**IAN MUTAI HYPOTHESIS TESTING REPORT**

1. **Problem Statement**

Autolib is an electric car sharing service which was inaugurated in Paris, France, in December 2011. The Autolib service has maintained a fleet of all electric cars such as the Bollore bluecar, Utilib and the Utilib 1.4 for public use on a paid subscription basis, employing a citywide network of parking and charging stations.

Working as a data scientist for the Autolib electric car sharing service company, I have been tasked to investigate a claim about the blue cars from the provided dataset.

**Null Hypothesis** : The average number of blue cars taken on Monday is similar to the average number of blue cars taken on Tuesday.

**Average Hypothesis** : The average number of blue cars taken on Monday is different from the average number of blue cars taken on Tuesday.

The reason why this hypothesis is interesting is because we assume that the start of the week is usually the busiest and thus we expect the blue cars taken on Monday on average to be similar to the number of blue cars taken on Tuesday.

1. **Dataset Description**

The dataset provided was an open source Autolib dataset which contained information on the electric car usage in Paris during a period of six months between 1st January 2018 to 19th June 2018. The dataset entailed the total number of electric cars, that is, bluecar, Utilib and Utilib 1.4 taken and returned within the same day. Some of the other information included in our dataset was the postal code for areas in Paris, the days at which the data was recorded and the type of day i.e weekend or weekday. Additionally, the total number of recharging slots freed or taken during the days was also recorded in our dataset.

Keeping in mind that the data was already collected by Autolib, I would have conducted the data collection process by hiring a team of data specialists and sending them to collect and record the usage of electric areas in the city of Paris.

1. **Hypothesis Testing Procedure**

The dataset had a total of 16085 records consisting the following fields ; postal code, number of blue cars taken and returned to the respective addresses, the dates that the electric cars were taken or returned as well as the days of the week that electric cars were taken and returned. All this information was useful in helping us understand the electric car usage in Paris.

Having this in mind, first of all I located the weekdays in my dataset and narrowed down to Monday and Tuesday so as to be able to test my hypotheses. Afterwards, I decided to use the stratified sampling method. The reason I used this sampling method is to ensure that there is no bias and also make sure that the proportion of Monday and Tuesday is equal in our grouped sample.

Using the stratified sampling method, I chose to use 10% of the total Monday and Tuesday records since this percentage gives us a large enough sample to work with and test our hypothesis. After getting my sample, I calculated the z-score using the population mean, sample mean and the sample standard deviation which helped in attaining the p-value. Having set the significance level at 5% (0.05), I compared the p-value to the significance level with the aim of deciding whether to reject or fail to reject the null hypothesis.

1. **Hypothesis Testing Results**

After deciding to use the z-score as my test statistic, I calculated the z-score which was 0.08114049437316853.

I was also able to calculate the z-critical value and confidence intervals and determined that z-critical value was 1.959963984540054 and the confidence intervals were (96.73347227158973, 130.15447698845256).

I then used this z-score to calculate the p-value which came to 0.5323348890065372 which is way greater than the alpha significance level thus we fail to reject the null hypothesis as there is sufficient evidence to indicate that the average number of blue cars taken on Monday is similar to the average number of blue cars taken on Tuesday.

1. **Discussion of Test Sensitivity**

Sensitivity in a statistical test is the measure of performance of a binary classification test. It measures the proportion of the actual positive i.e. the probability of a null hypothesis being true.

1. **Summary / Conclusion**

I performed exploratory data analysis on our dataset before employing the stratified random sampling technique which ensures there is no bias and that the proportion of Monday and Tuesday was equal in our sample. Finally I did hypothesis testing as the implementation to our research question.

I can therefore conclude that we failed to reject the null hypothesis since there was sufficient evidence to indicate that the average number of blue cars taken on Monday is similar to the average number of blue cars taken on Tuesday.