

Expt No-13

Date : 13-10-25

Hypothetical using T-Test

Objective : To test whether the average IQ score of a sample of students differs significantly from a population mean IQ score of 100.

Procedure:

1. Null Hypothesis (H_0) : The average IQ score of the sample is 100.
2. Alternative Hypothesis (H_1) : The average IQ score of the sample is not 100.
3. Sample : Measure the IQ scores of 28 randomly selected students.
4. T-Test : Conduct a one-sample T-Test to compare sample mean to 100.

5. Decision Rule : Use a significance level of $\alpha = 0.05$.

Program:

```
import numpy as np
import scipy.stats as stats
np.random.seed(42)

sample_size = 25
sample_data = np.random.normal(loc=102, scale=
                                15, size=sample_size)

population_mean = 100
sample_mean = np.mean(sample_data)
sample_std = np.std(sample_data, ddof=1)
n = len(sample_data)

t_statistic, p_value = stats.ttest_1samp(sample_data,
                                          population_mean)

print(f"Sample Mean: {sample_mean:.2f}")
print(f"T-Statistic: {t_statistic:.4f}")
print(f"P-Value: {p_value:.4f}")

alpha = 0.05
if p_value < alpha:
    print("Reject the null hypothesis! The average IQ score is significantly different from 100.")
else:
    print("Fail to reject the null hypothesis!")
    print("There is no significant difference in average IQ score from 100.")
```

Output:

Sample Mean : 99.55

T-Statistic : -0.1577

P-Value : 0.8766

Fail to ~~reject~~ reject the null hypothesis: There is no significant difference in average IQ score from

Test for difference between two sample means

Statistically, the null hypothesis is that there is no significant difference between the two sample means.

Let H_0 be the hypothesis of no difference in the two sample means.

The comparison of the two sample means is done by calculating the difference between the two sample means.

The difference between the two sample means is calculated as follows:

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

The value of T is compared with the critical value of T obtained from the standard normal distribution table.

If the calculated T -value is less than the critical value, then the null hypothesis is rejected.

If the calculated T -value is greater than the critical value, then the null hypothesis is not rejected.

The calculated T -statistic is -0.1377 with a p-value of 0.8760 . Since the p-value > 0.05 , we fail to reject the null hypothesis. Thus there is no significant difference.