CS-23334 FUNDAMENTALS OF DATA SCIENCE

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Experiment 12 **Date: 16.10.2025**

12. Hypothetical using Z-Test

Aim:

To test whether the average weight of a species of birds differs from 150 grams.

Description:

Z test is used to determine if the average weight of the bird population significantly differs from 150 grams by comparing the sample mean to the hypothesized population mean.

Algorithm:

1. Null Hypothesis (H_0): The average weight of the birds is 150 grams.

2. Alternative Hypothesis (H_1): The average weight of the birds is not 150 grams.

3. Sample: Measure the weights of 30 birds randomly selected from the population.

4. Z-Test: Conduct a Z-test to compare the sample mean to 150 grams.

5. Decision Rule: Use a significance level of $\alpha = 0.05$.

Code With Output:

```
import numpy as np
import scipy.stats as stats

#sample data
sample_data = np.array([152, 148, 151, 149, 147, 153, 150, 148,
152,149,151, 150, 149, 152, 151, 148, 150, 152, 149, 150,148, 153,
151,150, 149, 152, 148, 151, 150, 153])

#pop mean under null
population_mean = 150

#sample
sample_mean = np.mean(sample_data)
sample_std = np.std(sample_data, ddof=1)

#number of obv
n = len(sample_data)

#z-statistic
z_statistic = (sample_mean - population_mean) / (sample_std
/np.sqrt(n))

#p value
p_value = 2 * (1 - stats.norm.cdf(np.abs(z_statistic)))

print(f"Sample Mean: {sample_mean:.2f}")
print(f"Z-Statistic: {z_statistic:.4f}")
print(f"P-Value: {p_value:.4f}")
```

Output:

```
Sample Mean: 150.20
Z-Statistic: 0.6406
P-Value: 0.5218
```

```
alpha = 0.05
if p_value < alpha:
    print("Reject the null hypothesis: The average weight
issignificantly different from 150 grams.")
else:
    print("Fail to reject the null hypothesis: There is no significant
difference in average weight from 150 grams.")
```

Output:

```
Fail to reject the null hypothesis: There is no significant difference in average weight from 150 grams.
```

Result:

Thus, the Python program to test whether the average weight of the bird species differs from 150 grams uses a z test that compares the sample mean to the hypothesized population mean was executed.