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Batch: Data Analytics Dec live Batch

Assignment: Hypothesis Testing

Assignment

Question 1: What is a null hypothesis (H_0) and why is it important in hypothesis testing?

Answer:

The null hypothesis (H_0) is a statement that assumes no effect, no difference, or **no change**. Null hypothesis (H_0) represents the current or **default assumption**.

Importance:

- It provides a starting point for testing
- Helps decide whether observed results are due to chance or not

Example:

H_0 : Average complaint resolution time is **10 minutes**.

Question 2: What does the significance level (α) represent in hypothesis testing?

Answer:

The significance level (α) is the **probability of rejecting a true null hypothesis**.

Common values:

- $\alpha = 0.05$ (5%)

Question 3: Differentiate between Type I and Type II errors.

Answer:

Type I error is **rejecting a true null hypothesis** while **Type**

II error is **failing to reject a false null hypothesis**.

Question 4: Explain the difference between a one-tailed and two-tailed test. Give an example of each.

Answer:

One-tailed Test

- Tests only one direction
- Example: “Has productivity increased?”

$$H_1: \text{Mean} > \mu$$

Two-tailed Test

- Tests both directions
- Example: “Has the mean changed?”

$$H_1: \text{Mean} \neq \mu$$

Question 5: A company claims that the average time to resolve a customer complaint is 10 minutes. A random sample of 9 complaints gives an average time of 12 minutes and a standard deviation of 3 minutes. At $\alpha = 0.05$, test the claim.

Answer:

Given: Sample Mean(\bar{x}) = 12 min

Critical Mean(μ_e) = 10 min

Sigma = 3 min

significance level (α) = 0.05

n = 9

Step 1: null hypothesis : Customer complain solved in 10 min.

Alternative hypothesis: Customer complain not solved in 10 min.

Step 2: Sample size (n) < 30 that means t test

Step 3: Apply Formula of t test

$$(x\bar{ - } \mu) / (\text{sample std} / \sqrt{n})$$

$$(12 - 10) / 3 / \sqrt{9} = 2$$

Step 4: Critical

Value Type is two

tail. df = n - 1 = 8

$t_{0.05} \approx 2.306$

Step 4: Decision

Here , Calculated $t <$ Critical t

$$|t| = 2 < 2.306$$

since calculated $t <$ critical t , accept null hypothesis reject alternate hypothesis

Question 6: When should you use a Z-test instead of a t-test?

Answer:

Z test . is used when

1. Sample size(n) ≥ 30
2. Population std should be known
3. data is roughly normally distributed

T test is used when

1. Sample size(n) < 30 .
2. Population std is unknown

