PittBike

A visualization exploration for Pittsburgh bikeshare

Group members

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Outline

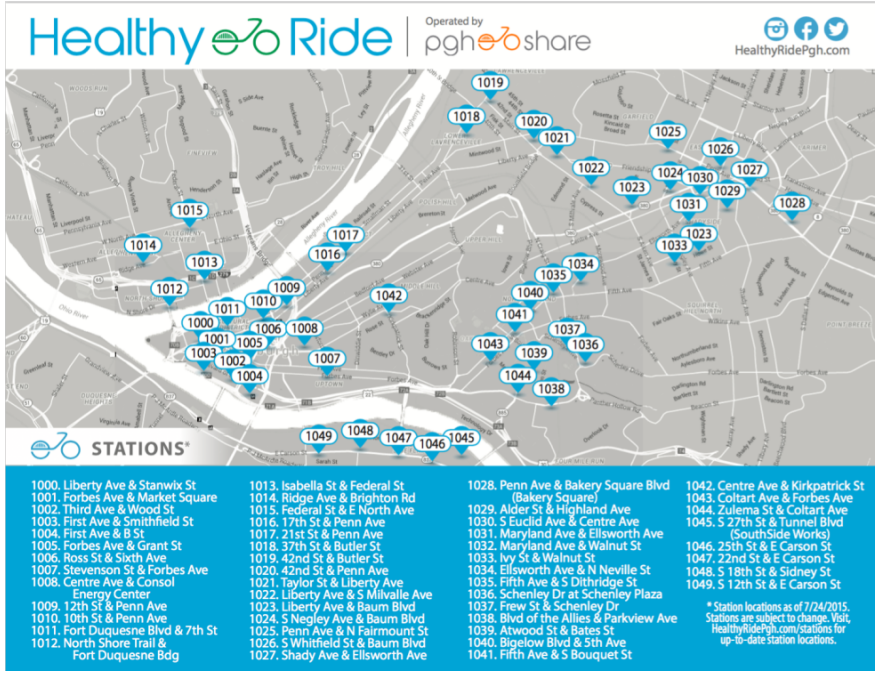
- ❑ Introduction
- ❑ Related work
- ❑ Visual design
- ❑ Evaluation

Introduction--Background

Healthy Ride

Pittsburgh's bike share system is the latest mode of transit in Pittsburgh

With **50 stations** located throughout the city, it provides affordable active transportation options for the public.



References: https://healthyridepgh.com/stations/

Introduction--Framework

Station overview

Visualize information of the location and the trip frequency of each station

Trip period frequency viz

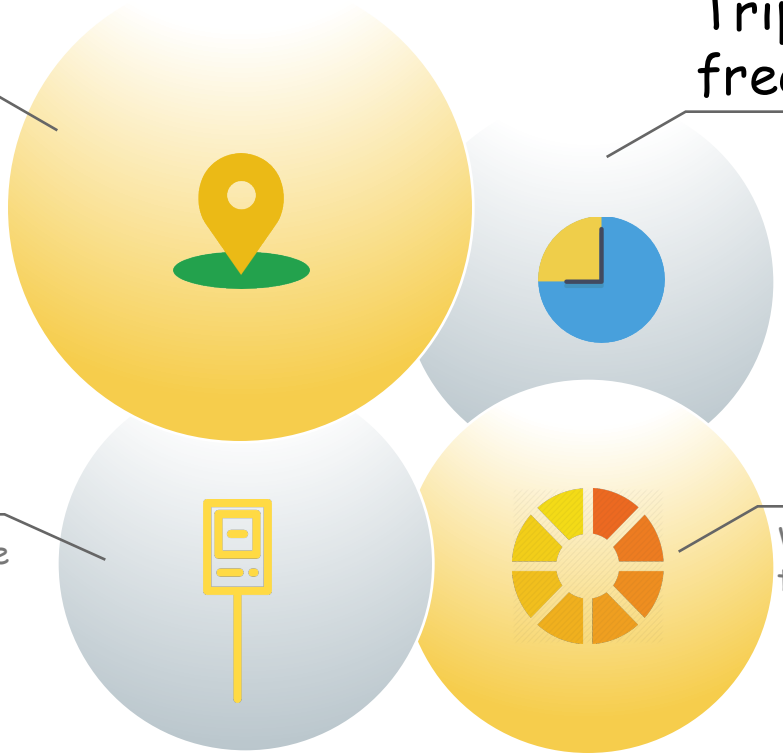
Visualize the bike trip frequency by day and hours

Station balance viz

Visualize the in and out bike amount imbalance of each station by month

Trip duration viz

Visualize the trip duration time by each customer type



Introduction--Data

- **Station dataset** - StationNum, geographical location and locker numbers.

StationNum	StationName	RackQnty	Latitude	Longitude
1000	Liberty & Stanwix	16	40.441326	-80.004679
1001	Forbes Ave & Market Sq	19	40.440877	-80.00308
1002	Third & Wood	15	40.43903	-80.00186
1003	First Ave & Smithfield St	15	40.4372	-80.000375
1004	First Ave & B St	15	40.4358002	-79.9968767
1005	Forbes Ave & Grant St	19	40.4387769	-79.9974405
1006	Ross St & Sixth Ave	21	40.4400542	-79.9951376
1007	Stevenson St & Forbes Ave	19	40.437643	-79.986695
1008	Centre Ave and Consol	35	40.440368	-79.988636
1009	12th St & Penn Ave	19	40.445844	-79.99238
1010	10th St & Penn Ave	15	40.444614	-79.9958114

- **Rental dataset**- detail trip information including: time, stations bikeID and trip duration.

Trip id	Starttime	Stoptime	Bikeid	Tripduration
20217133	7/1/16 0:44	7/1/16 1:22	70362	2263
20218077	7/1/16 1:22	7/1/16 1:34	70124	708
20220848	7/1/16 2:31	7/1/16 2:39	70135	475
20227674	7/1/16 5:48	7/1/16 6:10	70260	1300
20228273	7/1/16 6:05	7/1/16 6:24	70010	1107
20228404	7/1/16 6:09	7/1/16 6:23	70037	816
20228890	7/1/16 6:21	7/1/16 6:57	70322	2172
20229069	7/1/16 6:25	7/1/16 7:07	70281	2503
20229097	7/1/16 6:26	7/1/16 6:49	70049	1420

From station id	From station name	To station id	To station name	Usertype
1009	12th St & Penn Ave	1025	Penn Ave & N Fairm	Customer
1001	Forbes Ave & Market Square	1012	North Shore Trail &	Customer
1049	S 12th St & E Carson St	1007	Stevenson St & Forb	Customer
1022	Liberty Ave & S Millvale Ave (West Penn Hospital)	1005	Forbes Ave & Grant	Subscriber
1025	Penn Ave & N Fairmount St	1001	Forbes Ave & Marke	Subscriber
1032	Walnut St & College St	1040	Bigelow Blvd & Fifth	Customer
1033	Ivy St & Walnut St	1001	Forbes Ave & Marke	Subscriber
1048	S 18th St & Sidney St	1048	S 18th St & Sidney S	Subscriber
1017	21st St & Penn Ave	1019	42nd St & Butler St	Customer

Introduction—Our Goal

- Provide users an effective and meaningful way to obtain Pittsburgh bike sharing system **operation information** and to **plan their bike trips**.
- Provide an to see the **pattern and trend** of the current Pittsburgh bike sharing system.
- Help to build a **better bike sharing system**.

Related Work

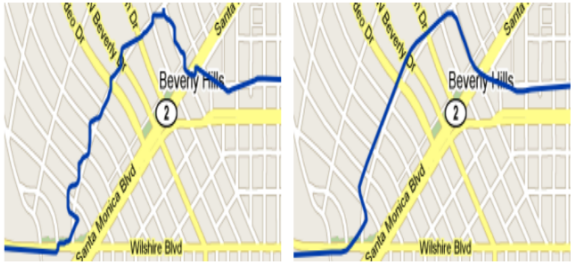
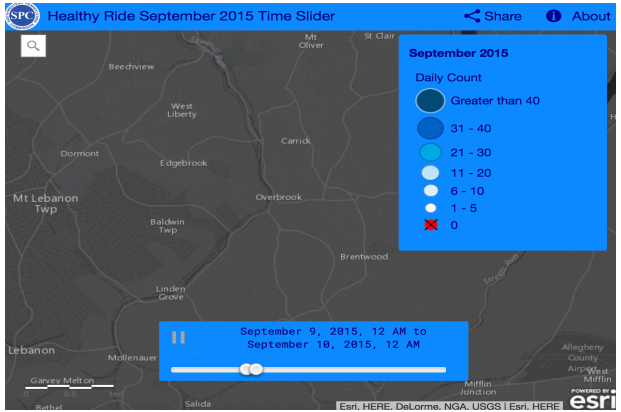
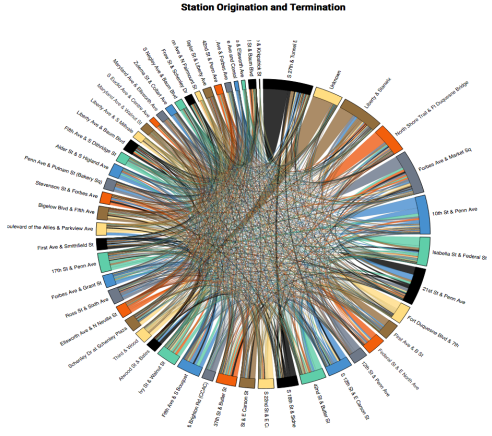


