**9. ANOVA-TEST**

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CODE:

import numpy as np

import scipy.stats as stats

# Set a random seed for reproducibility

np.random.seed(42)

# Generate hypothetical growth data for three treatments (A, B, C)

n\_plants = 25

# Growth data (in cm) for Treatment A, B, and C

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)

# Combine all data into one array

all\_data = np.concatenate([growth\_A, growth\_B, growth\_C])

# Treatment labels for each group

treatment\_labels = ['A'] \* n\_plants + ['B'] \* n\_plants + ['C'] \*

n\_plants

# Perform one-way ANOVA

f\_statistic, p\_value = stats.f\_oneway(growth\_A, growth\_B, growth\_C)

# Print results

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}")

# Decision based on the significance level

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.")

# Additional: Post-hoc analysis (Tukey's HSD) if ANOVA is

significant

if p\_value < alpha:

from statsmodels.stats.multicomp import pairwise\_tukeyhsd

tukey\_results = pairwise\_tukeyhsd(all\_data, treatment\_labels,

alpha=0.05)

print("\nTukey's HSD Post-hoc Test:")

print(tukey\_results)

OUTPUT:

