



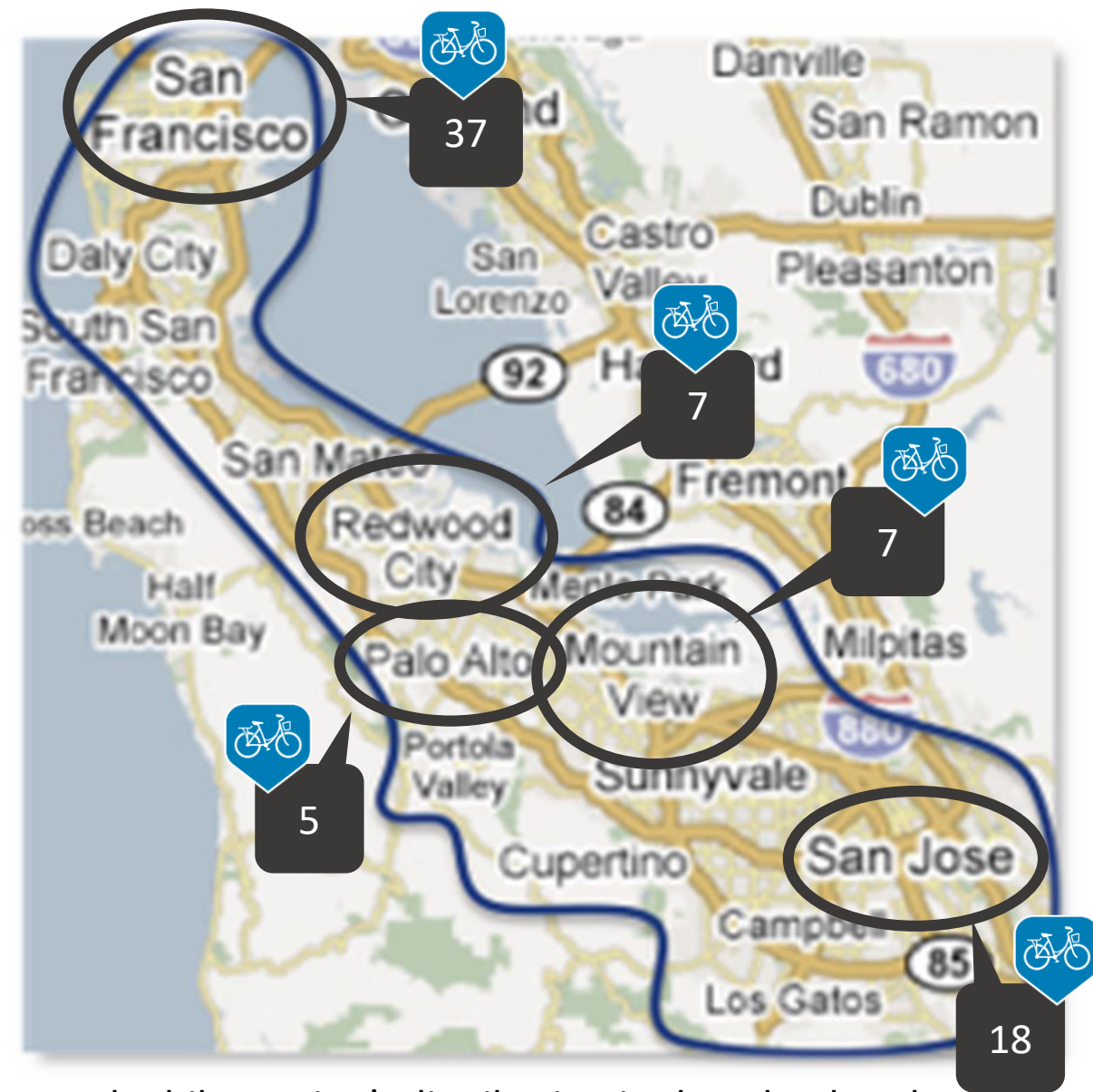
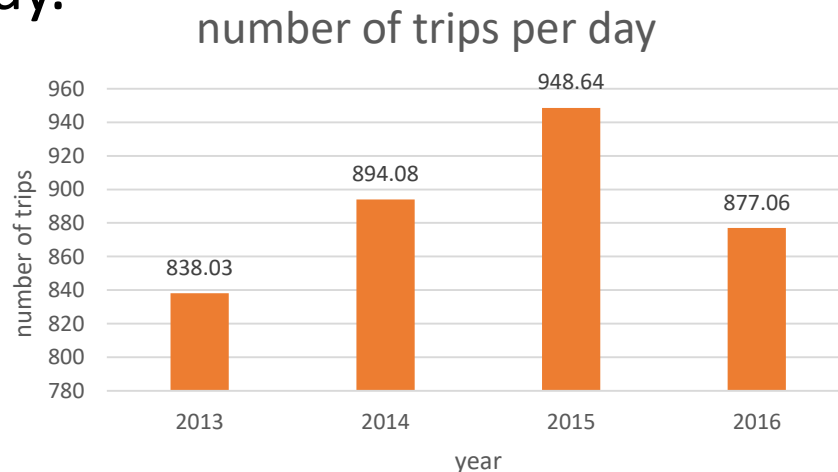
yc3238  
Ya-Hsuan Chuo