Figure 1. Simplification and smoothing of route information.

Biketastic: Sensing and Mapping for Better Biking

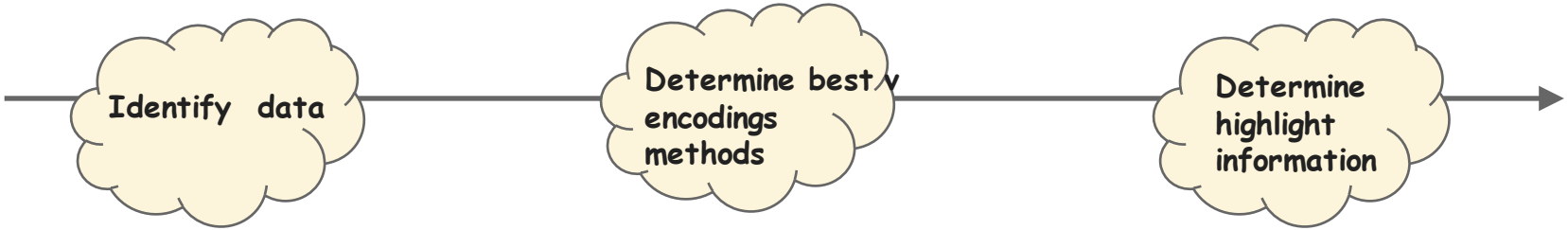


Healthy Ride Pittsburgh Bike Share Maps



A Study of HealthyRide Pittsburgh Data

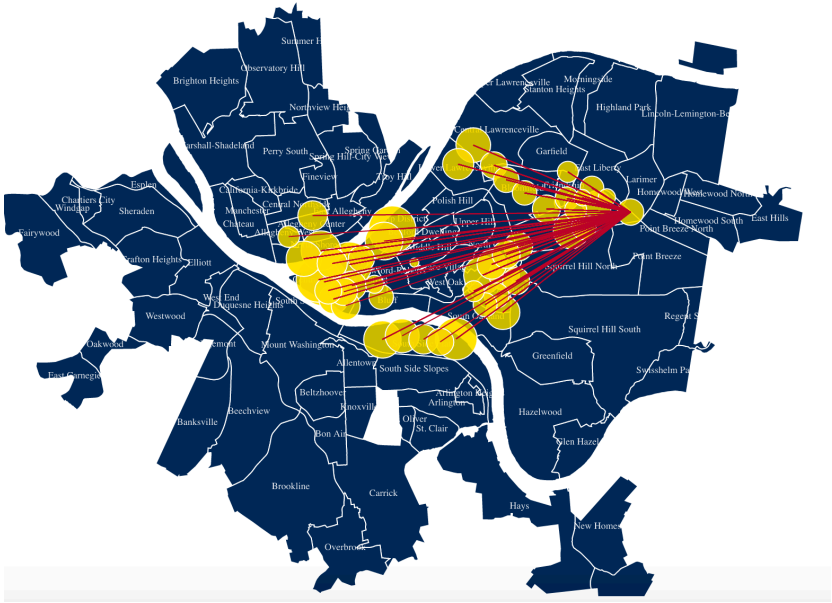
Visualization Design --Design Process



- Data types
- Data description

- Station overview --Interactive Map
- Bike balance in 50 station -- Small multiple line charts
- Trips frequency during one week -- Circular heat chart
- Trip duration percentage – Interactive pie charts

Station Overview—Encoding Method



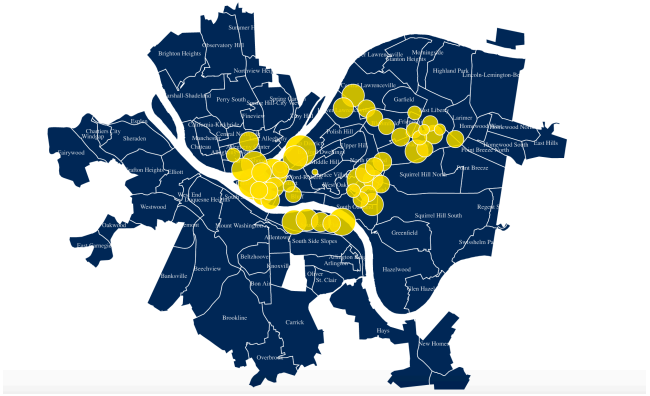
Interactive Map

Station connections → Lines

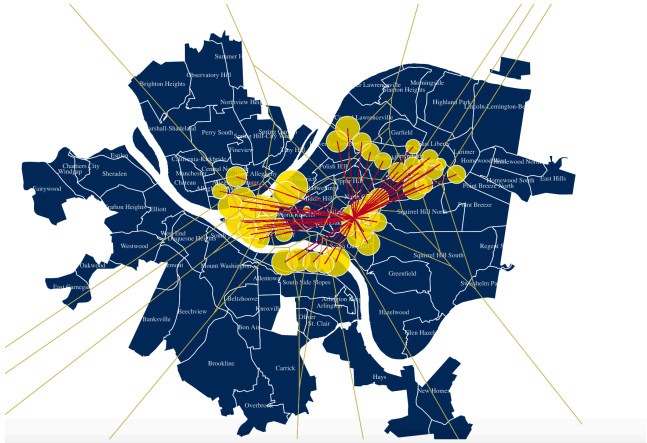
Station locations → Bubbles

Station trip activity → Bubble Size

Station Overview—Information Highlight



Map station locations and station connections on Pittsburgh neighborhood map. Mouseover interaction reduce the map information clutter



Voronoi diagrams to find the largest empty circle, locating best promising station location

Station Balance Viz—Encoding Method

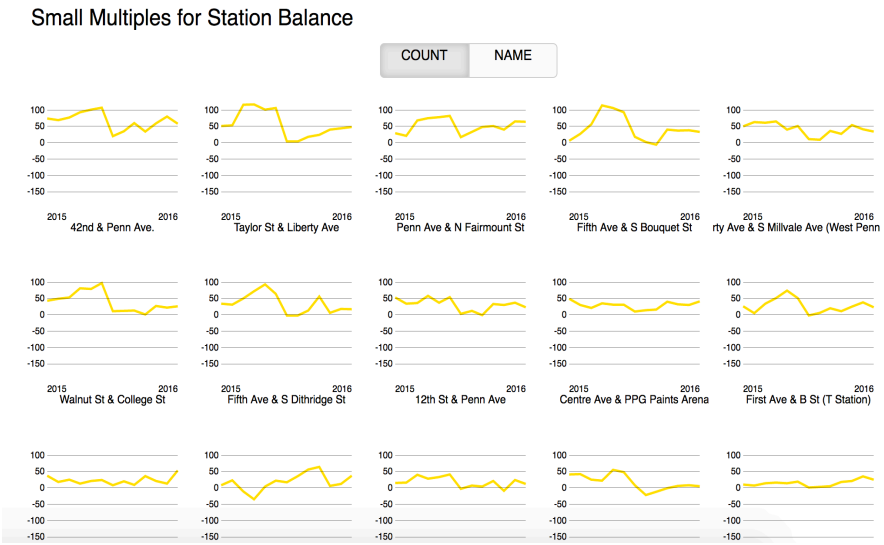
Sortable Small multiples -Slice up the data and use a separate plot to visualize each slice. The end result is a grid of charts that all follow the same visual format, but show different pieces of the data

X - axis->Time series

Y - axis ->Bike balance

Station trip balance amount by months-> sliced line chart

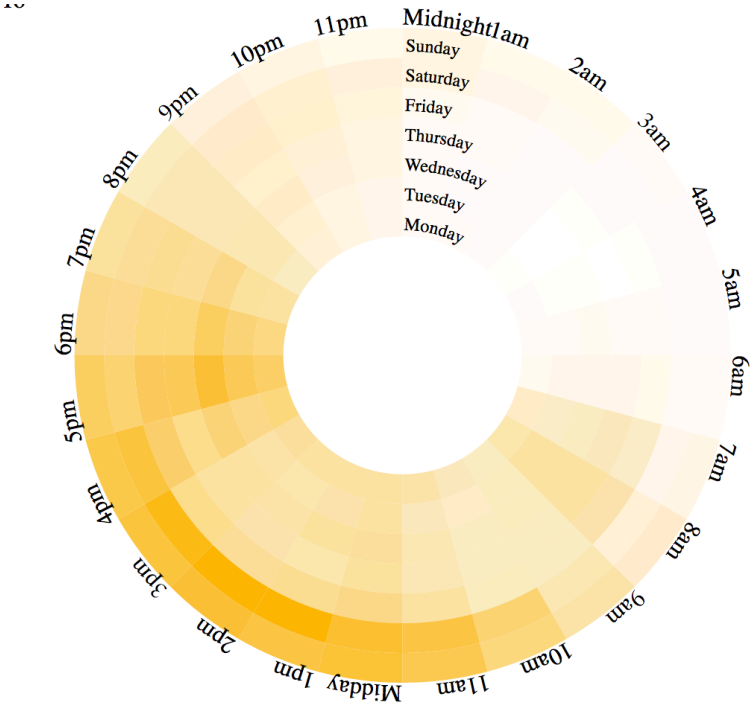
Station Balance Viz— Information Highlight



Find out the bike in and out difference at each station. Users can see stations that more tend to start the trip, and make proper adjustment to improve the bike amount distribution

The sortable interaction enables review information by amount and station name

Trip Period Frequency Viz—Encoding Method

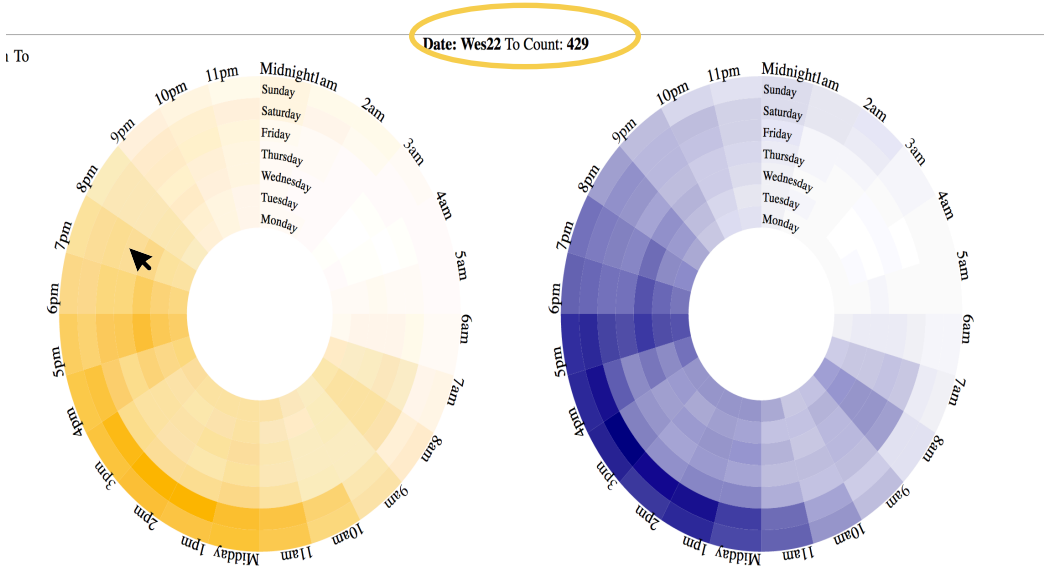


Circular Heat Chart- Novel visualization design to display quantitative data as an array of circular segments, coloured according to value.

