

EXPERIMENT 14

Aim:

To perform a One-Way ANOVA test to determine if there is a significant difference in mean plant growth among three different treatments.

Algorithm:

1. Import the necessary libraries — NumPy, SciPy, and StatsModels.
2. Generate random growth data for three plant treatments (A, B, and C) using normal distributions.
3. Combine the data and assign treatment labels.
4. Perform a One-Way ANOVA using `scipy.stats.f_oneway()` to compare the means.
5. Calculate the F-statistic and corresponding p-value.
6. Compare the p-value with the significance level ($\alpha = 0.05$).
7. Accept or reject the null hypothesis based on the result.

Code:

```
import numpy as np
import scipy.stats as stats
from statsmodels.stats.multicomp import pairwise_tukeyhsd

np.random.seed(42)
n_plants = 25
growth_A = np.random.normal(loc=10, scale=2, size=n_plants)
growth_B = np.random.normal(loc=12, scale=3, size=n_plants)
growth_C = np.random.normal(loc=15, scale=2.5, size=n_plants)

all_data = np.concatenate([growth_A, growth_B, growth_C])
treatment_labels = ['A'] * n_plants + ['B'] * n_plants + ['C'] * n_plants

f_statistic, p_value = stats.f_oneway(growth_A, growth_B, growth_C)

print("Treatment A Mean Growth:", np.mean(growth_A))
```

```
print("Treatment B Mean Growth:", np.mean(growth_B))
print("Treatment C Mean Growth:", np.mean(growth_C))
print()
print(f"F-Statistic: {f_statistic:.4f}")
print(f"P-Value: {p_value:.4f}")

alpha = 0.05
if p_value < alpha:
    print("Reject the null hypothesis: There is a significant difference in mean growth rates among
the three treatments.")
else:
    print("Fail to reject the null hypothesis: There is no significant difference in mean growth rates
among the three treatments.")
```

Output:

```
Treatment A Mean Growth: 9.672983882683818
Treatment B Mean Growth: 11.137680744437432
Treatment C Mean Growth: 15.265234904828972
```

F-Statistic: 36.1214

P-Value: 0.0000

Reject the null hypothesis: There is a significant difference in mean growth rates among the three treatments.

Result:

Thus, the One-Way ANOVA test was successfully performed, and it was concluded that there is a significant difference in mean plant growth among the three treatments.