SNS COLLEGE OF TECHNOLOGY

Kurumbapalayam (Po), Coimbatore – 641 035

An Autonomous Institution

Accredited by NAAC – UGC with 'A++' Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

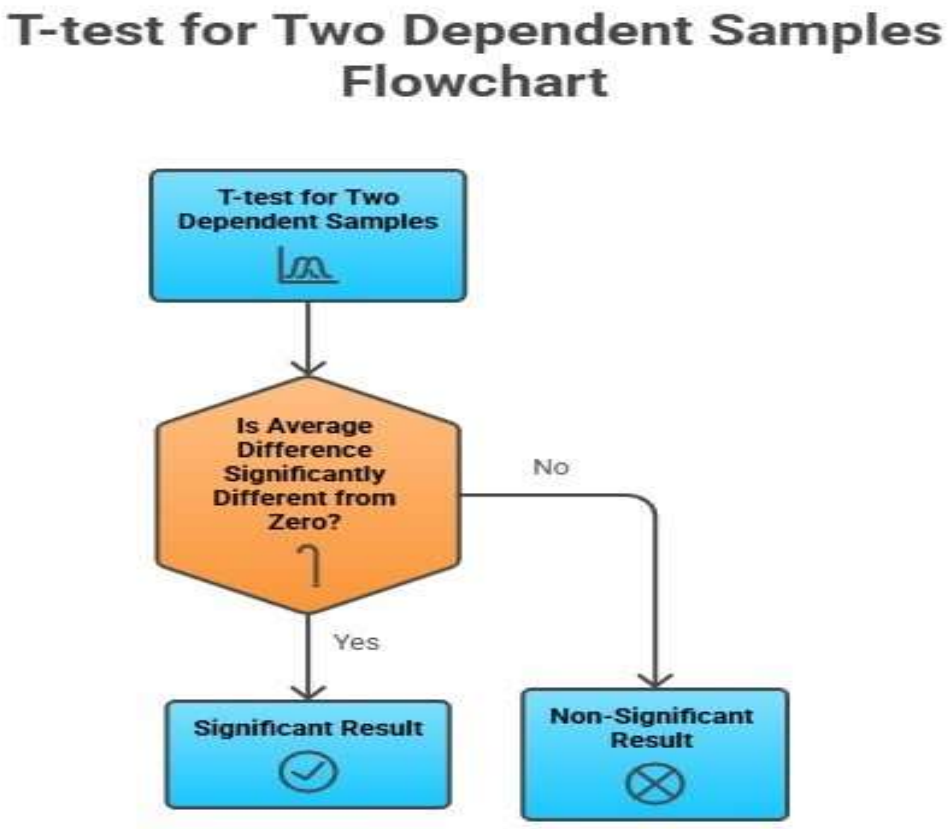
COURSE NAME: 23ADO201- DATA SCIENCE FUNDAMENTALS (OPEN ELECTIVE)

