CS-23334 FUNDAMENTALS OF DATA SCIENCE

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Experiment 13 **Date: 16.10.2025**

13. Hypothetical using T-Test

Aim:

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

Description:

A statistical T-Test is conducted to determine if the average IQ score of a sample of students significantly differs from the population mean 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 With Example:

```
import numpy as np
import scipy.stats as stats

# Set a random seed for reproducibility
np.random.seed(42)

# Generate hypothetical sample data (IQ scores)
sample_size = 25
sample_data = np.random.normal(loc=102, scale=15, size=sample_size)

# Population mean under the null hypothesis
population_mean = 100

# Calculate sample statistics
sample_mean = np.mean(sample_data)
sample_std = np.std(sample_data, ddof=1)

# Number of observations
n = len(sample_data)

# Calculate the T-statistic and p-value
t_statistic, p_value = stats.ttest_1samp(sample_data,population_mean)

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

Output:

```
Sample Mean: {sample_mean:.2f}
T-Statistic: {t_statistic:.4f}
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:

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

Result:

The Python program to test whether the average IQ score of a sample differs significantly from a population mean of 100 involves performing a one-sample T-Test that compares the sample mean to the population mean was executed