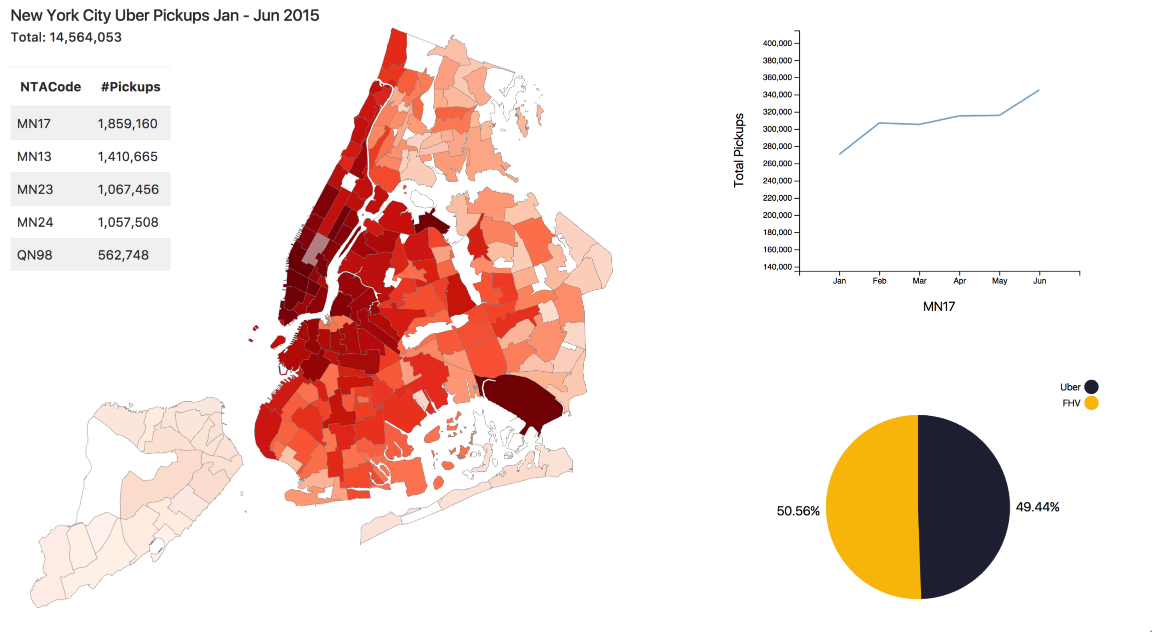
PROJECT REPORT

CIS602-02 Data Visualization



New York City Uber Pickups Jan - Jun 2015

Total: 14,564,053

NTACode	#Pickups
MN17	1,859,160
MN13	1,410,665
MN23	1,067,456
MN24	1,057,508
QN98	562,748

Tu D. Luong

UMass Dartmouth - Spring 2017

TABLE OF CONTENTS

Datasets 1
Tasks...3
Visualization evolution..3
Final Visualization..5

DATASETS

In this project, I will analyze about Uber trips data in New York city compared to other FHV (for-hire vehicles) companies. The data contains over 4.5 million Uber pickups in New York City from April to September 2014, and 14.3 million more Uber pickups from January to June 2015, Uber data from January to June 2016. Data also contains 10 other for-hire vehicle (FHV) companies including Lyft company.

The dataset's URLs include:

1. Unified New York City Taxi and Uber data (https://github.com/toddwschneider/nyc-taxi-data)
2. New York Map Data (https://raw.githubusercontent.com/se2/cis602-02-project/master/design/nyc.geo.2.json)

The datasets of Uber and FHV (For-Hire Vehicles) from Todd Schneider are raw datasets which are approximately 1.3 billion taxi and Uber trips originating in New York City. Due to the limitation of the time and effort in this project, I will only analyze Uber and FHV data from Jan to Jun in 2015 (approx. 14.5 million Uber pickups and approx. 15.5 million pickups for other FHV types). Below is the format of original Uber dataset:

Dispatching_base_num	Pickup_date	locationID
B02617	2015-05-17 09:47:00	141
B02617	2015-05-17 09:47:00	65

The FHV dataset format is similar:

Dispatching_base_num	Pickup_date	locationID
B00053	2015-01-01 01:05:00	45
B00053	2015-01-01 01:30:00	141

Dispatching base number is a unique number provided by TLC Company (http://www.nyc.gov/html/tlc/html/industry/base_and_business.shtm) for all FHV including Uber, format of FHV bases is as following:

base_number	base_name	dba_category
B00001	London Towners Inc.	Other
B02395	Abatar Inc.	Uber