III YEAR / VI SEMESTER

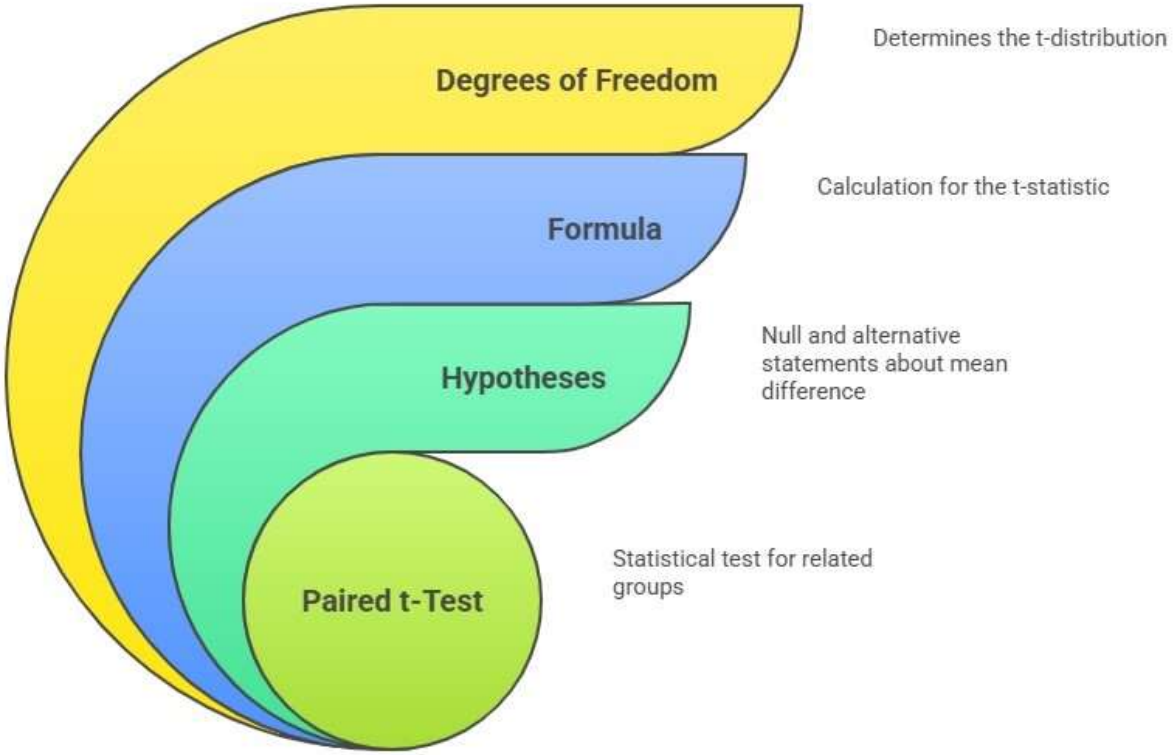
Unit 4 - ANALYSIS OF VARIANCE

Topic : t-test for two related samples.

