Transit Data Analysis: Part A

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Introduction

Transit is an app used to collect and map real-time public transit data. People may use the app to determine which train or bus route to take, to plan a trip, or to search for the quickest form of transportation among other things. The data collected from the app includes the users' locations, saved placemarks and routes, usage of the the Uber features, usage of car sharing and bike sharing features, trip planning feature, and so on.

Figure 1: Transit Logo

Figure 2: Transit interface of nearby transportation

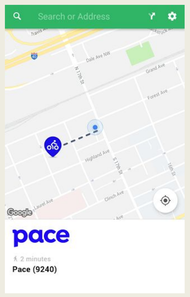


Figure 3: Bike sharing feature

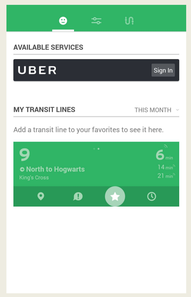


Figure 4: Transit interface for available services and saved routes

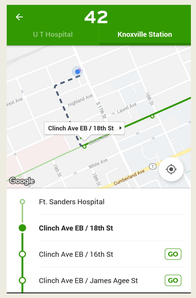


Figure 5: Trip planning feature

Process

Convert given json files to csv files and add unique codes to identify users → Isolate necessary data from tables of interest → Construct algorithms to perform analysis and edit as needed to achieve optimal results

Research Questions

- Can Transit users' home and work locations be inferred from from the data collected from the users using the app?
- What is the difference between the uber users from Transit app and the Uber users from Uber app? What is the connection between their travel time?
- What caused the users who want to use public transportation first to switch to request Uber through the Transit app? What are the characteristics of the user's location and the distance from the subway or bus station? Does the weather factor affect the user's choice?
- What is the relationship between the data characteristics of uber request and taxi travel?

Analysis of Uber Requests

Users who request Uber through the Transit app are signaling their intent to try to use public transportation first but are willing to move on to other modes when transit does not meet their needs.

We use the Uber request data and combined the public data on the network: the yellow taxi and the green taxi data for New York City and the time data for the Uber raw data. Here are aspects of this research:

1. For the Uber request data: Analyze the location characteristics and time characteristics of the users, research the relationship between location and subway distribution, and research the relationship between travel time and weather and traffic flow status.
2. Compare the time portion of the Uber raw data to research the time characteristics of different users choosing different modes of travel.
3. Combine the taxi data of New York City to research the relationship between taxi travel and Uber travel in Transit.

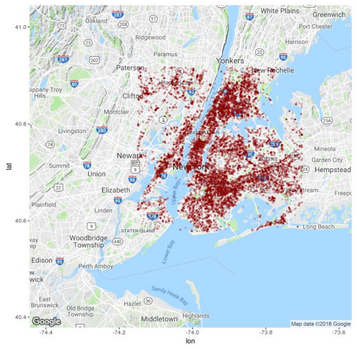


Figure 6: Uber_request distribution in New York

Figure 7: New York City subway line distribution

- The data in this section is from November 1, 2016 to October 31, 2017.
- This project concentrates on New York City.

Uber_request from Transit trends over time:

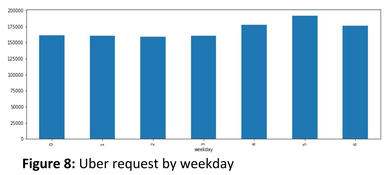


Figure 8: Uber request by weekday

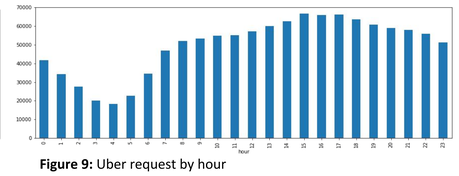


Figure 9: Uber request by hour

The yellow and green taxi in New York City

Time trends of taking a taxi(one month) :

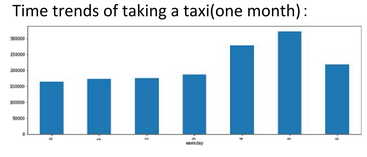


Figure 10: Taxi ride trends by weekday

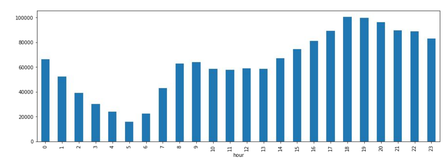


Figure 11: Taxi ride trends by hour

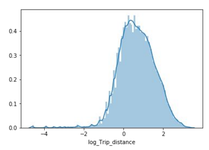


Figure 12: Log trip distance

weather example

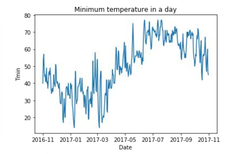


Figure 13: Minimum temperature by day

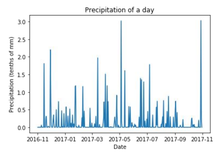


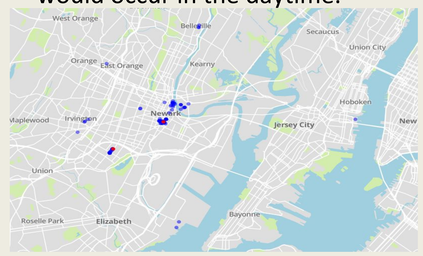
Figure 14: Millimeters of precipitation by day

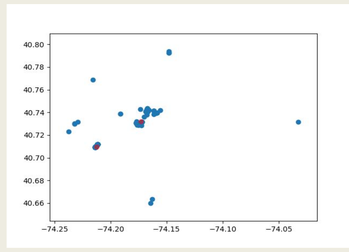
Home/Work Inferences of Users

Assumption: Users' location data will have two well-distinguishable clusters, indicating their home and work places. The user will be at their home and work locations at distinct times of the day, times not overlapping.

Process: Specific users who have saved their home and/or work locations have been extracted. The data from these users has been run through a k-means algorithm specified to have two clusters.

Issues: In the beginning, the assumption was that users would open the app in the morning before work when they were at home and in the evening after work when they were getting ready to leave work. This assumption did not match the data. Then it was assumed the majority of data at the home would occur in the night and the majority of data at the workplace would occur in the daytime.






```
Work: 40.730, -74.174
Assumed home location: 40.712, -74.211
Cluster 1: 40.73147935344828, -74.17267849137932
Cluster 2: 40.71373475, -74.21478375000001
```

Figure 15: Map of location data of a specific user
Red points mark saved locations, blue points mark location data
Figure 16: Graph of clustered points of a specific user
Red points mark centroids, blue points mark location data
Figure 17: Comparison of saved locations with centroids found by algorithm
Coordinates have been altered to protect user identity

Results:

- Distinguished location data for individual users
- Extracted some saved home and work locations
- Implemented k-means clustering algorithm to find clusters of location data
- Validated some centroids of the clusters as points of interest with a small margin of error

Future work:

- Label centroids as "home" and "work"
- Expand dataset to include location data from the rest of the year of 2016
- Apply algorithm to users without saved locations
- Use Google Maps API to investigate more saved locations

Acknowledgements

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