

Data Visualization and Analysis of SD Parking Transactions

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Methodology / Objectives

Using Python and the PM transactions dataset do the following

1. Visualize the locations of all parking meters on a map
2. Answer the following questions
 - a. Which areas have the most parking meters for 2023 ?
 - b. How does total revenue change per year and per area?
 - c. Which areas experience consistently high or low parking space occupancy ?
 - d. When are the peak hours for parking and how do they vary across different areas?
3. Visualize probability of parking availability at different times of day



Data Overview

- Preprocessing done to merge of two datasets based on pole ID:
 - SD Parking Meter Transactions (2018 - 2023)

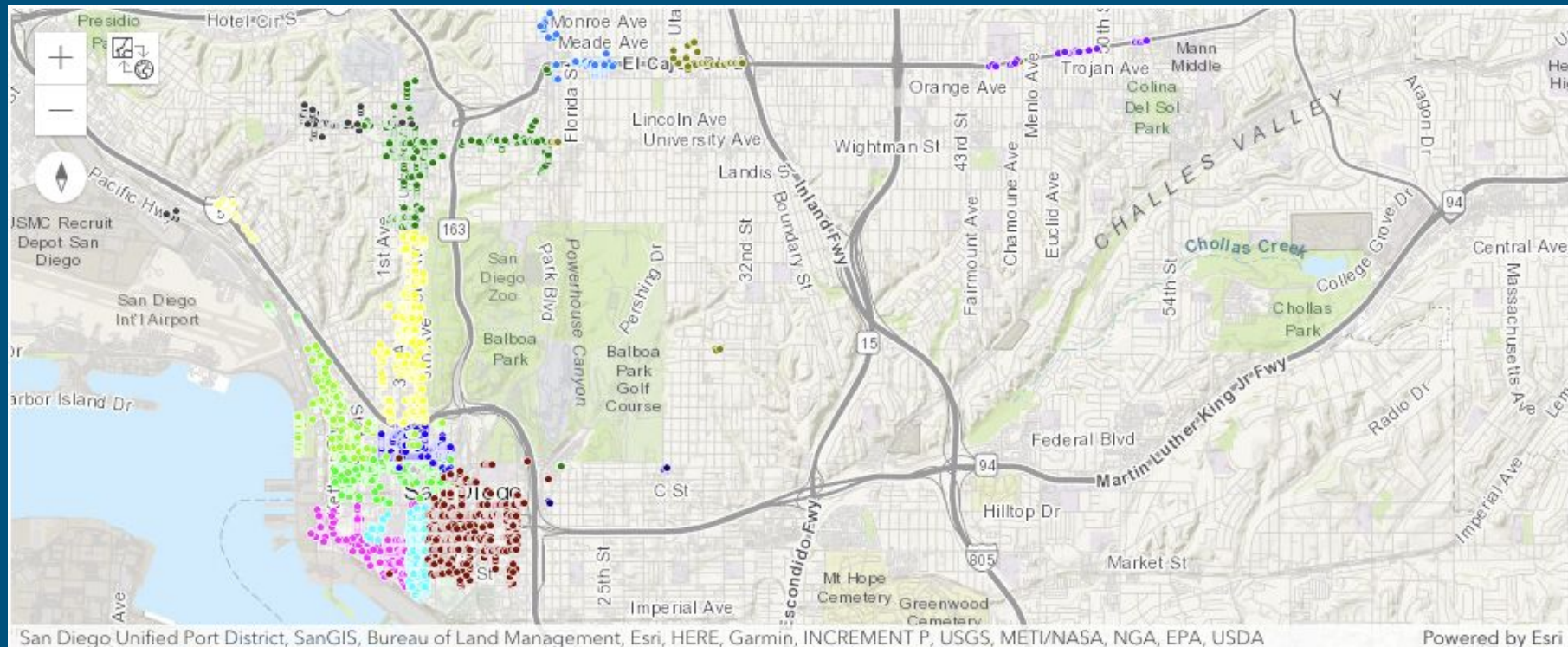
POLE_ID	METER_TYPE	DATE_TRANS_START	DATE_METER_EXPIRE	TRANS_AMT	PAY_METHOD
AL-4012	SS	2023-01-13 15:29:39	2023-01-13 17:29:39	175	CREDIT CARD

- SD Parking Meter Locations

zone	area	sub_area	pole	config_id	config_name	date_inventory	lat	lng	sapid
Downtown	Core	1000 FIRST AVE	1-1004	49382	Sunday Mode	1/4/21	32.715904	-117.16393	SS-000031