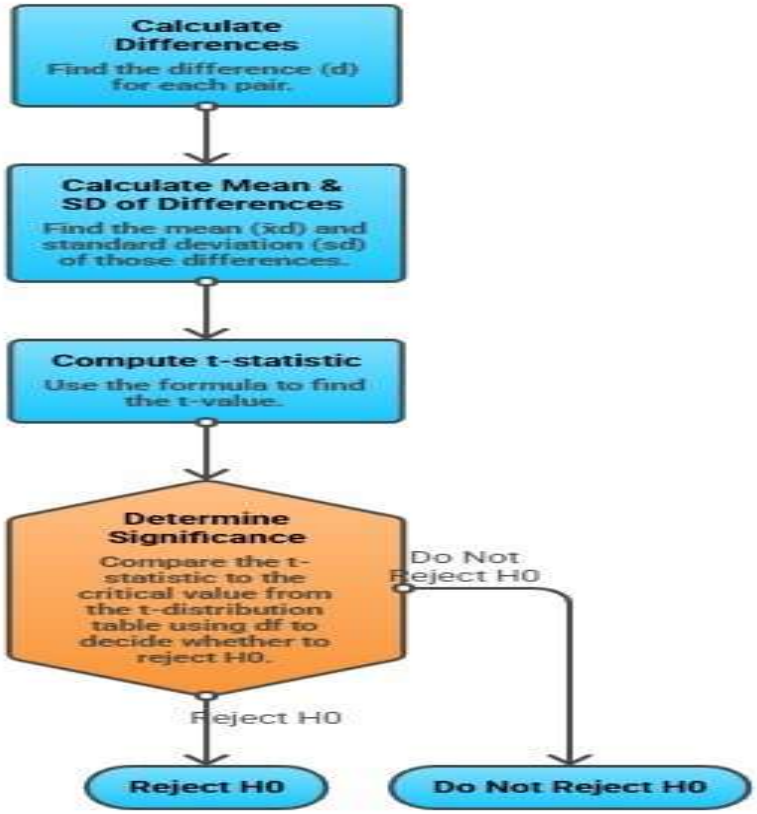
Empathy

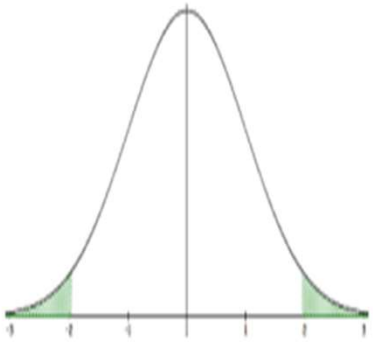
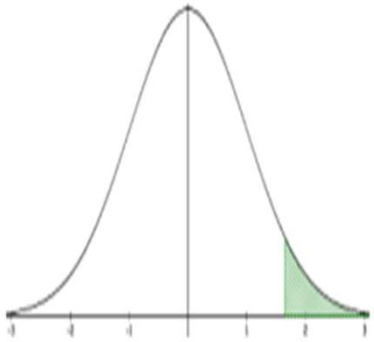
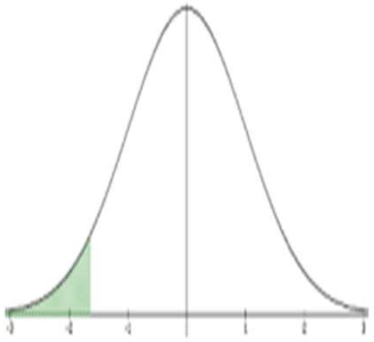

T-test for Two Dependent Samples Flowchart
T-test for Two Dependent Samples
Is Average Difference Significantly Different from Zero?
No
Yes
Significant Result
Non-Significant Result

Paired t-Test Structure



Paired t-Test Analysis Steps



Two-tailed Test	Right-tailed Test	Left-tailed Test
$H_0: \mu_D = 0$ $H_1: \mu_D \neq 0$	$H_0: \mu_D = 0$ $H_1: \mu_D > 0$	$H_0: \mu_D = 0$ $H_1: \mu_D < 0$
		

A dietician is testing to see if a new diet program reduces the average weight. They randomly sample
35 patients and measure them before they start the program and then weigh them again after 2 months on the program. What are the correct hypotheses?

Solution

Let x_1 = weight before a weight-loss program and x_2 = weight after the weight-loss program. We want to test if, on average, participants lose weight. Therefore, the difference $D = x_1 - x_2$. This gives D = before weight – after weight, thus if on average people do lose weight, then in general the before > after and the D's are positive. How we define our differences determines that this example is a right-tailed test (carry the > sign down to the
alternative hypothesis
) and the correct hypotheses are:

$H_0: \mu_D = 0$

$H_1: \mu_D > 0$

If we were to do the same problem but reverse the order and take D = after weight – before weight the correct
alternative hypothesis
is $H_1: \mu_D < 0$ since after weight < before weight. Just be consistent throughout your problem, and never switch the order of the groups in a problem.

https://stats.libretexts.org/Bookshelves/Introductory_Statistics/Mostly_Harmless_Statistics_(Webb)/09%3A_Hypothesis_Tests_and_Confidence_Intervals_for_Two_Populations/9.01%3A_Two_Sample_Mean_T-Test_for_Dependent_Groups

Activity

Activity: T-Test for Two Related Samples (Paired T-Test)

🎯 Objective

To determine whether there is a significant difference between two related sample means (e.g., before and after measurements).

🧪 Activity Scenario

A teacher wants to check whether a new teaching method improves student performance.

•Marks of students are recorded **before** and **after** the new method.

Student	Before	After
A	60	65
B	55	58
C	70	75
D	65	68
E	62	66

Steps to Perform the Activity

1.State Hypothesis

1. H_0 (Null Hypothesis): No difference between before and after scores
2. H_1 (Alternative Hypothesis): Significant difference exists

2.Find Differences (d)

1. d = After − Before

3.Calculate Mean of Differences (d̄)

3. $\bar{d}$ = (5 + 3 + 5 + 3 + 4) / 5 = 4

4.Apply Paired T-Test Formula

$$t = \frac{\bar{d}}{s_d/\sqrt{n}}$$

Where:

•$\bar{d}$ = mean difference

•s_n = standard deviation of differences

•n = number of pairs

5.Calculate Standard Deviation (s_n)

(Students can compute step-by-step as part of activity)