- Understanding the route of bikes and examine whether the docks were built enough



- The Bay Area Bike Share is the region's bike sharing system with 74 stations across the region, with locations in San Francisco bay area.
- Source: <https://cloud.google.com/bigquery/public-data/bay-bike-share>
- Datasets are the records of bike trips from 2013-08-30 to 2016-08-30 with 983,648 trips. The average demand is about 898 trip/per day.



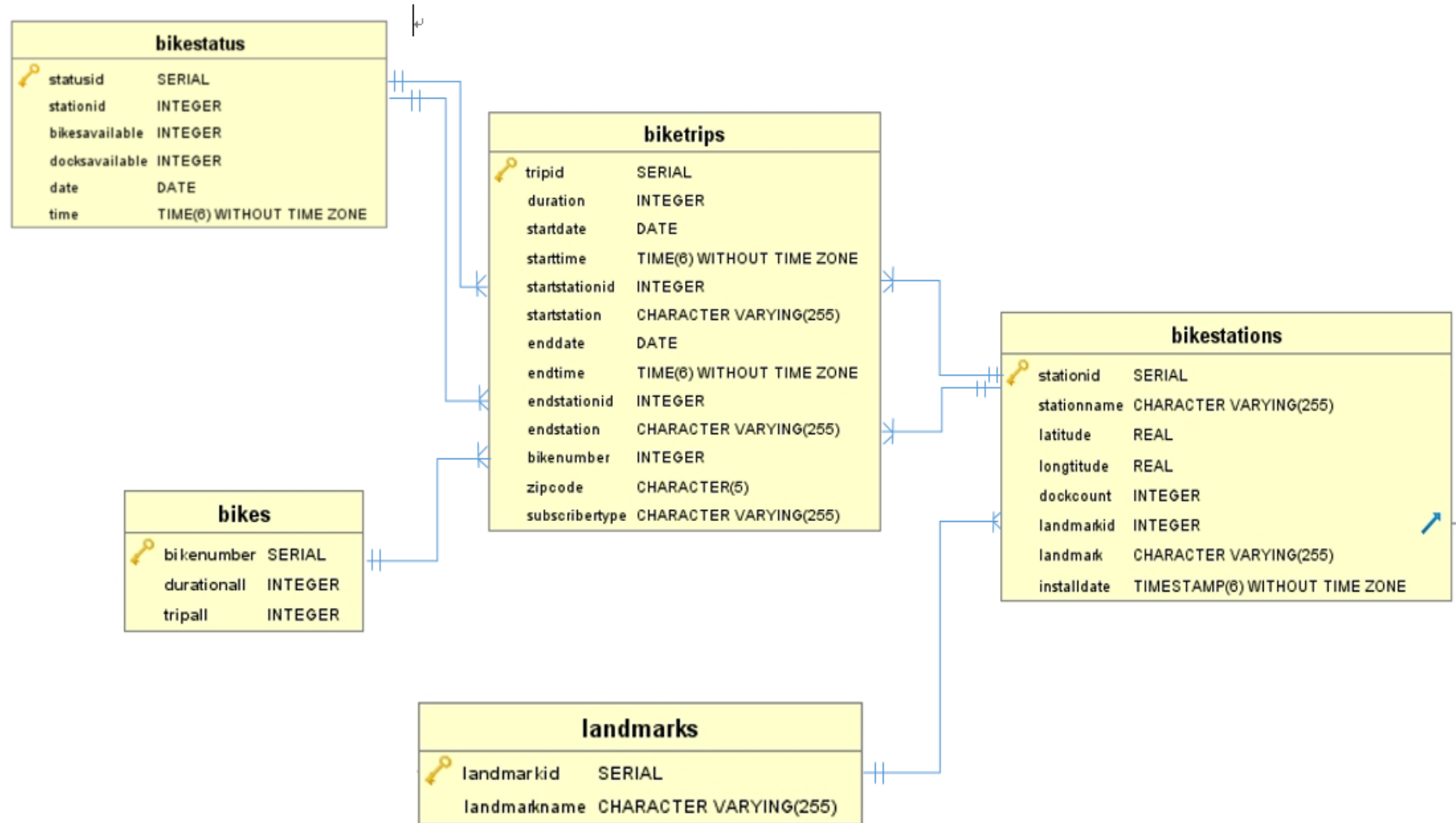
The bike station's distribution in the 5 landmarks

