common-statistical-test

October 9, 2024

[3]:
```
# Importing necessary libraries
import numpy as np
from scipy import stats
```

[5]:
```
# 1) One-sample t test
# Data: mass of acorns in grams
acorn_masses = [8.8, 6.6, 9.5, 11.2, 10.2, 7.4, 8.0, 9.6, 9.9, 9.0,
                7.6, 7.4, 10.4, 11.1, 8.5, 10.0, 11.6, 10.7, 10.3, 7.0]

# Hypothesized population mean (mu = 10 g)
population_mean = 10

# Perform one-sample t-test
t_statistic, p_value = stats.ttest_1samp(acorn_masses, population_mean)

# Print results
print(f"T-statistic: {t_statistic}")
print(f"P-value: {p_value}")

# Conclusion at alpha = 0.05
alpha = 0.05
if p_value < alpha:
    print("Reject the null hypothesis: The average mass is significantly␣
 ↪different from 10 g.")
else:
    print("Fail to reject the null hypothesis: The average mass is not␣
 ↪significantly different from 10 g.")
```

```
T-statistic: -2.2491611580763973
P-value: 0.03655562279112415
Reject the null hypothesis: The average mass is significantly different from 10
g.
```

[7]:
```
# 2) Two-sample t-test
# Sample data for acorns from upwind and downwind
upwind_acorns = [10.8, 10.0, 8.2, 9.9, 11.6, 10.1, 11.3, 10.3,
                 10.7, 9.7, 7.8, 9.6, 9.7,
                 11.6, 10.3, 9.8, 12.3, 11.0,
```

```
                  10.4, 10.4]

downwind_acorns = [7.8, 7.5, 9.5, 11.7, 8.1, 8.8, 8.8, 7.7,
                   9.7, 7.0, 9.0, 9.7, 11.3, 8.7, 8.8, 10.9,
                   10.3, 9.6, 8.4, 6.6, 7.2, 7.6, 11.5, 6.6,
                   8.6, 10.5, 8.4, 8.5, 10.2, 9.2]

# Perform two-sample t-test assuming equal variances
t_statistic, p_value = stats.ttest_ind(upwind_acorns, downwind_acorns,␣
 ↪equal_var=True)

# Print results
print(f"T-statistic: {t_statistic}")
print(f"P-value: {p_value}")

# Conclusion at alpha = 0.057
alpha = 0.057
if p_value < alpha:
    print("Reject the null hypothesis: The mass of acorns from downwind trees␣
 ↪is significantly different from those upwind.")
else:
    print("Fail to reject the null hypothesis: The mass of acorns from downwind␣
 ↪trees is not significantly different from those upwind.")
```

```
T-statistic: 3.5981947686898033
P-value: 0.0007560337478801464
Reject the null hypothesis: The mass of acorns from downwind trees is
significantly different from those upwind.
```

[8]:
```
#3) One Way ANNOVA test
# Marks of randomly picked students from each section
A = [57, 45, 33, 45, 67]  # Section A
B = [23, 43, 23, 43, 45]  # Section B
C = [56, 76, 74, 87, 56]  # Section C

# Perform one-way ANOVA test
f_statistic, p_value = stats.f_oneway(A, B, C)

# Print results
print(f"F-statistic: {f_statistic}")
print(f"P-value: {p_value}")

# Conclusion at significance level alpha = 0.05
alpha = 0.05
if p_value < alpha:
    print("Reject the null hypothesis: The mean marks of students in the three␣
 ↪sections are significantly different.")
```

```
else:
    print("Fail to reject the null hypothesis: The mean marks of students in␣
 ↪the three sections are not significantly different.")
```

```
F-statistic: 9.336106489184692
P-value: 0.0035860538707912296
Reject the null hypothesis: The mean marks of students in the three sections are
significantly different.
```

[ ]: