PGH BIKE

A look back on Pittsburgh's first-ever bicycle share program so far

YuMeng Lu(yul139) FengTao Wu(Few14)LingHui Liu(lil103) S.S.K Anand Varanasi(svk9)

BACKGROUND OF PITT BSS

BICYCLE-SHARING SYSTEM

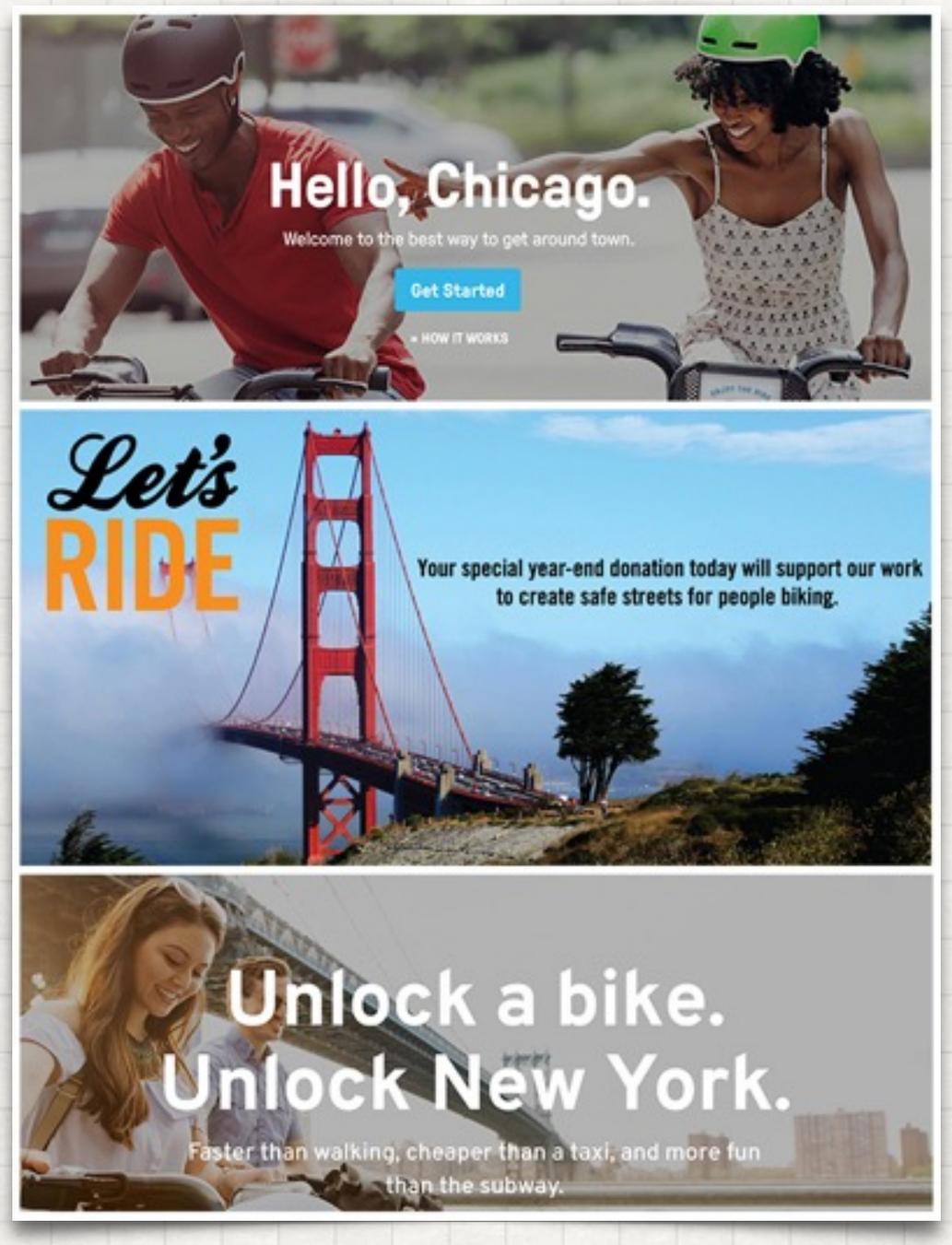
- Huge success in cities like New York, Chicago, San Jose,Washington DC, Paris, and London.

- The mission of Pittsburgh Bike Share is to expand access to public transit through easy-to-use, affordable active transportation opportunities.

DO WE ENJOY THIS INNOVATION

FOLLOWERS WHO CARE ABOUT THE SYSTEM

- Chicago already stabilized ***580+*** Stations with ***5,800*** bikes.
- San Francisco's BSS have processed ***700*** stations and ***7,000*** bikes.
- ***600*** stations with ***10,000*** bikes have been established in New York.



WHAT WE GOT

HOW MUCH WE GOT FROM THE PROGRAM

- The system have been running for ***3 Quarters.***
- PGH program already earned ***$236,557.***

1.2 Mb files

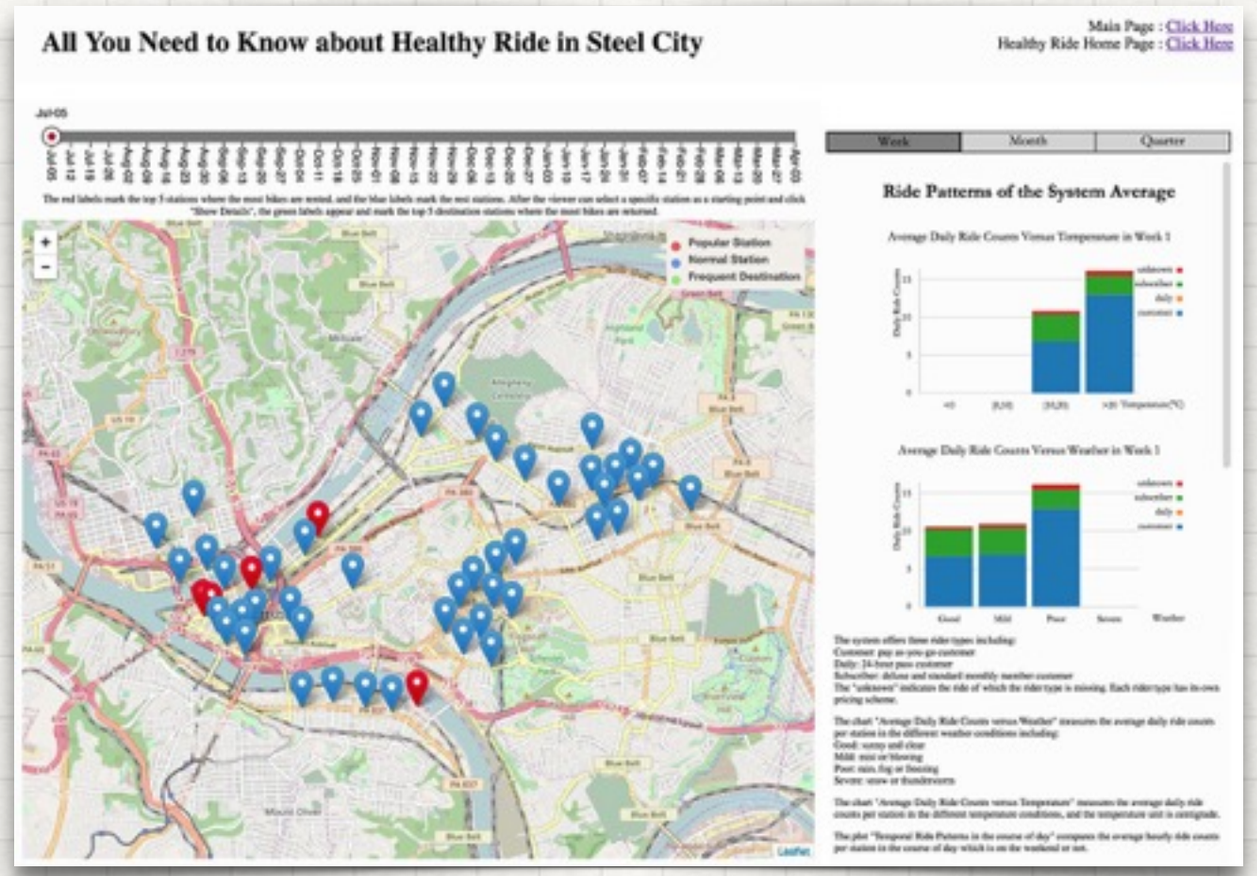
60 thousands x 10 datasets

Too obscure for everyone

$ 236,557

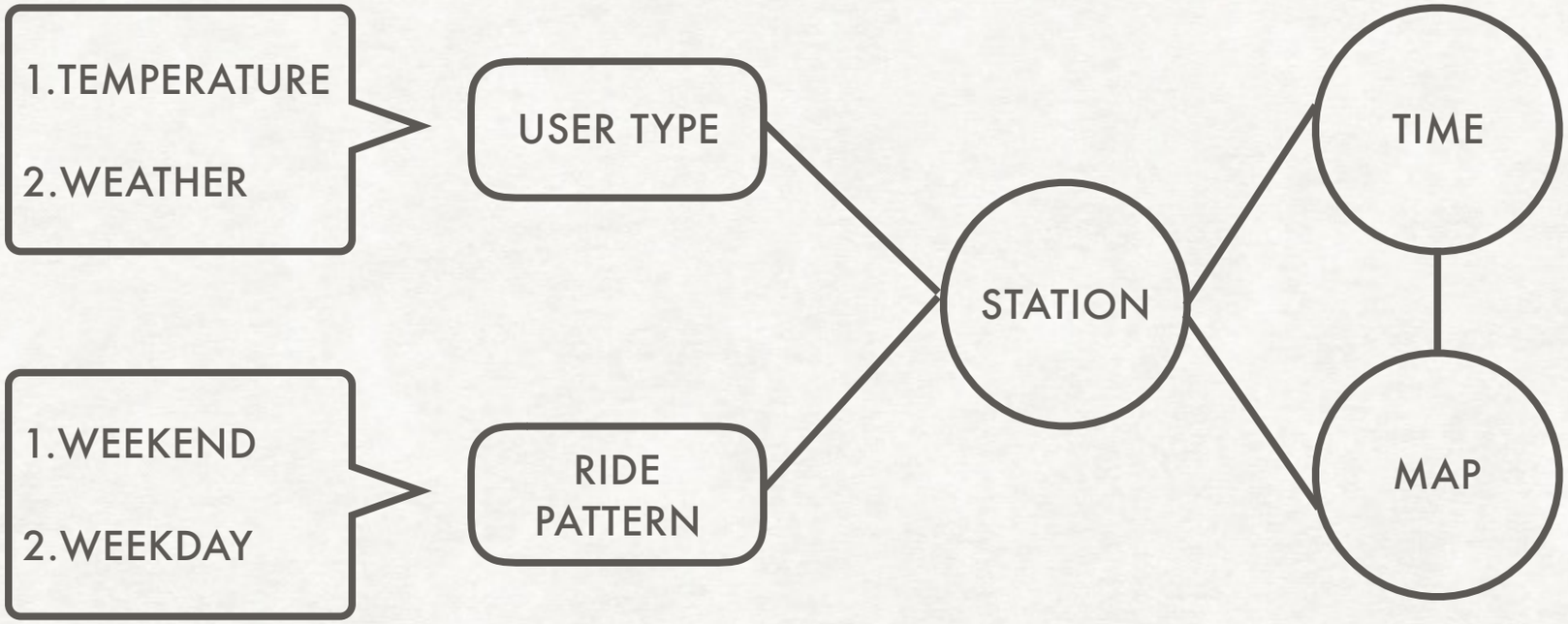
WE WANT TO SHOW THE PGH IN MORE INTELLIGENT WAY

- What is the layout of the PGH.
- What are these ***most popular stations*** so far.
- what are differences about usage in ***Pitts' seasons***.
- The perspective of people using PGH towards ***weekend's entertainment*** or ***daily commuting***.
- The "***brother love***" between stations.



OVERVIEW OF OUR SYSTEM

&VISUAL ENCODING



Geo Map

Variable	Type	Encoding
Bike Station	Geo Location	Lat & Lon
Rack Quantity	Quantitative	Text
Station Type	Categorical	Color Hue
Station Rank	Quantitative	Color Hue
Week	Date	Slider Input

Bar Chart (Average Daily Ride Counts Versus Temperature In Each Week/ Month/ Quarter)

Variable	Type	Encoding
Temperature	Quantitative	X
Daily Rides Count (Avg)	Quantitative	Y
Rider Type	Categorical	Color Hue

Bar Chart (Average Daily Ride Counts Versus Weather In Each Week/ Month/ Quarter)

Variable	Type	Encoding
Weather	Quantitative	X
Daily Rides Count (Avg)	Quantitative	Y
Rider Type	Categorical	Color Hue

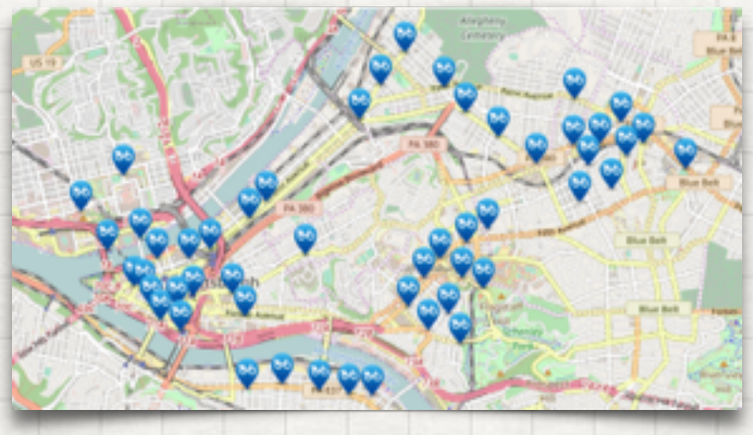
Line Chart (Temporal Ride Patterns in the Course of Day During Each Week/ Month/ Quarter)

Variable	Type	Encoding
Hour	Quantitative	X
Ride Counts / Hour	Quantitative	Y
Day Type	Categorical	Color Hue

THE DATA

DATA CLEANING&MERGING

- DATA SOURCE
  - The ***bike ride data*** in the 3rd and 4th quarter in 2015 and the 1st quarter in 2016 from PGH
  - The ***geographical data*** of the stations
  - The ***weather data*** in the 3rd and 4th quarter in 2015 and the 1st quarter in 2016
  - The ***calendar data*** in the 3rd and 4th quarter in 2015 and the 1st quarter in 2016



THE DATA

DATA AGGREGATION

- System average level
  - Week
  - Month
  - Quarter
- Specific station level
  - Weekday&Weekend
  - Temperature
  - weather

A	B	C
Quarter	StationId	Bike_out
3	1045	2194
3	1001	2192
3	1000	1961
3	1010	1846
3	1017	1735

A	B	C
Month	StationId	Bike_out
7	1001	893
7	1000	765
7	1045	759
7	1010	672
7	1017	655

A	B	C
StationId	Week	Bike_out
1045	1	175
1000	1	161
1001	1	133
1017	1	102
1010	1	93

A	B	C	D	E
Week	StationId	Hour	Weekday_bike_out	Weekend_bike_out
1	1000	0	2	0
1	1000	1	0	0
1	1000	2	0	0
1	1000	3	0	0
1	1000	4	0	0
1	1000	5	0	0
1	1000	6	0	1

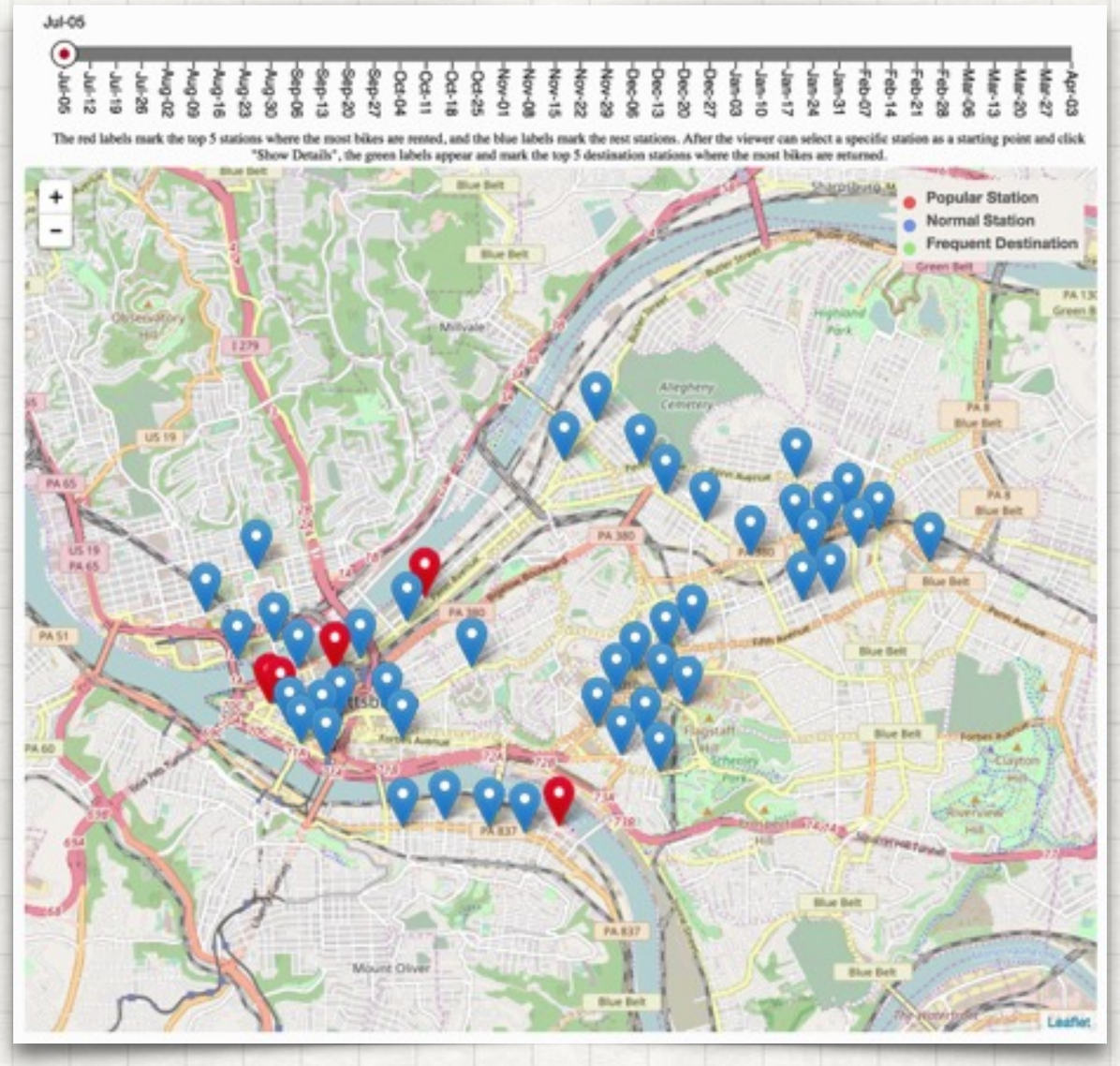
A	B	C	D	E	F	G	H
Week	StationId	Temperature.rank	Bike_out	Customer	Daily	Subscriber	Unknown
1	1000	0	0	0	0	0	0
1	1000	1	0	0	0	0	0
1	1000	2	29	20.6666667	0	8.33333333	0
1	1000	3	74	64	0	10	0
1	1001	0	0	0	0	0	0
1	1001	1	0	0	0	0	0
1	1001	2	26.6666667	18.3333333	0	8	0.33333333
1	1001	3	52	45	0	7	0

A	B	C	D	E	F	G	H
Week	StationId	Weather.rank	Bike_out	Customer	Daily	Subscriber	Unknown
1	1000	0	17	13	0	4	0
1	1000	1	35	24.5	0	10.5	0
1	1000	2	74	64	0	10	0
1	1000	3	0	0	0	0	0
1	1001	0	32	21	0	10	1
1	1001	1	24	17	0	7	0
1	1001	2	52	45	0	7	0
1	1001	3	0	0	0	0	0

MAIN MAP

INTERACTIVE STATION MAP WITH TIME SLIDER

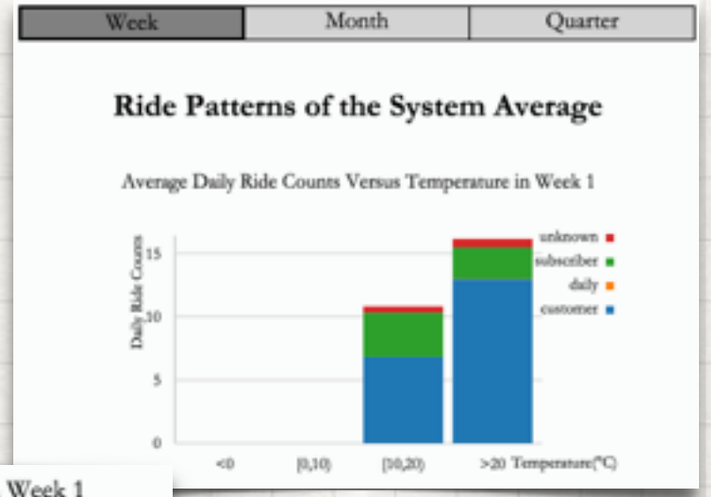
- Three quarters are divided into 40 weeks.
- Time Slider controls the time based on week.
- Defaulting highlighting five popular stations in current week/month/quarter.

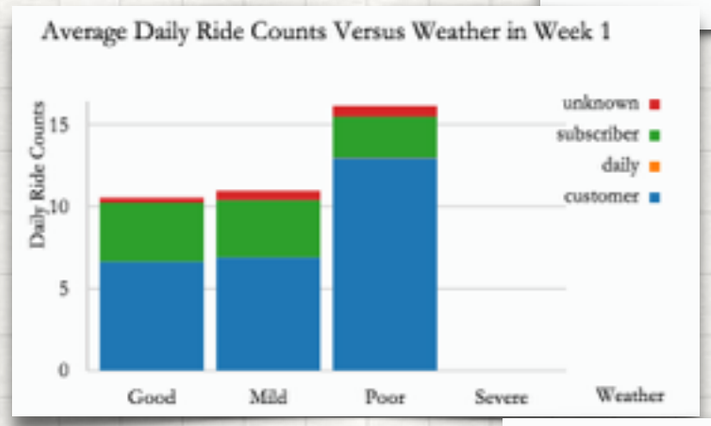


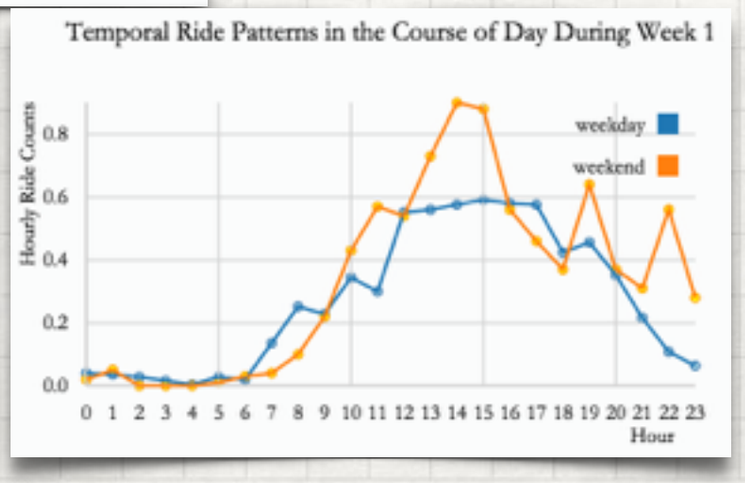
RIDE PATTERNS OF THE SYSTEM

BASED ON WEEK/MONTH/QUARTER

- Based on chosen time measurement
  - Average daily ride counts versus temperature.
  - Average daily ride counts versus weather.
  - Temporal ride patterns in the course of Day



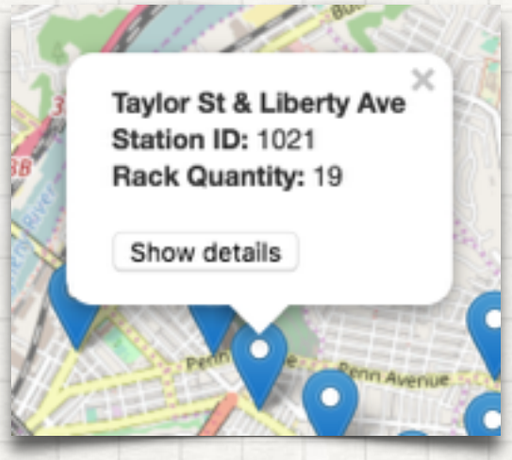


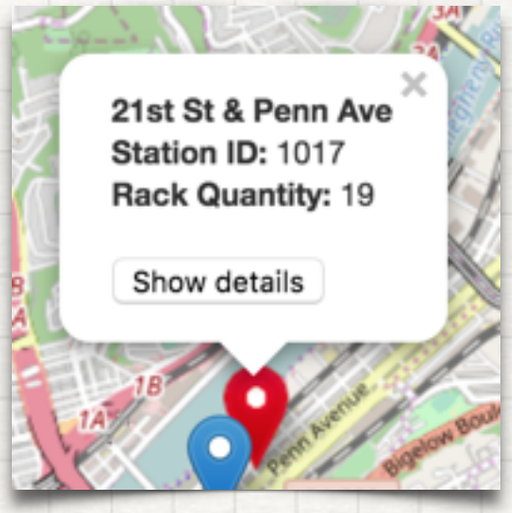


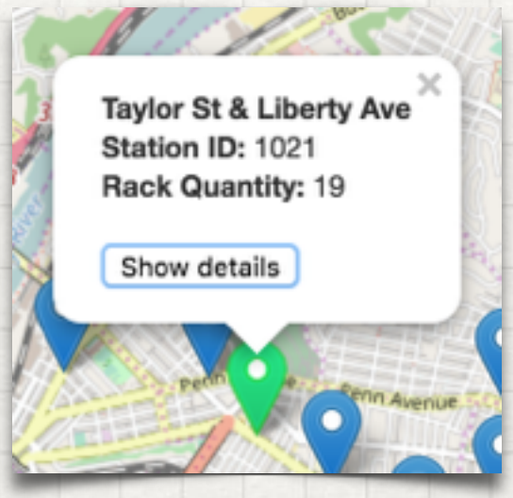
MAP-DETAILS

FOR EVERY STATION

- Popup function
  - Address
  - Station ID
  - Rack Quantity



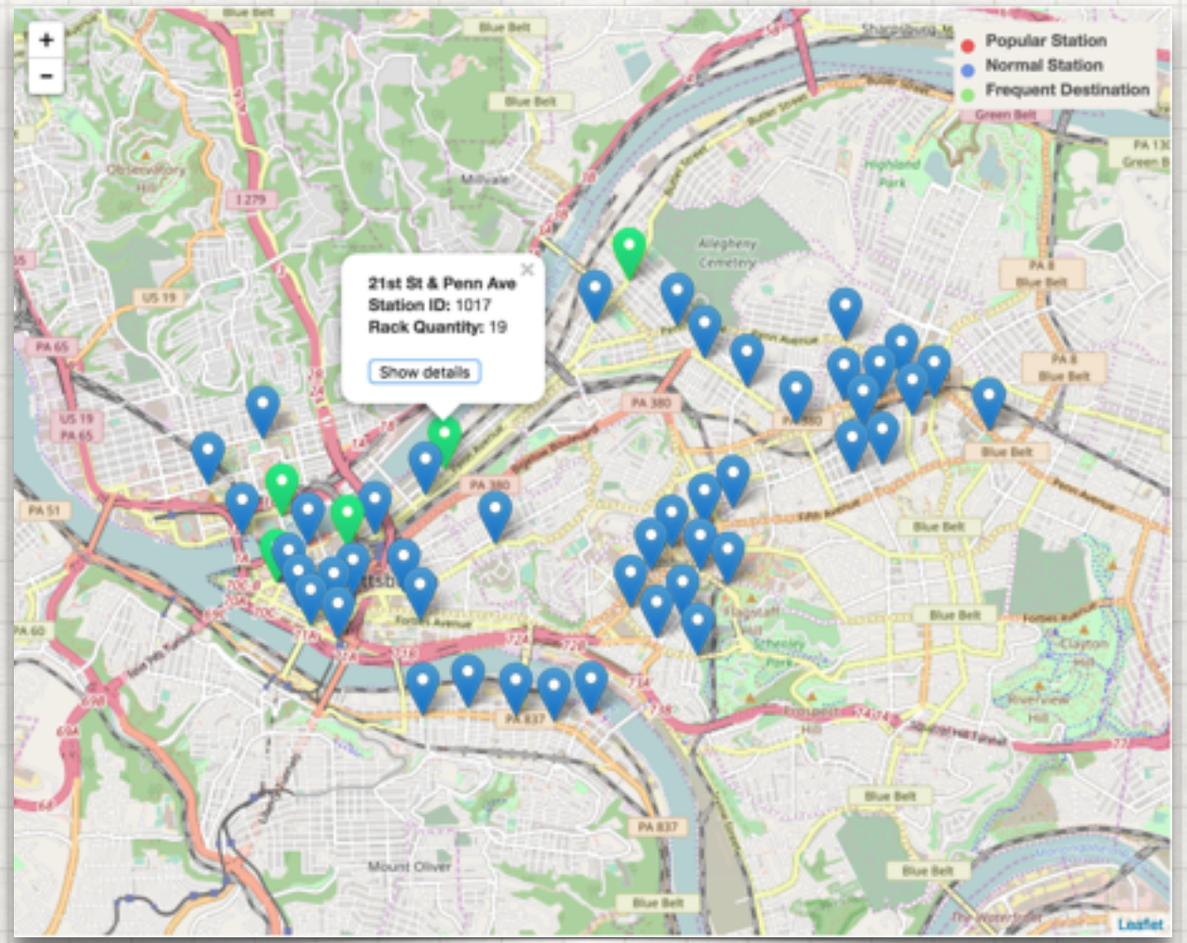




MAP-DETAILS

FOR SPECIFIC STATION

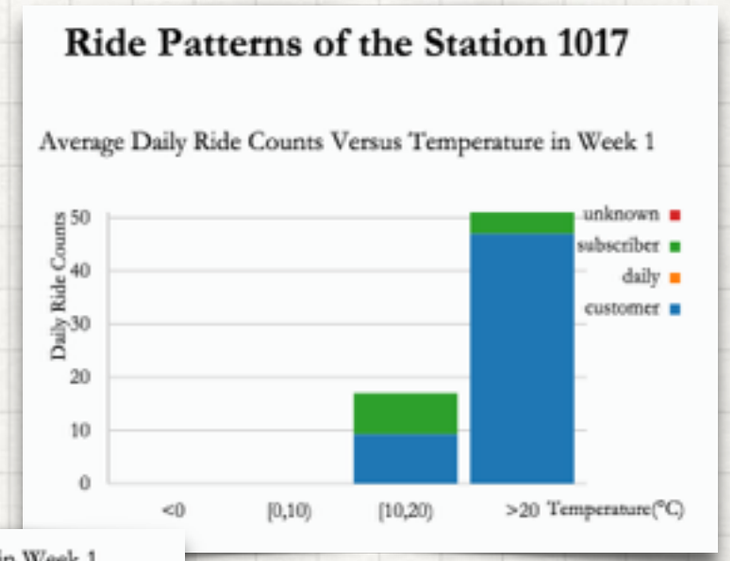
- Highlight five destination stations(light green)
- Most closely association
- In current week

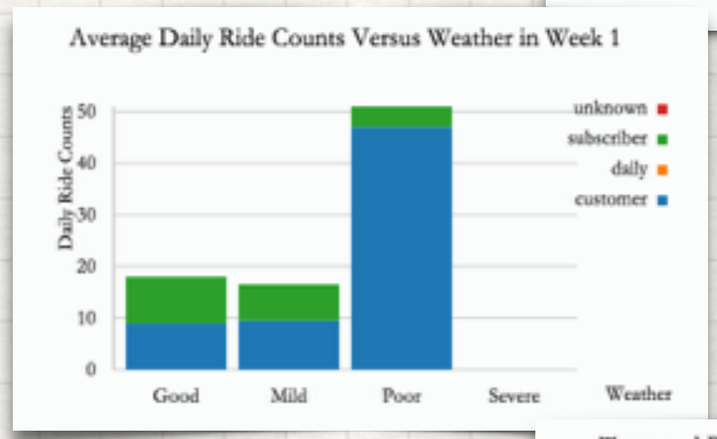


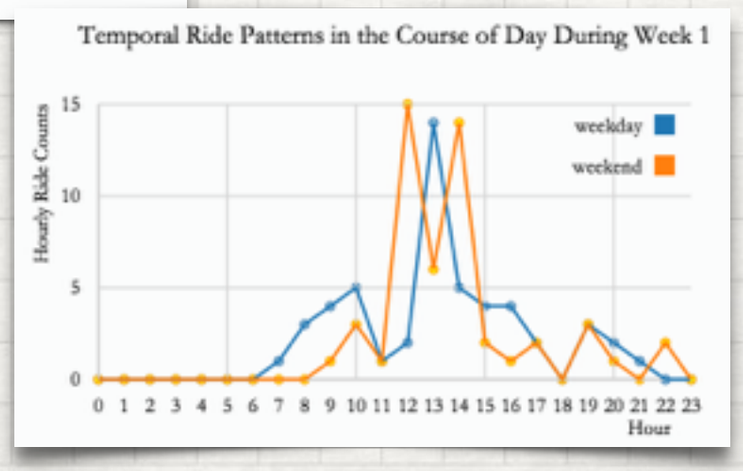
RIDE PATTERNS OF THE STATION

FOR SPECIFIC STATION

- Showing ride patterns of chosen station in current week.
  - Average daily ride counts versus temperature.
  - Average daily ride counts versus weather.
  - Temporal ride patterns in the course of Day







EVALUATION

10 CANDIDATES + 8 EVALUATION QUESTIONS

Gender	Does the system contain the info you want?	Does the system inspire you thinking?	Do you think it's efficient for you to learn from our system?	Is it easy for you to learn from our system?	Do you think it is helpful?	Which part do you think attracts you most?	Which part do you think attracts your least?	Self-Evaluation
F	5	5	5	5	5	Hint after choose specific station is not enough	Map and chart could connect	5
M	4	5	5	5	5		Annotation is not clear enough should have 'note' symbol	5
M	4	3	5	4	5	Webpage and layout has little problem	Combination is good	4
F	3	5	4	4	4	The key idea is not clear enough	Detail for station is good	4
M	4	4	3	4	4	Time-slider and map combination	Annotation	4
M	4	4	5	5	5	The graphics	The comparison of temperature to number of rides	5
M	5	4	5	5	5	Popular locations and popular destinations	Popular locations and popular destinations	5
M	5	4	5	5	4	Layout design graph show		5
M	4	5	4	4	5	Time slider	Complexity of maps	5
M	5	4	4	4	5	Frequent destination		4

RESULTS OF EVALUATION

Question	Criteria	Score
Does the system contain the info you want?	Efficiency	4.3
Does the system contain the info you want?	Efficiency	4.3
Is it easy for you to learn from our system?	Usefulness	4.5
Do you think it is helpful?	Usefulness	4.5
Self-Evaluation	Usefulness	4.7
Does the system contain the info you want?	Usefulness	4.6

