

HYPOTHESIS TESTING REPORT

Hypothesis testing is a powerful way to analyze data. Apart from performing a hypothesis test, it must also be aware of the test's limits of practical significance.

1. Problem Statement

The dataset provided was an Autolib dataset containing details on the operation of cars within Paris in France. In the dataset, was a compilation of dates of when blue cars were picked up from and returned to the particular stations. The claim being investigated was whether or not the average number of blue cars picked up from the station was different from the blue cars returned to the station during the same period.

Null Hypothesis, H_0 : The average number of blue cars taken is not different from that of blue cars returned.

Alternative Hypothesis, H_a : The average number of blue cars taken is different from that of blue cars returned.

This hypothesis assists in the understanding of the data and its distribution as well.

2. Data Description

The dataset used for this study was an open dataset for cars in Paris. This includes variables such as the zip code of the area that was Paris and the dates in which the data was collected. The data was from January to July 2018. It also had a number of daily data points that could be used to aggregate each day of the aggregation within the specified time period.

The days of the week are regular Mondays to Fridays, with defaults and special days assigned. Weekday or weekend records contained specific days within the period. The blue cars that were picked and returned, utilib data, and slot dataset were also included in the dataset. The issue under investigation was on the averages by which the null hypothesis and the alternative hypothesis were generated.

If such comprehensive data hadn't been collected, a data response team could have been commissioned to head out to the field for data collection and perform analysis from which all conclusions would be drawn.

3. Hypothesis Testing Procedure

The dataset is large with 16085 columns and 13 rows. A sample which is a portion of the population, was picked using the stratified sampling method because using this method, the sample selected would be unbiased.

Stratified sampling required the grouping of data into different sets of strata, and thereafter randomly selecting a sample from the previously selected strata. However, using Python Programming made it really easy, quick and efficient to generate the sample. The dataset only had the dates and counts of the picked and returned bluecars, those were used to determine my hypothesis.

The decision to work on the average number of picked and returned blue cars was because it wouldn't be viable to manually group the data or identify the clusters and samples within them. It would be interesting to get to know the average number of blue cars picked in a day and compare them to the number of blue cars returned on that same day. Through this, we found it quite easy to determine the future business operations trends relating to blue cars in the Autolib electric car sharing company.

After carrying out stratified sampling, the sample found was made up of 296 columns and 4 rows. This, therefore means that the sample size, $n > 30$. With the sample size in mind, the z-score was used to determine the p-value. The statistic used demanded that we perform normality tests on the data. The alpha (α) level of significance used was 0.05.

4. Hypothesis Testing Results

The hypothesis tests we conducted proved that there is insufficient evidence that the mean values of the blue cars taken and the blue cars returned are not equal. The null hypothesis was not rejected since the z-score was -1.3163. The z-critical value was 1.95996 with confidence intervals of (38.6768, 80.9246)

The p-value of 0.0940 was greater than the significance level.

5. Discussion of Test Sensitivity

Statistical test sensitivity is a measure of the performance of a binary classification test. It measures the percentage of what is in actual sense positive, that is, the probability that the null hypothesis is true. In this case, the sensitivity was 91%.

6. Summary and Conclusions

The project was demanding and comprehensive. Exploratory data analysis was performed with hypothesis testing as an implementation. Finally, the null hypothesis could be rejected because there was clearly not enough evidence to reject the null hypothesis.

Null Hypothesis, H_0 : The average number of blue cars taken is not different from that of blue cars returned.

Alternative Hypothesis, H_a : The average number of blue cars taken is different from that of blue cars returned(CLAIM).