

Program6: Create random sample data and perform statistics test on random data. Perform statistical analysis using the SciPy library. Demonstrate basic statistical tests, hypothesis testing, and summary statistics to analyze datasets.

```
import numpy as np
import scipy.stats as stats
# Generate some sample data
np.random.seed(0)
data1 = np.random.normal(loc=0, scale=1, size=100) # Sample data 1 (normal distribution)
data2 = np.random.normal(loc=1, scale=1, size=100) # Sample data 2 (normal distribution)
# Summary statistics
mean_data1 = np.mean(data1)
median_data1 = np.median(data1)
std_data1 = np.std(data1)
min_data1 = np.min(data1)
max_data1 = np.max(data1)
# Perform t-test
t_statistic, p_value = stats.ttest_ind(data1, data2)
# Perform ANOVA
data3 = np.random.normal(loc=2, scale=1, size=100) # Sample data 3 (normal distribution)
anova_statistic, anova_p_value = stats.f_oneway(data1, data2, data3)
# Print summary statistics
print("Summary Statistics:")
print("Mean:", mean_data1)
print("Median:", median_data1)
print("Standard Deviation:", std_data1)
print("Minimum:", min_data1)
print("Maximum:", max_data1)
# Print t-test results
print("\nT-test:")
print("T-statistic:", t_statistic)
print("P-value:", p_value)
# Print ANOVA results
print("\nANOVA:")
print("F-statistic:", anova_statistic)
print("P-value:", anova_p_value)
```

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Summary Statistics:
Mean: 0.059808015534485
Median: 0.09409611943799814
Standard Deviation: 1.0078822447165796
Minimum: -2.5529898158340787
Maximum: 2.2697546239876076
```

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T-test:
T-statistic: -7.04142736901327
P-value: 3.059820094514085e-11
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ANOVA:
F-statistic: 88.00111635520777
P-value: 9.708427651972184e-31
```

Conclusion: The program showcases basic statistical analysis techniques using SciPy, including t-tests and ANOVA. It provides a practical example of how to conduct hypothesis testing and summarize statistical properties of datasets. By understanding the significance of p-values and test statistics, researchers can draw meaningful conclusions from their data and make informed decisions. This approach serves as a foundation for more advanced statistical analyses and hypothesis testing in scientific research and data analysis projects.