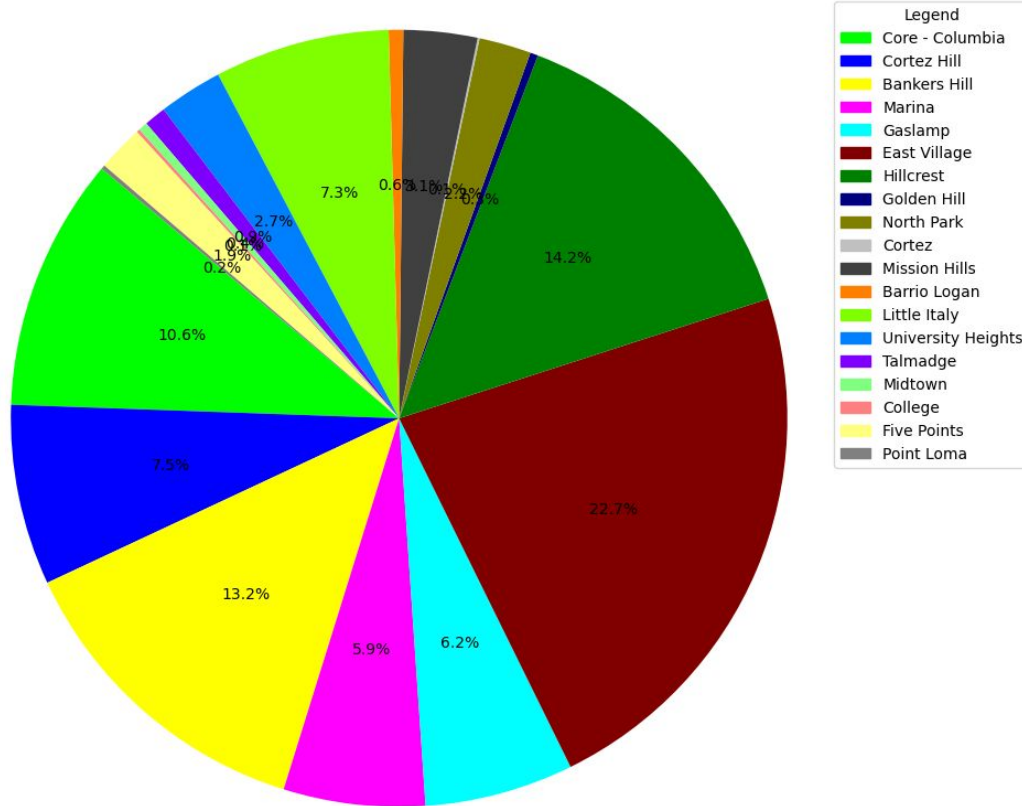
Map Visualization

- Using the ArcGIS Python API we were able to plot all parking meters locations for 2023
- Map is dynamic (zoom, pan, etc) - see map_visualization notebook
- Each color corresponds to a specific area
 - 19 areas



Which areas have the most parking meters for 2023 ?

Distribution of Poles (%) by Area 2023



Top Five Areas

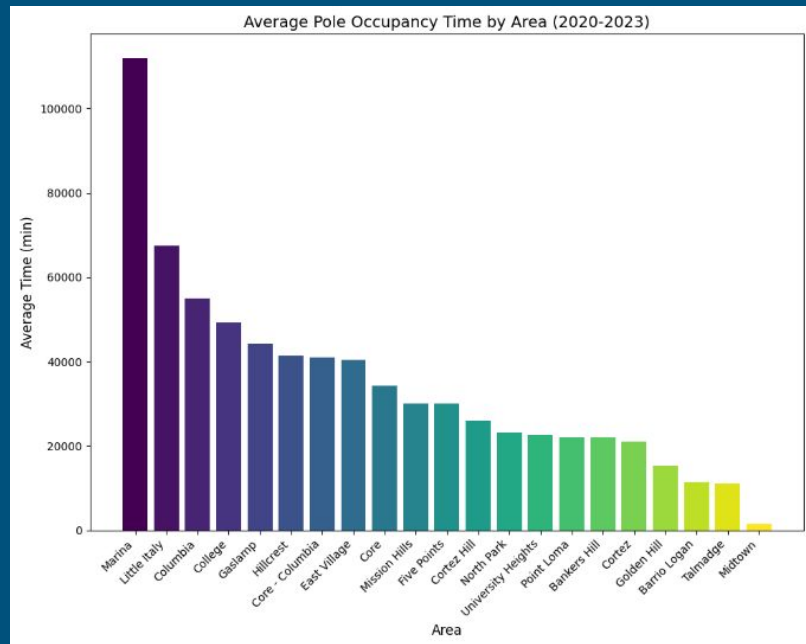
1. East Village (22.7)
2. Hillcrest (14.2)
3. Bankers Hill (13.2)
4. Core-Columbia (10.6)
5. Cortez Hill (7.5)

Which areas experience consistently high or low parking space occupancy ?

- The original overlapped time intervals are combined, covering the earliest start time and the latest end time from the original data.
- The graph ranks the total parking time for each area, averaged by the number of parking spaces.