# Normalization

- Bikestatus
- Biketrips
- Bikestations



- Bikestatus
- Bikestations
- Biketrips
- Bikes
- Landmarks





- Government would consider whether the bike share program is efficient in the area
- *Given the existing number of bikes now, are the docks in each station built enough to accommodate?*



**motivate**

- Motivate company handling the establish and planning for the bike share program
- Advertising on those bikes that runs more time on the road rather than stationaries

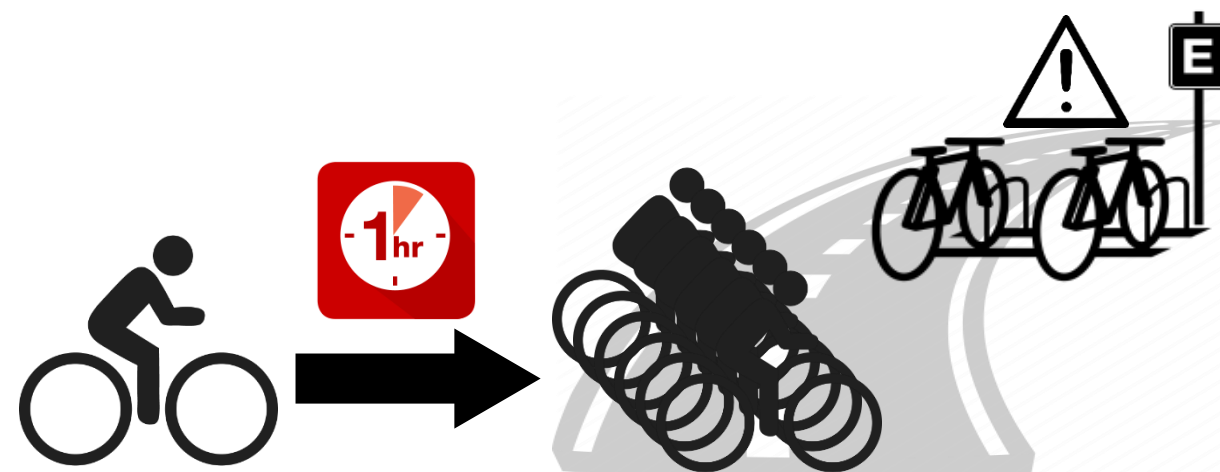
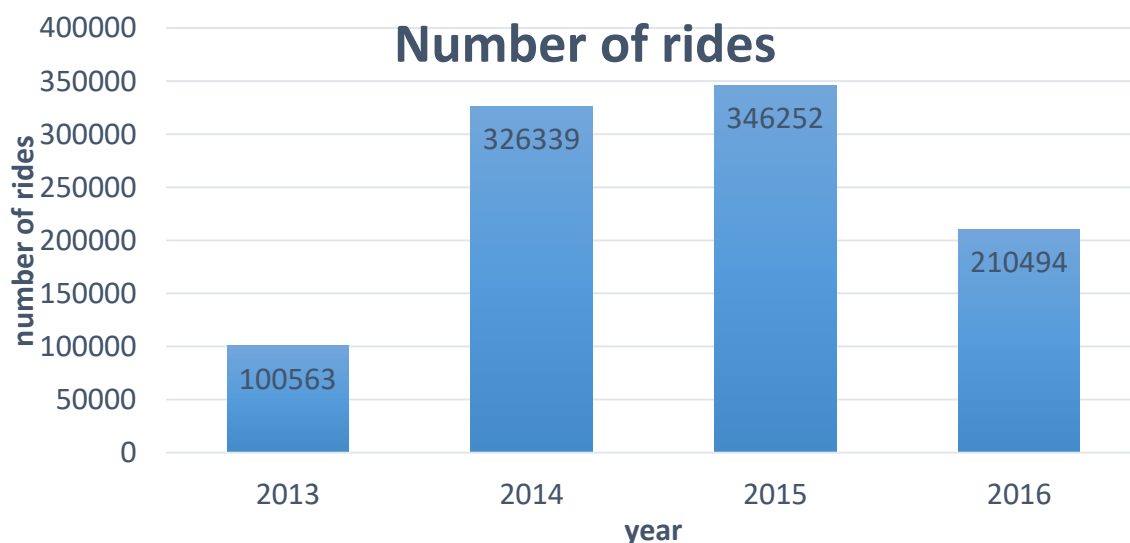