New York map data is a **FeatureCollection** type with NTA Code (Neighborhood Tabulation Areas Code) for each small area project/master/design/nyc.geo.2.json), each NTA Code has a unique location ID which can be retrieved from https://github.com/toddwschneider/nyc-taxi-data/blob/master/data/taxi-zone-lookup-with-ntacode.csv with following format:

location_id	borough	zone	service_zone	ntacode
1	EWR	Newark Airport	EWR	NJ01
2	Queens	Jamaica Bay	Boro Zone	QN61

We have a locationID attribute for each pickup from both Uber and FHV data above, this locationID can be used to retrieved ntacode, and therefore, we know how many pickups from each NTA area. In this project, due to the tremendous amount of data from both Uber and FHV (more than 1GB in total for both), I have calculated and filtered down the data to the minimal datasets including only attributes I need, this will enhance the performance of d3.js queue function. The final format of pre-processed dataset is as following, both Uber and FHV:

```
[
  {
    "key": "MN17",
    "value": 315238
  },
  {
    "key": "MN13",
    "value": 237467
  },
  {
    "key": "MN23",
    "value": 182768
  },
…
  {
    "key": "SI32",
    "value": 2
  },
]
```

Thus, base on the above dataset, I can create a choropleth map of NYC with density of Uber and FHV pickups for each NTA area.

TASKS

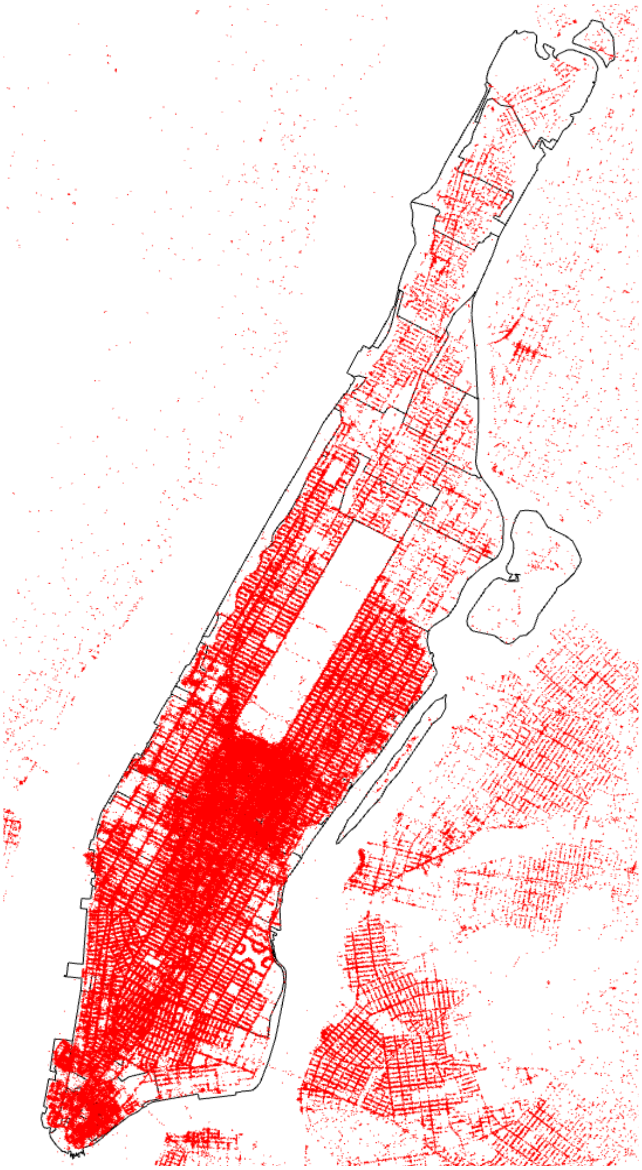
There are some questions I want to find out when making the visualization:

1. *Which places have the highest density of Uber and FHV pickups? And top 5 highest NTA areas of Uber and FHV?*
2. *The trending of Uber over first six months of 2015, represented by total number of pickups each month?*
3. *The sharing of Uber and FHV (in percentage) for each NTA area.*

To answer those above questions, I need to create a colormap, a line chart, and a pie chart with the datasets I have finalized.

