

Lab7-Hypothesis Testion

Choose the best Test and apply.

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In [21]: from scipy import stats
import numpy as np
from scipy.stats import ttest_ind
from scipy.stats import ttest_rel
```

Question1:

suppose we want to know whether or not the mean weight of a certain species of some turtle is equal to 310 pounds.

To test this, we go out and collect a simple random sample of turtles with the following weights:

Weights: 300, 315, 320, 311, 314, 309, 300, 308, 305, 303, 305, 301, 303

```
In [5]: turtle_weight_sample = np.array([300, 315, 320, 311, 314, 309, 300, 308, 305, 303, 305, 301, 303])
hypotheses = 310

t_statistic, p_value = stats.ttest_1samp(turtle_weight_sample, hypotheses)

print(f"T-Statistic: {t_statistic:.4f}")
print(f"P-Value: {p_value:.4f}")

alpha = 0.05
if p_value < alpha:
    print("We can reject the null hypothesis")
else:
    print("We can accept the null hypothesis")

T-Statistic: -1.5848
P-Value: 0.1390
We can accept the null hypothesis
```

Question2:

suppose we want to know whether or not the mean weight between two different species of turtles is equal.

To test this, we collect a simple random sample of turtles from each species with the following weights:

Sample 1: 300, 315, 320, 311, 314, 309, 300, 308, 305, 303, 305, 301, 303

Sample 2: 335, 329, 322, 321, 324, 319, 304, 308, 305, 311, 307, 300, 305

```
In [16]: sample_1 = np.array([300, 315, 320, 311, 314, 309, 300, 308, 305, 303, 305, 301, 303])
sample_2 = np.array([335, 329, 322, 321, 324, 319, 304, 308, 305, 311, 307, 300, 305])

mean1 = np.mean(sample_1)
mean2 = np.mean(sample_2)

print("Sample 1 mean value:", mean1)
print("Sample 2 mean value:", mean2)

std1 = np.std(sample_1)
std2 = np.std(sample_2)

print("Sample 1 std value:", std1)
print("Sample 2 std value:", std2)

t_test,p_val = ttest_ind(sample_1, sample_2, equal_var=False)
print("The P-value is: ", p_val)

if p_val < 0.05:
    print("We can reject the null hypothesis")
else:
    print("We can accept the null hypothesis")

Sample 1 mean value: 307.2307692307692
Sample 2 mean value: 314.61538461538464
Sample 1 std value: 6.053020176278769
Sample 2 std value: 10.565098285162705
The P-value is: 0.049144851129745294
We can reject the null hypothesis
```

Question3:

suppose we want to know whether or not a certain training program is able to increase the max vertical jump (in inches) of basketball players.

The following data shows the max jump height (in inches) before and after using the training program for each player:

Before: 22, 24, 20, 19, 19, 20, 22, 25, 24, 23, 22, 21

After: 23, 25, 20, 24, 18, 22, 23, 28, 24, 25, 24, 20

```
In [26]: before = np.array([22, 24, 20, 19, 19, 20, 22, 25, 24, 23, 22, 21])
after = np.array([23, 25, 20, 24, 18, 22, 23, 28, 24, 25, 24, 20])

mean_before = np.mean(before)
mean_after = np.mean(after)

print(f"Mean Before Training: {mean_before}")
print(f"Mean After Training: {mean_after}")

t_statistic, p_value = ttest_rel(before, after)

print(f"T-Statistic: {t_statistic}")
print(f"P-Value: {p_value}")

alpha = 0.05

if t_statistic > 0 and (p_value / 2) < alpha:
    print("Reject H0: Jump height increased.")
elif t_statistic < 0:
    print("Test invalid: Jump height did not increase.")
else:
    print("Fail to reject H0: No significant increase.")

Mean Before Training: 21.75
Mean After Training: 23.0
T-Statistic: -2.5289026942943655
P-Value: 0.02802807458682508
Test invalid: Jump height did not increase.
```

In []: