

Hypothesis Testing using T-Test

Exp : 13

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Aim:

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

Algorithm:

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 25 randomly selected students.
4. **T-Test:** Conduct a one-sample T-test to compare the sample mean to 100.
5. **Decision Rule:** Use a significance level of $\alpha = 0.05$.

Code:

```
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: There is no significant difference in average IQ score from 100.")
```

Output:

Sample Mean: 99.55

T-Statistic: -0.1577

P-Value: 0.8760

Fail to reject the null hypothesis: There is no significant difference in average IQ score from 100.

Result:

The one-sample T-Test was successfully performed. With a **Sample Mean of 99.55** and a **P-Value of 0.8760**, the P-Value (0.8760) is significantly greater than the significance level ($\alpha = 0.05$). Therefore, we **Fail to reject the Null Hypothesis**. There is no statistically significant evidence to conclude that the average IQ score of the sample differs from the population mean of 100.