**Lab Problem: Two-Way ANOVA**

**Scenario:**

A company wants to analyze the impact of two different factors on the performance of their employees. The factors are:

1. **Training Type** (Factor A): Two types of training - Type 1 and Type 2.
2. **Department** (Factor B): Two departments - HR and Finance.

The goal is to determine whether there is a significant difference in performance scores based on the type of training, department, and their interaction.

**Dataset**

| **Employee** | **Training Type** | **Department** | **Performance Score** |
| --- | --- | --- | --- |
| 1 | Type 1 | HR | 80 |
| 2 | Type 1 | HR | 85 |
| 3 | Type 1 | HR | 82 |
| 4 | Type 1 | Finance | 90 |
| 5 | Type 1 | Finance | 92 |
| 6 | Type 1 | Finance | 88 |
| 7 | Type 2 | HR | 78 |
| 8 | Type 2 | HR | 74 |
| 9 | Type 2 | HR | 77 |
| 10 | Type 2 | Finance | 85 |
| 11 | Type 2 | Finance | 89 |
| 12 | Type 2 | Finance | 84 |

**Questions**

**Without Replication:**

1. **Perform Two-Way ANOVA Without Replication:**
   * Analyze the dataset to determine if there are significant differences in performance scores due to the training type and department.
   * Use statistical software or tools to calculate the ANOVA table, F-values, and p-values.
   * Interpret the results to determine if either factor (Training Type, Department) or their interaction has a significant effect on performance scores.

**With Replication:**

1. **Perform Two-Way ANOVA With Replication:**
   * Use the extended dataset with multiple observations per combination of training type and department.
   * Calculate the ANOVA table, F-values, and p-values.
   * Interpret the results and discuss the impact of replication on the analysis.

**Dataset for Replication (Extended)**

| **Employee** | **Training Type** | **Department** | **Performance Score** |
| --- | --- | --- | --- |
| 1 | Type 1 | HR | 80 |
| 2 | Type 1 | HR | 85 |
| 3 | Type 1 | HR | 82 |
| 4 | Type 1 | Finance | 90 |
| 5 | Type 1 | Finance | 92 |
| 6 | Type 1 | Finance | 88 |
| 7 | Type 2 | HR | 78 |
| 8 | Type 2 | HR | 74 |
| 9 | Type 2 | HR | 77 |
| 10 | Type 2 | Finance | 85 |
| 11 | Type 2 | Finance | 89 |
| 12 | Type 2 | Finance | 84 |
| 13 | Type 1 | HR | 81 |
| 14 | Type 1 | HR | 87 |
| 15 | Type 1 | HR | 79 |
| 16 | Type 1 | Finance | 91 |
| 17 | Type 1 | Finance | 89 |
| 18 | Type 1 | Finance | 87 |
| 19 | Type 2 | HR | 76 |
| 20 | Type 2 | HR | 75 |
| 21 | Type 2 | HR | 78 |
| 22 | Type 2 | Finance | 83 |
| 23 | Type 2 | Finance | 88 |
| 24 | Type 2 | Finance | 85 |

This lab problem provides a hands-on approach to understanding the impact of replication in two-way ANOVA and helps in interpreting the significance of factors and their interactions in both replicated and non-replicated scenarios.

Top of Form

Bottom of Form