TAKE IT AWAY

ADVANTAGE

1. The whole system fits in time perfectly from ***Q3,2015 to Q1,2016***.

2. The whole visualization is designed in a ***feasible framework.***

3. The whole system offers ***user-friendly interactivity.***

4. Use appropriate way to express different data.

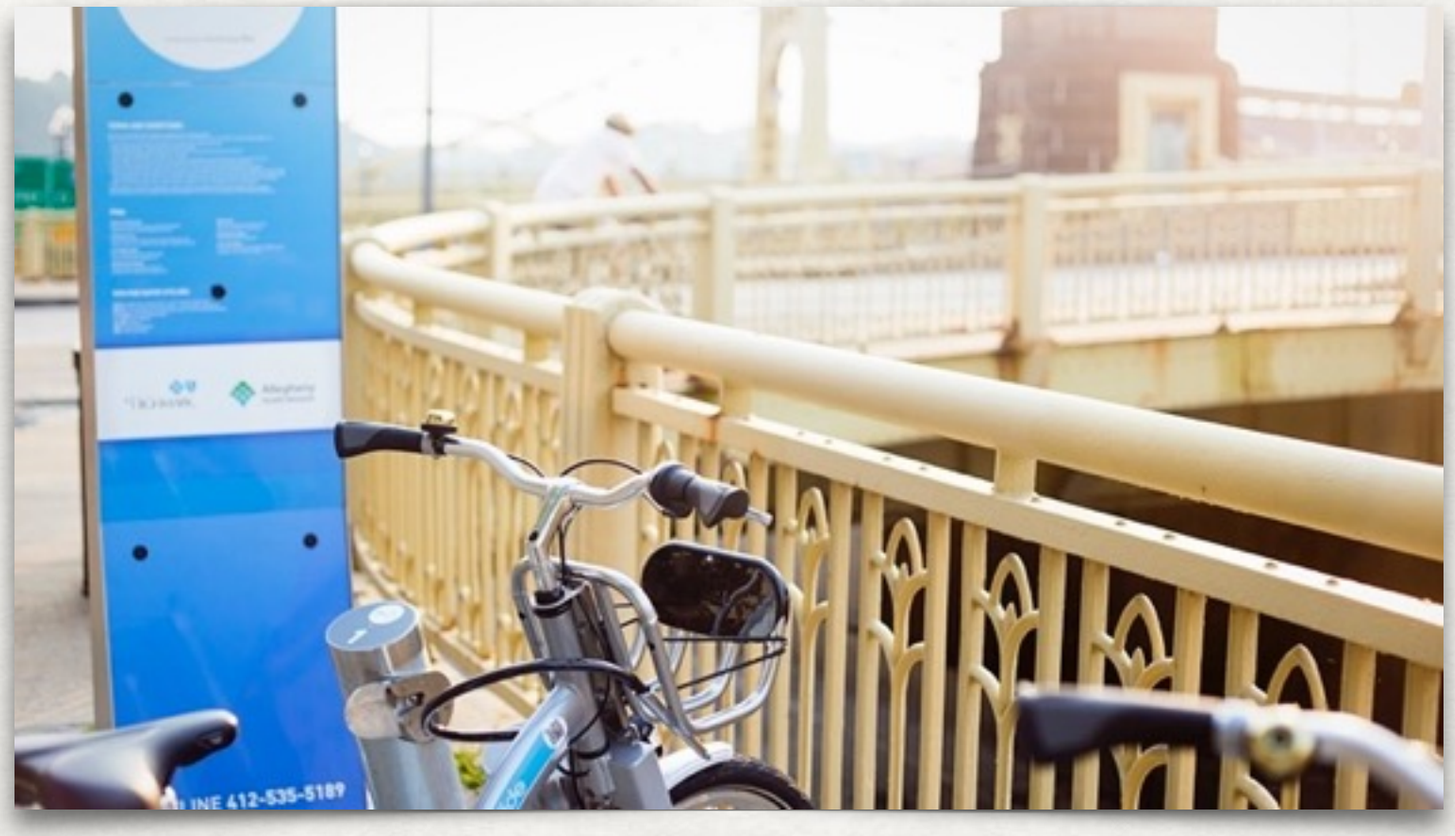
5. Successfully combine the ***Map Tool***, ***Time Controller*** and ***Data Analysis***.

TAKE IT AWAY

Our system will help the program operator discover…

1.Subscribers prefer to ride in business day for commuting form work to home.

2.Customers tend to take ride much more in weekend than week day.



TAKE IT AWAY

Challenge

1.Time Slider will be foreseeable crowded when the length of time becomes longer.

2. Keep the map display the informative area when the viewers use the interactive functions.

TAKE IT AWAY

Improvement

1.Function “Ride Pattern analysis for specific station” is hard to find the close button.

2.The way of demonstrating the data is simple and normal.

3.Scroll bar for data demonstration function is hard to recognize.

THANKS

LET'S RIDE AND ENJOY

REFERENCES

[1] Vogel, P., & Mattfeld, D. C. (2011, September). Strategic and operational planning of bike-sharing systems by data mining–a case study. In International Conference on Computational Logistics (pp. 127-141). Springer Berlin Heidelberg.

[2] Guo, H., Gomez, S. R., Ziemkiewicz, C., & Laidlaw, D. H. (2016). A Case Study Using Visualization Interaction Logs and Insight Metrics to Understand How Analysts Arrive at Insights. IEEE transactions on visualization and computer graphics, 22(1), 51-60.

[3] Vrotsou, K., Janetzko, H., Navarra, C., Fuchs, G., Spretke, D., Mansmann, F., ... & Andrienko, G. (2015). SimpliFly: A Methodology for Simplification and Thematic Enhancement of Trajectories. IEEE transactions on visualization and computer graphics, 21(1), 107-121.

[4] Healthy ride data. https://healthyridepgh.com/data/.Accessed: 2016-11-20.

[5] National climatic data center.https://www.ncdc.noaa.gov/. Accessed: 2016-11-20.