Bike number

#535 #680 #262

- Approximately, how many bikes will return and where will they return to?
- The average demand per min is calculated as :  

$$\frac{\text{number of bike rides}}{365 \text{ (days)} * 24 \text{ (hours)} * 60 \text{ (min)}} \cong 0.6 \frac{\text{bikes}}{\text{per min}}$$
- Assume that there will have 0.6 bikes per min depart from a station
- After one hour, the total departing bike in this hour :  $0.6 * 60 = 36$  bikes



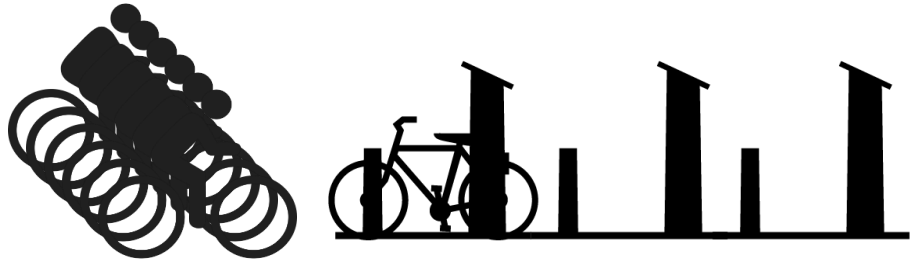
- After 1 hour, some of the 36 bikes that depart from each 74 different stations will return, and some of them will still be on the trip. The number of return bikes was estimated by **survival analysis** and the survival rate is calculated based on each station.
- The end station is chosen by the most popular/frequent route from each start station
- Compared with the docks in each end station, we can conclude that whether this station is able to accommodate the demand or not



Start station	End station	Landmark name	End Station's Name	Return bikes	Docks	Return - Docks
2	4	San Jose	Santa Clara at Almaden	26.01927	11	-15.0193
3	2	San Jose	San Jose Diridon Caltrain Station	23.28985	27	3.710149
4	2	San Jose	San Jose Diridon Caltrain Station	26.99729	27	0.002712
5	2	San Jose	San Jose Diridon Caltrain Station	26.26763	27	0.732369
6	2	San Jose	San Jose Diridon Caltrain Station	25.60135	27	1.398645
7	2	San Jose	San Jose Diridon Caltrain Station	25.70061	27	1.299393
8	11	San Jose	MLK Library	25.53897	19	-6.53897
---	-----	-----	----	----	----	---

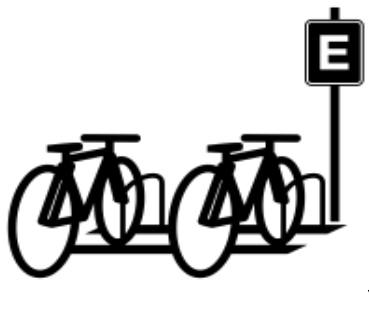


## Sufficient docks & popular end station



San Jose Diridon Caltrain Station  
San Francisco Market at Sansome

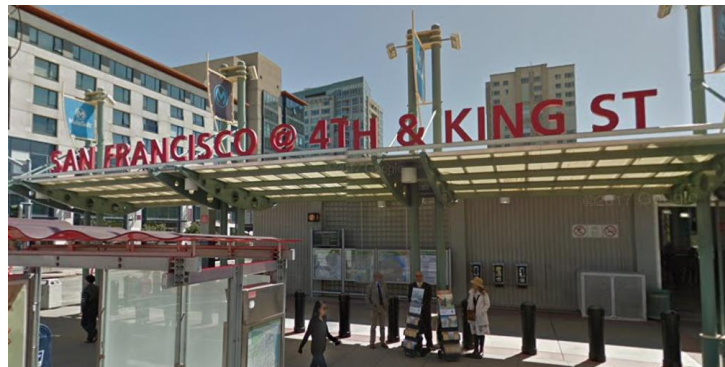
**Station & Markets are popular tourist spots**



