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.

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 $\alpha = 0.05$.

Program:

```
[3]:  import numpy as np
      import scipy.stats as stats
```

```
[4]:  np.random.seed(42)
      sample_size = 25
      sample_data = np.random.normal(loc=102, scale=15, size=sample_size)
```

```
[5]:  population_mean = 100
      sample_mean = np.mean(sample_data)
      sample_std = np.std(sample_data, ddof=1)
      n = len(sample_data)
```

```
[6]:  t_statistic, p_value = stats.ttest_1samp(sample_data, population_mean)
      alpha = 0.05
```

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

      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.")
```

```
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:

      Thus, the Python code to perform a one-sample T-test to compare the sample IQ scores with the population mean is successfully executed.