



PARSHVANATH CHARITABLE TRUST'S

**A. P. SHAH INSTITUTE OF TECHNOLOGY**

**Department of Information Technology**

**(NBA Accredited)**



**Academic Year: 2022-23**

**Semester: VI**

**Class / Branch/ Div: TE- IT A/B**

**Subject: DS Using Python Skill based Lab**

**Name of Instructor:**

**Name of Student:**

**Student ID:**

**Roll No.**

**Date of Submission:**

### **Experiment No.3**

**Aim:** To implement two-sample Z-test.

**Prerequisites:** python.

**Objectives:** - At the end of this experiment, you will be able to:

- solving real life problems based on Statistical analysis
- Use Z test on the given problem

**Theory:** The two-sample z test is to tests the difference between means of two groups, whereas a one-sample z test is to tests the difference between a single group and the hypothesized population value.

#### **Assumptions of Two sample Z hypothesis tests**

- Population data is continuous
- Population follows a standard normal distribution
- Both sample ends must be higher than 30
- The population standard deviation is known
- Similar spread between the groups, in other words homogeneity of variance
- Both the samples should be randomly selected from the population
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#### **Two sample Z-test Formula**

$$Z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

- $\bar{x}_1$  = sample mean of first sample
- $\bar{x}_2$  = sample mean of second sample
- $\mu_1$  = Mean of first population
- $\mu_2$  = Mean of second population



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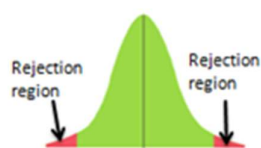


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- $\sigma_1^2$  = population variance in first population
- $\sigma_2^2$  = population variance in second population
- $n_1$  = sample size of first group
- $n_2$  = sample size of second group

### Hypothesis Testing

A tailed hypothesis is an assumption about a population parameter. The assumption may or may not be true. A one-tailed hypothesis is a test of hypothesis where the area of rejection is only in one direction. Whereas two-tailed, the area of rejection is in two directions. The selection of one or two-tailed tests depends upon the problem.

| Z- Test      | Null Hypothesis ( $H_0$ ) | Alternative Hypothesis ( $H_1$ ) | Statistical conclusion                                                                |
|--------------|---------------------------|----------------------------------|---------------------------------------------------------------------------------------|
| Two-tailed   | $\mu_1 = \mu_2$           | $\mu_1 \neq \mu_2$               |  |
| Left-tailed  | $\mu_1 \geq \mu_2$        | $\mu_1 < \mu_2$                  |  |
| Right-tailed | $\mu_1 \leq \mu_2$        | $\mu_1 > \mu_2$                  |  |

### Steps to Calculate Two Sample Z hypothesis test

- Select appropriate statistic- one-tailed or two-tailed?
- Determine the null hypothesis and alternative hypothesis



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- Determine the level of significance
  - Find the critical value
  - Calculate the standardized test statistics
  - Then make a decision to reject or fail to reject the null hypothesis. Reject the null hypothesis, If the test statistic falls in the critical region.
  - Finally, interpret the decision in the context of the original claim.

**Conclusion:** - In this experiment, we have validated dataset by performing two-sample Z-test