Circles-> Day and hour time dimensions

Hue-> Trip frequency amount

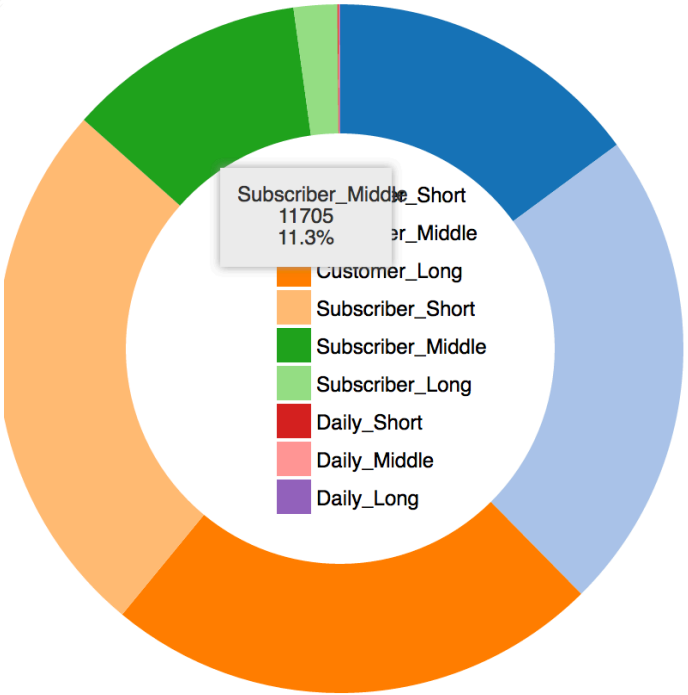
Trip Period Frequency Viz—Information Highlight



The darker the color is, the higher frequency of the trip in this time period is.

Mouse over the single cell can show the specific date time and trip number

Trip duration Viz--Encoding method

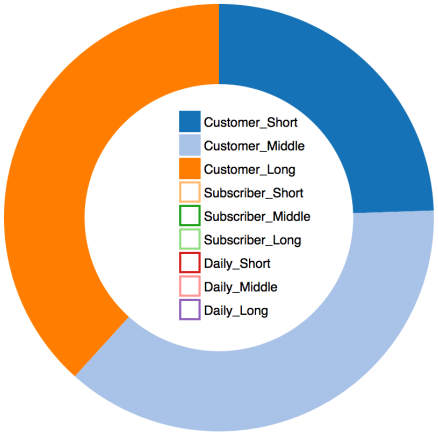


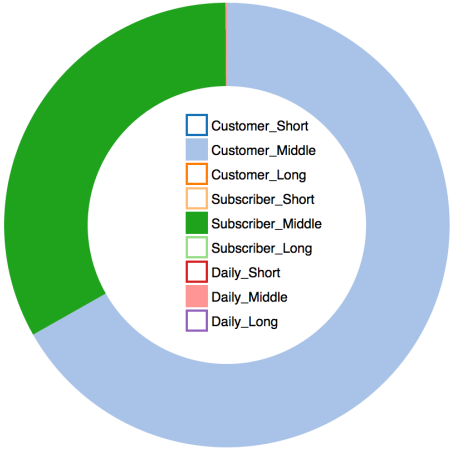
Interactive Pie Chart

Hue->Customer types

Mouse over-> Detail trip duration information

Trip duration Viz—Information Highlight





User can interact with check box to compare/see the trip duration time by customer types or duration length

Viewers can see average trip duration and the trip duration preference between different user types

Evaluation –User Study

	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
1.You can easily understand and use the visualization platform functions					
2.This platform provides information that can help you play your bike trip					
3.You can effectively interact with the platform with interactive functions					
4.You can easily see which month has the largest return and borrow imbalance at each station					
5.You can easily see which type of customer tend to use bike longer					
6.You can easily see the connection and trip frequency of stations from map overview page					
7.You can clearly see the busiest trip hour from trip time schedule page					

System level evaluation

Perceptual evaluation

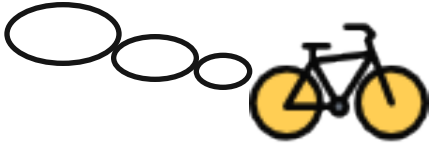
Evaluation--Limitations

- Since some bikes are returned at no-recorded stations or stolen, the data set has slightly difference with reality

- The map overview page can not be zoomed in and out and the detail information snippet of each station

- More in depth information can be diged out from time dimension

Evaluation--Future Improvement

- Page design can be more related to topic
- More interactive functions for users to dig out more information
- Tracking updated data for more accurate trend and pattern visualization

Thanks!