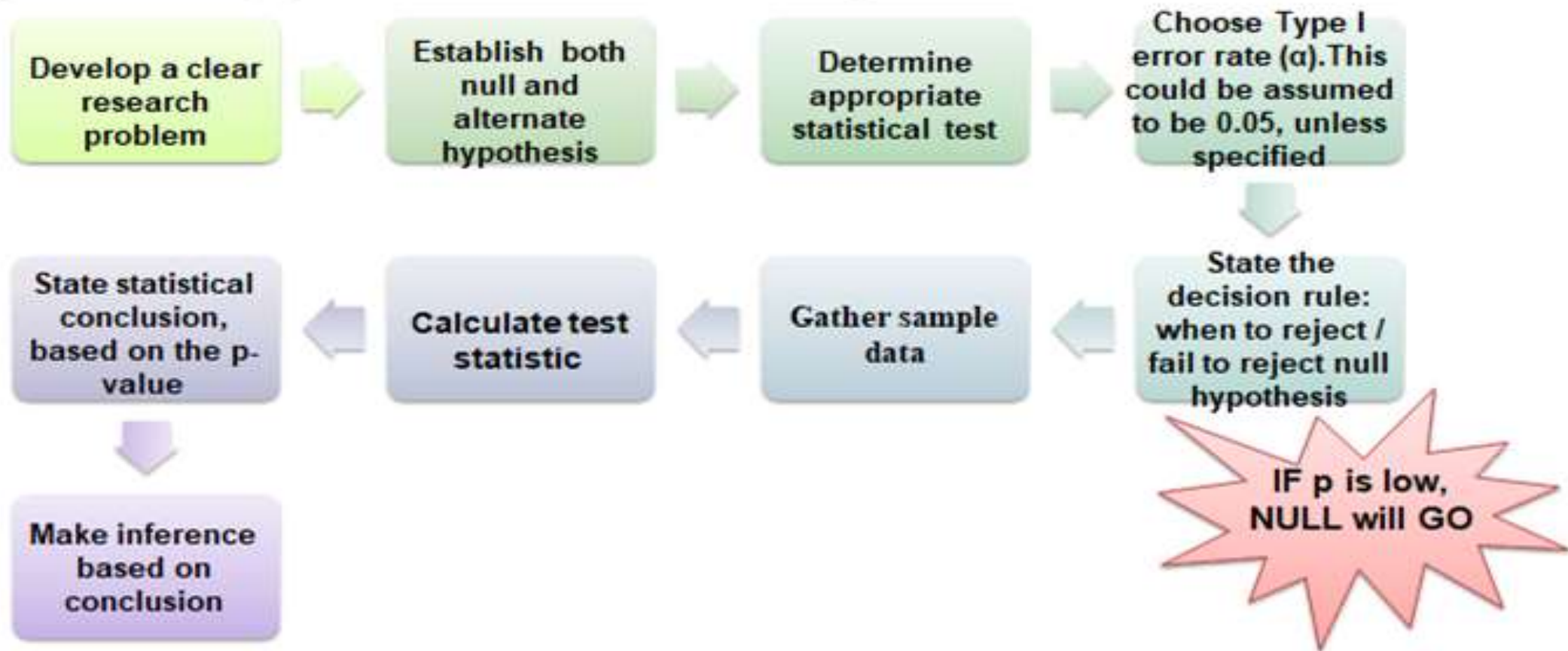
Hypothesis Testing

- α, β, Type I error, Type 2 error
- Significance level, Confidence level & power of test
- α + β is not equal to 1 !
- α is never calculated but is given or assumed !

