In-Class Activities

Experiment Analysis

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1. Introduction

This documentation outlines the process of analyzing user performance data collected from a study comparing the use of a mouse versus a trackpad. The analysis includes descriptive statistics and a paired t-test to determine whether there is a significant difference in performance times.

2. Dataset Acquisition

Source of Dataset

The dataset used for this analysis was obtained from Mockaroo website. The data includes two performance metrics for each participant: the time taken to complete a task using a mouse and the time taken using a trackpad.

Dataset Structure

The dataset consists of the following columns:

- **User Name**: Identifier for each participant.
- **Mouse Time**: Time taken (in seconds) to complete the task using a mouse.
- **Trackpad Time**: Time taken (in seconds) to complete the task using a trackpad.

Example Data

User Name	Mouse Time	Trackpad Time
User 1	2.5	3.0
User 2	1.8	2.5
...	...	...

3. Data Preparation

Data Entry

The data was entered into a Microsoft Excel spreadsheet, organized into three columns: User Name, Mouse Time, and Trackpad Time.

Cleaning the Data

- **Checking for Missing Values**: Ensured there were no missing values in the Mouse Time and Trackpad Time columns.
- **Ensuring Consistency**: Verified that all time measurements were in seconds and formatted correctly.

4. Data Analysis

4.1 Descriptive Statistics

Descriptive statistics were calculated for both Mouse Time and Trackpad Time to summarize the data.

Calculations Performed

1. **Mean**: The average time taken for each input device.
    - Formula used: =AVERAGE(range)
2. **Standard Deviation**: Measures the variability of the time taken.
    - Formula used: =STDEV(range)
3. **Standard Error**: Provides an estimate of the uncertainty of the mean.
    - Formula used: =Standard Deviation / SQRT(n), where n is the number of participants.

Results of Descriptive Statistics

Statistic	Mouse Time	Trackpad Time
Mean	3.426666667	2.966666667
Standard Deviation	1.183196528	1.214945247
Standard Error	0.216021143	0.221817639

4.2 Paired t-Test

A paired t-test was conducted to compare the means of Mouse Time and Trackpad Time.

Steps for Conducting the t-Test

1. **Formula Used**:
    - The paired t-test was calculated using the formula:

    =T.TEST(B2:B31, C2:C31, 2, 1)

    - Where:
        - B2:B31 is the range for Mouse Time.
        - C2:C31 is the range for Trackpad Time.
        - 2 indicates a two-tailed test.
        - 1 indicates a paired test.
2. **Result of the t-Test**:
    - The p-value obtained was **0.1791**.

5. Results Interpretation

5.1 Descriptive Statistics

- **Mean Times**: The means of Mouse Time and Trackpad Time provide a basic understanding of average performance.
- **Standard Deviation and Standard Error**: These values indicate the variability and reliability of the mean.

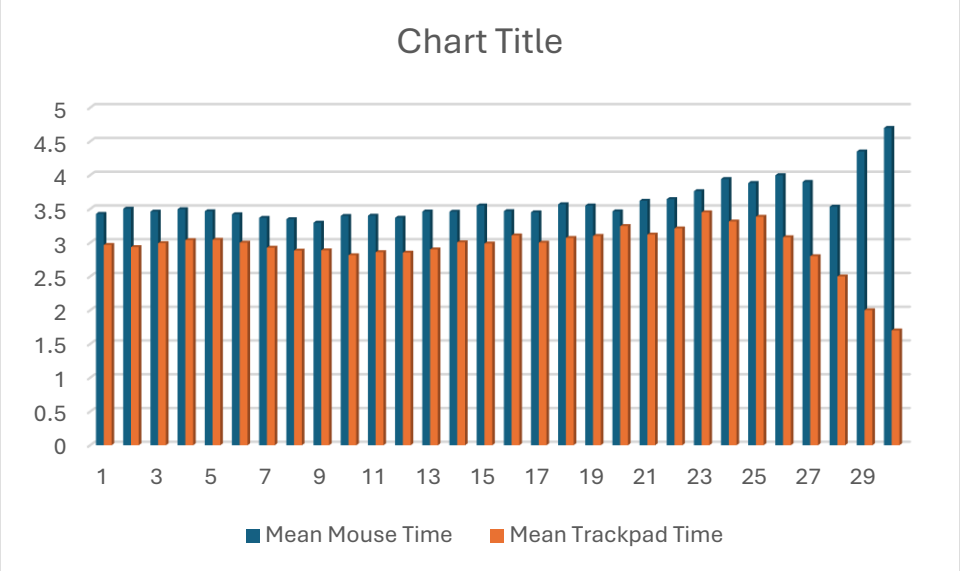
5.2 Paired t-Test Interpretation

- **P-Value**: The obtained p-value of **0.1791** is greater than the common significance level of 0.05.
- **Conclusion**:
    - Since the p-value is greater than 0.05, we do not reject the null hypothesis. This indicates that there is no statistically significant difference in performance times between using a mouse and a trackpad.

6. Visualizations

6.1 Bar Graph

A bar graph was created to visually compare the mean times for Mouse and Trackpad usage. Error bars representing standard error were also added to illustrate variability.



7. Conclusion

The analysis revealed that there is no significant difference in task completion times between a mouse and a trackpad, as indicated by the p-value from the paired t-test. This suggests that either input device can be used interchangeably for the tasks tested.

7.1 Limitations

- **Sample Size**: The size of the dataset could affect the statistical power of the analysis.
- **Variability**: Individual differences in user performance may not be fully captured.