

Analyzing the NYC Subway Dataset

Short Questions

Overview

This project consists of two parts. In Part 1 of the project, you should have completed the questions in Problem Sets 2, 3, 4, and 5 in the Introduction to Data Science course.

This document addresses part 2 of the project. Please use this document as a template and answer the following questions to explain your reasoning and conclusion behind your work in the problem sets. You will attach a document with your answers to these questions as part of your final project submission.

Section 1. Statistical Test

1. Which statistical test did you use to analyse the NYC subway data? Did you use a one-tail or a two-tail P value? What is the null hypothesis?
2. Why is this statistical test applicable to the dataset?
3. What results did you get from this statistical test? These should include the following numerical values: p-values, as well as the means for each of the two samples under test.
4. What is the significance and interpretation of these results?

Section 2. Linear Regression

1. What approach did you use to compute the coefficients theta and produce prediction for `ENTRIESn_hourly` in your regression model:
 - a. Gradient descent (as implemented in exercise 3.5)
 - b. OLS using Statsmodels
 - c. Or something different?
2. What features (input variables) did you use in your model? Did you use any dummy variables as part of your features?
3. Why did you select these features in your model? We are looking for specific reasons that lead you to believe that the selected features will contribute to the predictive power of your model. Your reasons might be based on intuition. For example, response for fog might be: "I decided to use fog because I thought that when it is very foggy outside people might decide to use the subway more often." Your reasons might also be based on data exploration and experimentation, for example: "I used feature X because as soon as I included it in my model, it drastically improved my R^2 value."
4. What is your model's R^2 (coefficients of determination) value?
5. What does this R^2 value mean for the goodness of fit for your regression model?
Do you think this linear model to predict ridership is appropriate for this dataset, given this R^2 value?

Section 3. Visualization

Please include two visualizations that show the relationships between two or more variables in the NYC subway data. You should feel free to implement something that we discussed in class (e.g., scatter plots, line plots, or histograms) or attempt to implement something more advanced if you'd like.

Remember to add appropriate titles and axes labels to your plots. Also, please add a short description below each figure commenting on the key insights depicted in the figure.

1. One visualization should contain two histograms: one of `ENTRIESn_hourly` for rainy days

and one of `ENTRIESn_hourly` for non-rainy days. You can combine the two histograms in a single plot or you can use two different plots.

For the histogram, you should have intervals representing the volume of ridership (value of `ENTRIESn_hourly`) on the x-axis and the frequency of occurrence on the y-axis. For example, you might have one interval (along the x-axis) with values from 0 to 1000. The height of the bar for this interval will then represent the number of records (rows in our data) that have `ENTRIESn_hourly` that fall into this interval.

Remember to increase the number of bins in the histogram (by having larger number of bars). The default bin width is not sufficient to capture the variability in the two samples.

2. One visualization can be more freeform, some suggestions are:
- Ridership by time-of-day or day-of-week
 - How ridership varies by subway station
 - Which stations have more exits or entries at different times of day

Section 4.

Conclusion

Please address the following questions in detail. Your answers should be 1-2 paragraphs long.

1. From your analysis and interpretation of the data, do more people ride the NYC subway when it is raining versus when it is not raining?
2. What analyses lead you to this conclusion?

Section 5. Reflection

Please address the following questions in detail. Your answers should be 1-2 paragraphs long.

1. Please discuss potential shortcomings of the data set and the methods of your analysis.
2. (Optional) Do you have any other insight about the dataset that you would like to share with us?

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