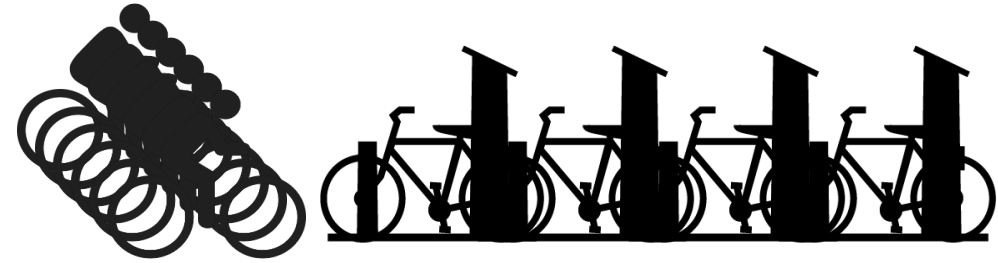
Popular end station

- **Both located in the popular tourist spot/city center**

San Jose Diridon Caltrain Station – 20%  
San Francisco Caltrain (Townsend at 4th) – 15%

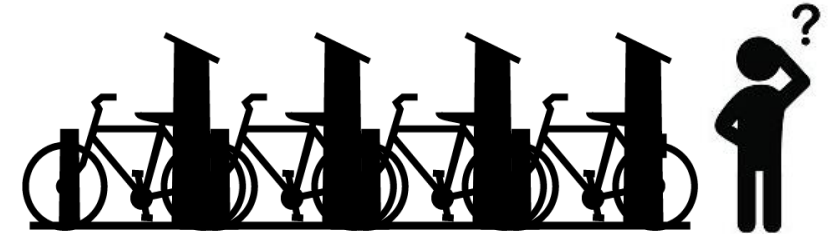


## Insufficient docks & popular end station



San Francisco caltrain (Townsend 4th) (70)  
San Francisco caltrain (300 Townsend) (69)