VISUALIZATION EVOLUTION

My visualization focuses on plotting density of Uber pickups via choropleth map of NYC, emphasizing the trending of Uber using via the consideration of the increase of total pickups over months, and weighing the share of Uber rides in percentage. At first, I intended to plot data base on latitude and longitude of each individual pickup and use some sort of programming technique to count how many dots in a polygon in the colormap, however, this technique is quite performance-costly and not quite correct, so I decided to use another dataset with location ID including in each pickup (as above dataset description). My first design looked like as following

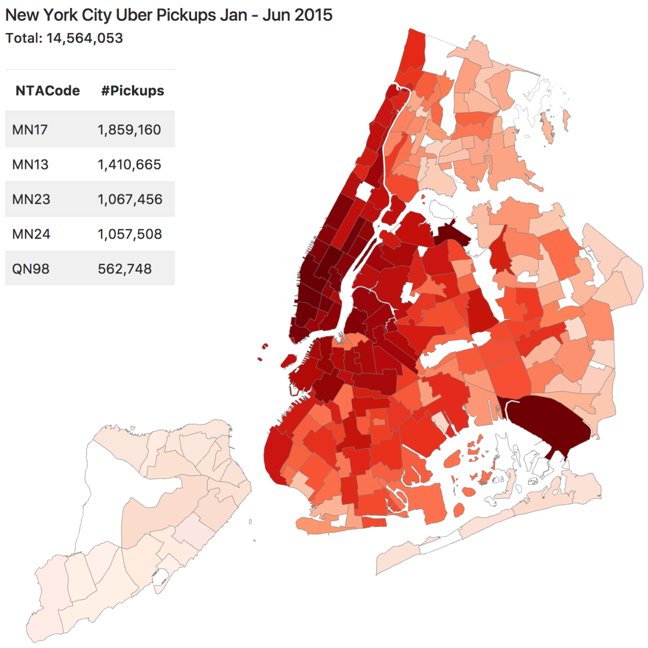


Those red “dots” in the map represent the position of pickups encoded by Latitude/Longitude attributes.

FINAL VISUALIZATION

As you can see, using Latitude/Longitude to plot pickups is quite messy and overlap in visualization, so I decided not using this, instead, counting number of pickups based on location ID and display by color saturation in my final visualization.

Density plot of Uber pickups represented in a choropleth map

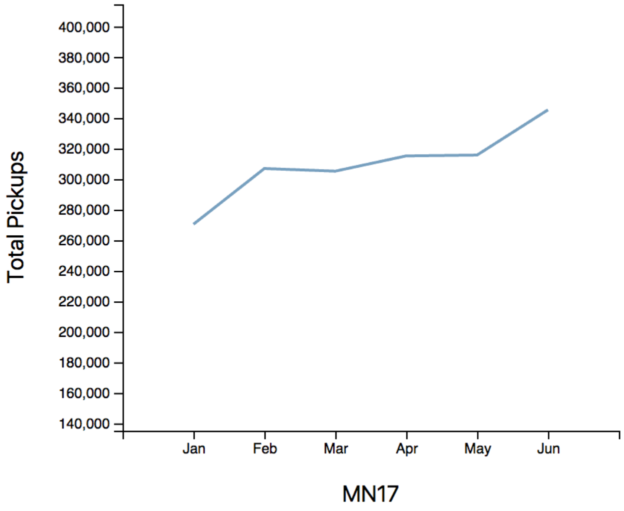


New York City Uber Pickups Jan - Jun 2015

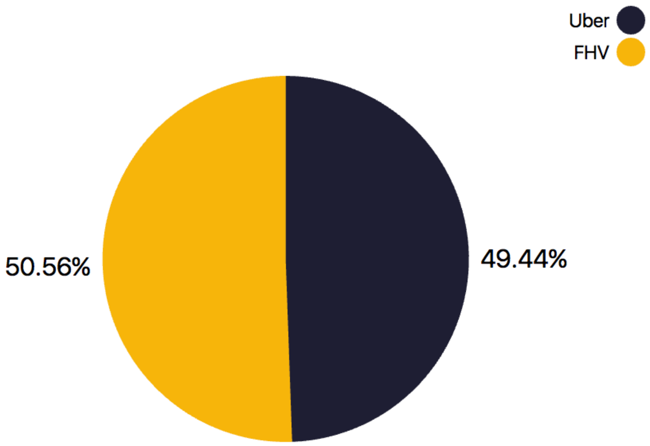
Total: 14,564,053

NTACode	#Pickups
MN17	1,859,160
MN13	1,410,665
MN23	1,067,456
MN24	1,057,508
QN98	562,748

Trending in using Uber can be seen for each NTA area, when we click on that area on the map, a simple line chart displays a trending of Uber using over six months from January to June 2015



Another attribute I want to see is that how many percentage of Uber comparing to FHV in the same NTA area, this could be analyzed via a simple pie chart



Marks & Channels:

	MARKS	**CHANNELS**
Choropleth map	Area Polygon	Color saturation
Line chart	Line	Position
Pie chart	Area	Size Categorical color

My visualization is based on multiple view principal, with main part is the choropleth map, and supporting views are line chart and pie chart. In future work, I want to analyze more about number of pickups broken down in weekdays & weekends; moreover, comparison between NTA areas or between boroughs is also my wish to accomplish in this visualization.