6.Find t-value and Compare

5. Compare with critical t-value from table (df = n−1)

📌 Conclusion

•If calculated t > table value → Reject H_0

•Otherwise → Accept H_0

Student	d
A	5
B	3
C	5
D	3
E	4

MCQ

T-Test for Two Related Samples (Paired T-Test) – MCQs

1. The paired t-test is used when:

A) Samples are independent

B) Samples are related

C) Population variance is known

D) Sample size is large

Answer: B) Samples are related

2. Which of the following is an example of paired data?

A) Heights of two different classes

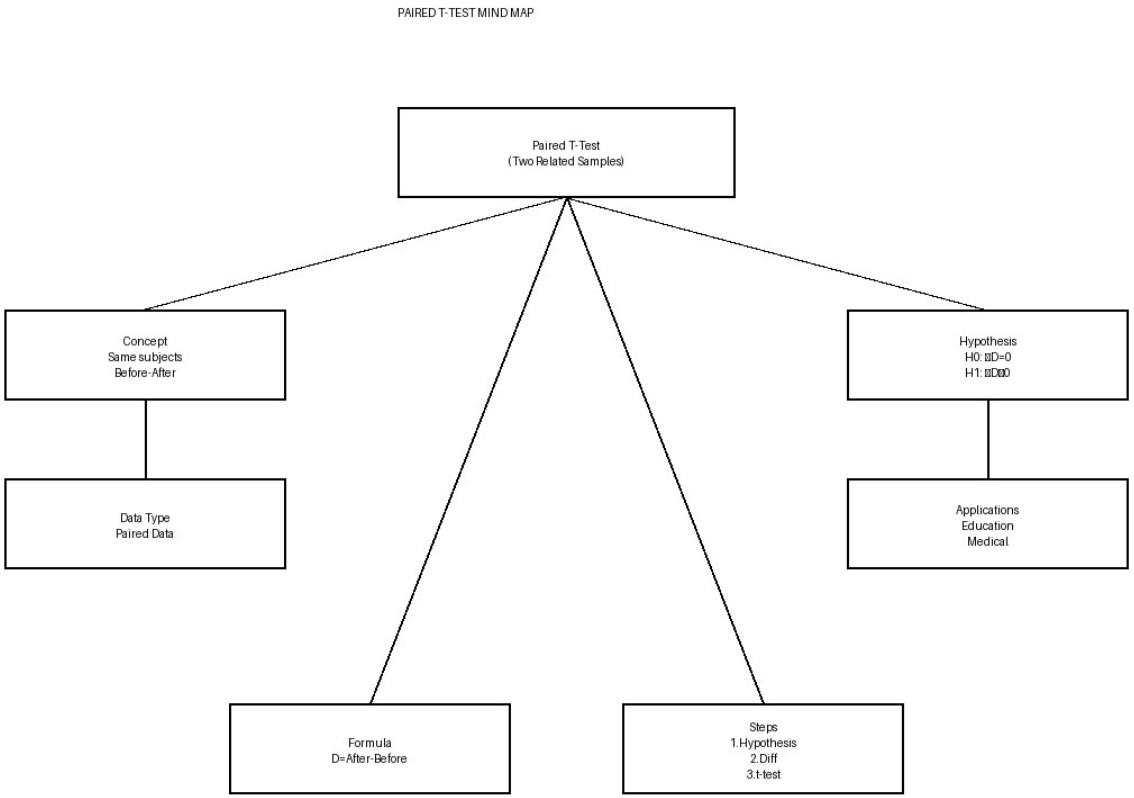
B) Marks of boys and girls

C) Before and after test scores of same students

D) Scores from two different schools

Answer: C) Before and after test scores of same students

MINDMAP


PAIRED T-TEST MIND MAP
Paired T-Test
(Two Related Samples)
Concept
Same subjects
Before-After
Data Type
Paired Data
Hypothesis
H0: ¤D=0
H1: ¤D¤0
Applications
Education
Medical
Formula
D=After-Before
Steps
1.Hypothesis
2.Diff
3.t-test

TEXT BOOKS	
1.	Srinivasan Desikan and Gopalaswamy Ramesh, ―Software Testing – Principles and Practices, Pearson Education, 2006.
REFERENCES	
1.	Ilene Burnstein, ―Practical Software Testing, Springer International Edition, 2003
2.	Edward Kit, Software Testing in the Real World – Improving the Process‖, Pearson Education, 1995
3.	Boris Beizer, Software Testing Techniques – 2nd Edition, Van Nostrand Reinhold, New York, 1990.
4.	Aditya P. Mathur, ―Foundations of Software Testing _ Fundamental Algorithms and Techniques, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

10

THANK YOU!

11