↳ **Consider build another station around this area?**

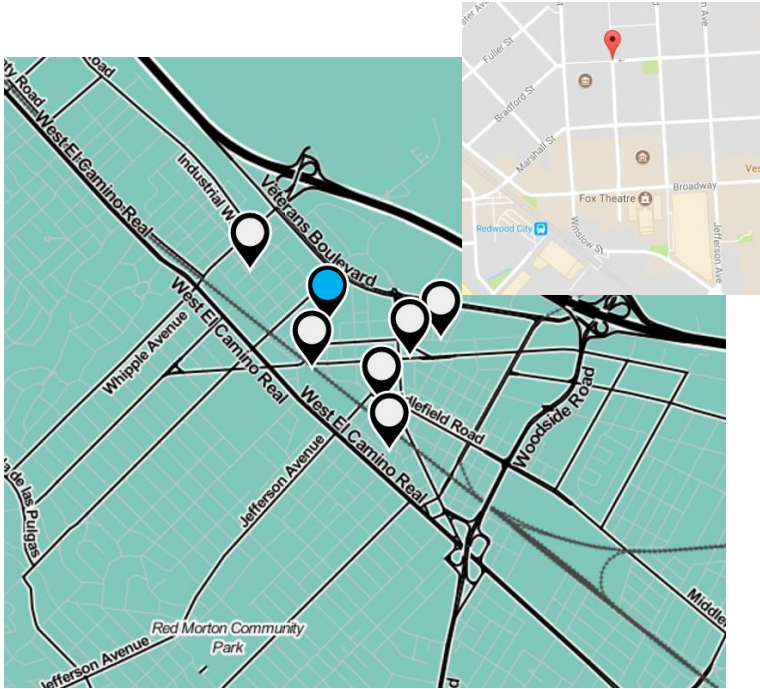


Highly insufficient docks – **be aware of these stations!**

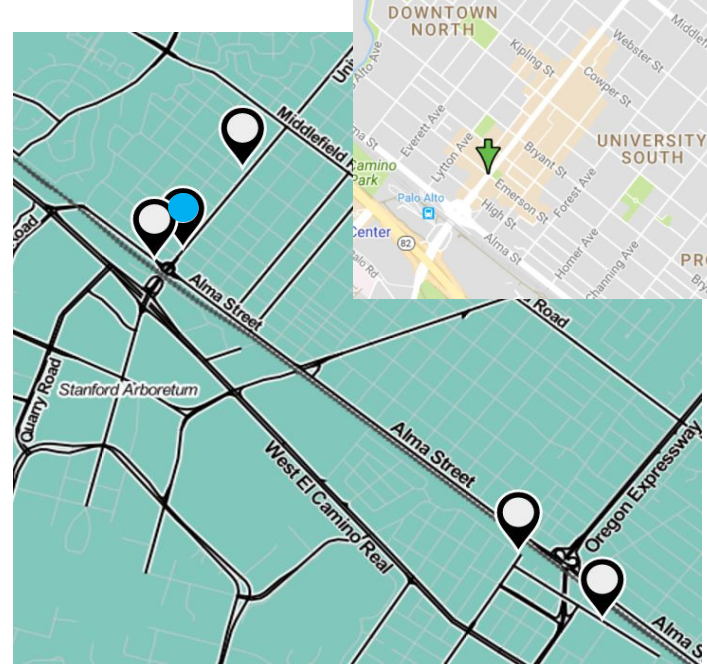


Santa Clara at Almaden  
Cowper at University  
Mountain View City Hall  
2nd at South Park  
San Antonio Shopping Center  
Broadway at Main  
Townsend at 7th

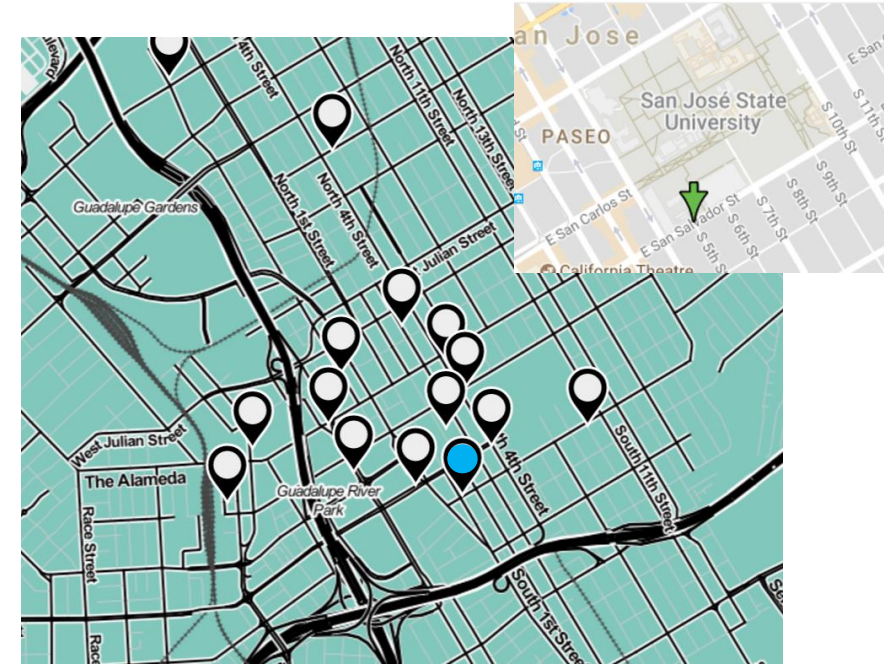
## San Mateo County Center, Redwood City



## University and Emerson, Palo Alto



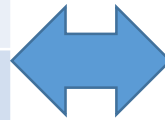
## 5th S. at E. San Salvador St, San Jose



- This is interesting. People **started and ended at the same station** at these three stations most of the time.
- These three places are located near university or county center.
- We can tell from the map that it is because the bike is not used for commuting. They may use for a one-time event, such as buying grocery, or tourists looking around this place.



Start and end at the same station?	
landmarkid	Station name
23	San Mateo County Center
35	University and Emerson
88	5th S. at E. San Salvador St



Highly insufficient stations	
landmarkid	Station name
4	Santa Clara at Almaden
37	Cowper at University
27	Mountain View City Hall
64	2nd at South Park
31	San Antonio Shopping Center
25	Broadway at Main
65	Townsend at 7th

It may be because these stations are close to stations that are highly insufficient.

In the future, we can consider building more bike stations near these areas. People may feel inconvenient because they need to return to their origin station because they didn't find a better place around to return.

# Recommendations & Further analysis

- We should really pay attention to the stations with insufficient docks.
- Also consider to build more station near those station that customers start and end at the same place.

Trips over 24 hours??? Did they really rent the bike over 24 hours?			
	Times	Total	Propotion
stations	66	74	89 %
trips	289	983648	0.3 %

- Some duration of trips are over 24 hours.
- New station installed after 2013 need more data to analyze.



Time series  
analysis

Geographical  
analysis

Need customer's  
data