Hypothesis Testing
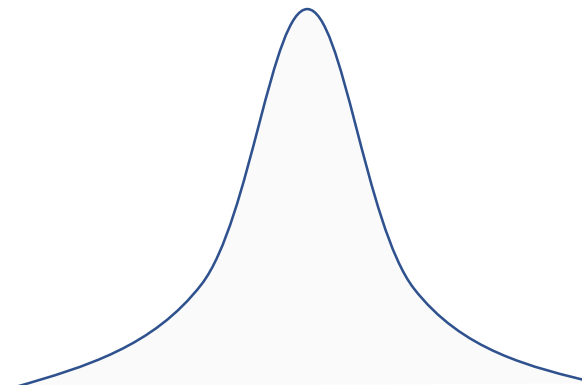
- 1-tailed vs 2-tailed test
- In 1-tailed, left tailed or right tailed?
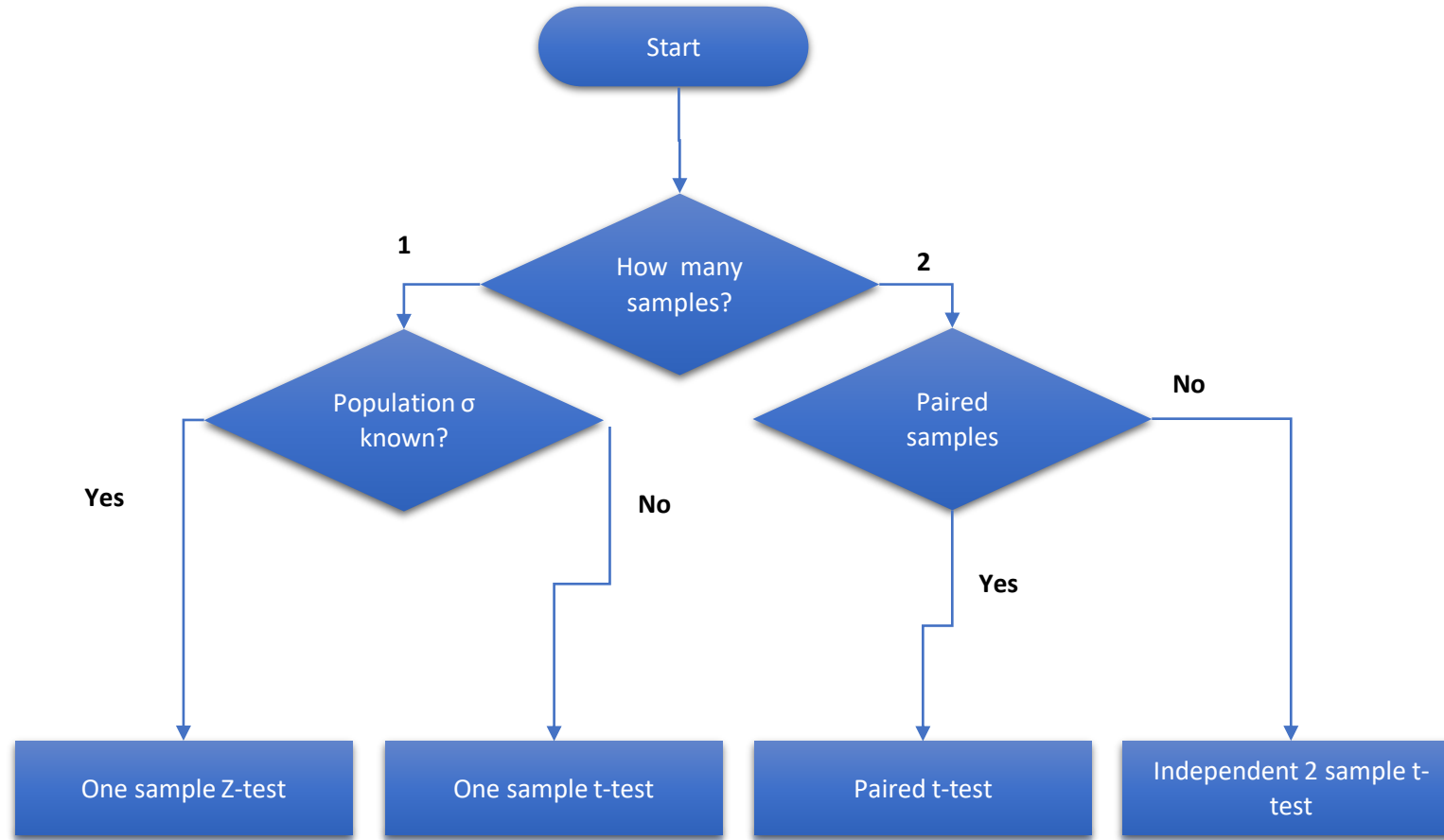- The answer depends on Ha

$H_o : \mu = 60$
$H_a : \mu \, != 60$

$H_o : \mu = 60$
$H_a : \mu < 60$

$H_o : \mu = 60$
$H_a : \mu > 60$

Hypothesis Testing – Which Test to use

Can Uber double its revenue by changing a single word ?

from "buy" to "try" more than doubled the conversions for Uber.

Uber wanted to discover how much extra its core users are willing to pay and hence increase its revenue.

https://factordaily.com/opinions/uber-ab-test-boost-revenue-india/

BUY

TRY

20% CONVERSION

47% CONVERSION

A/B Test example. Changing a single word more than doubles the conversion rate

Case Study-2 (Titan Insurance)

The Titan Insurance Company has just installed a new incentive payment scheme for its life policy sales-force. It wants to have an early view of the success or failure of the new scheme. Indications are that the sales force is selling more policies but sales always vary in an unpredictable pattern from month to month and it is not clear that the scheme has made a significant difference. Life Insurance companies typically measure the monthly output of a salesperson as the total sum assured for the policies sold by that person during the month.

Titan's new scheme is that the sales force receive low regular salaries but are paid large bonuses related to their output (i.e. to the total sum assured of policies sold by them). The scheme is expensive for the company but they are looking for sales increases to compensate for it. The scheme has now been in operation for four months. It has settled down after fluctuations in the first two months due to the changeover.

To test the effectiveness of the scheme, Titan has taken a random sample of 30 salespeople measured their output in the penultimate month prior to changeover and then measured it in the fourth month after the changeover (they have deliberately chosen months not too close to the changeover).

McDonald's Competition

We've all heard the tagline – "I'm lovin' it". But does the Mcdonalds happy meal really make us happy ? Let us analyse the nutrient value of different Mcdonalds food offerings.
Best Analysis and presentation earns the chance to win exciting prizes.

This was an exciting and fun way to practice and learn the concepts. Competition made me push hard for victory- Shweta Singh

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QUESTIONS

HAPPY LEARNING