Data preprocessing

	start time	end time	trans
Original Data	2023/1/17 17:02	2023/1/17 17:57	100
	2023/1/17 17:03	2023/1/17 18:00	10
	2023/1/17 17:15	2023/1/17 18:05	10
Merged Data	2023/1/17 17:02	2023/1/17 18:05	120
	Time Period	trans	
Final Data	63	120	

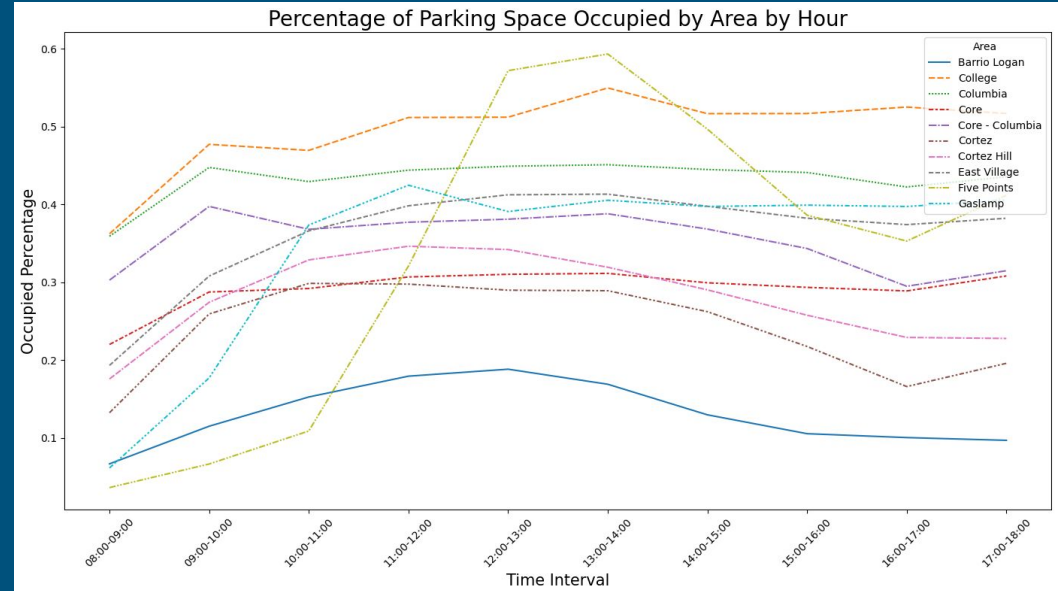


When are the peak hours for parking, how they vary across different areas?

Data preprocessing

start time	end time		occupied time by hourly slot				
2023/1/17 8:00	2023/1/17 9:15		8:00-9:00	9:00-10:00	10:00-10:30	17:00-18:00	18:00-19:00
2023/1/17 10:00	2023/1/17 10:30		60	15	30	45	5
2023/1/17 17:15	2023/1/17 18:05						

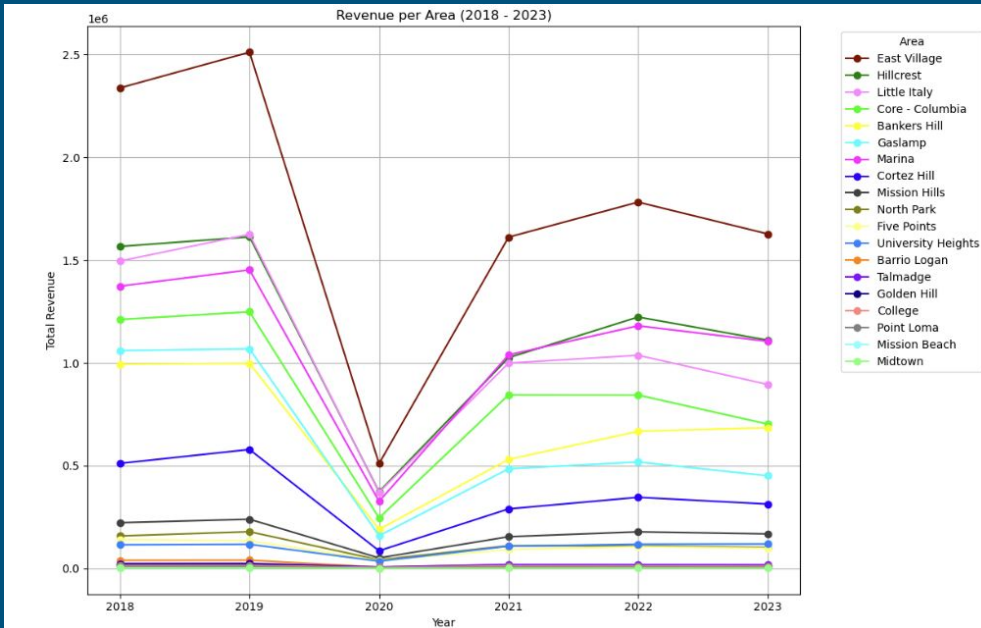
- Sliced parking time into hourly time slot and calculate the averaged parking time through the whole year for each slot.
- The graph shows the occupied parking space percentage through daytime by hour.



How does total revenue change per year and per area ?

Year	Total Revenue	Total Poles Used	Total Transactions
2018	\$11,293,715.35	4,824.0	10,670,383.0
2019	\$11,877,929.38	4,825.0	10,597,096.0
2020	\$2,447,509.33	4,585.0	2,000,710.0
2021	\$7,365,438.01	4,246.0	5,438,788.0
2022	\$8,229,361.71	3,840.0	5,651,651.0
2023	\$7,513,495.91	3,648.0	5,059,835.0

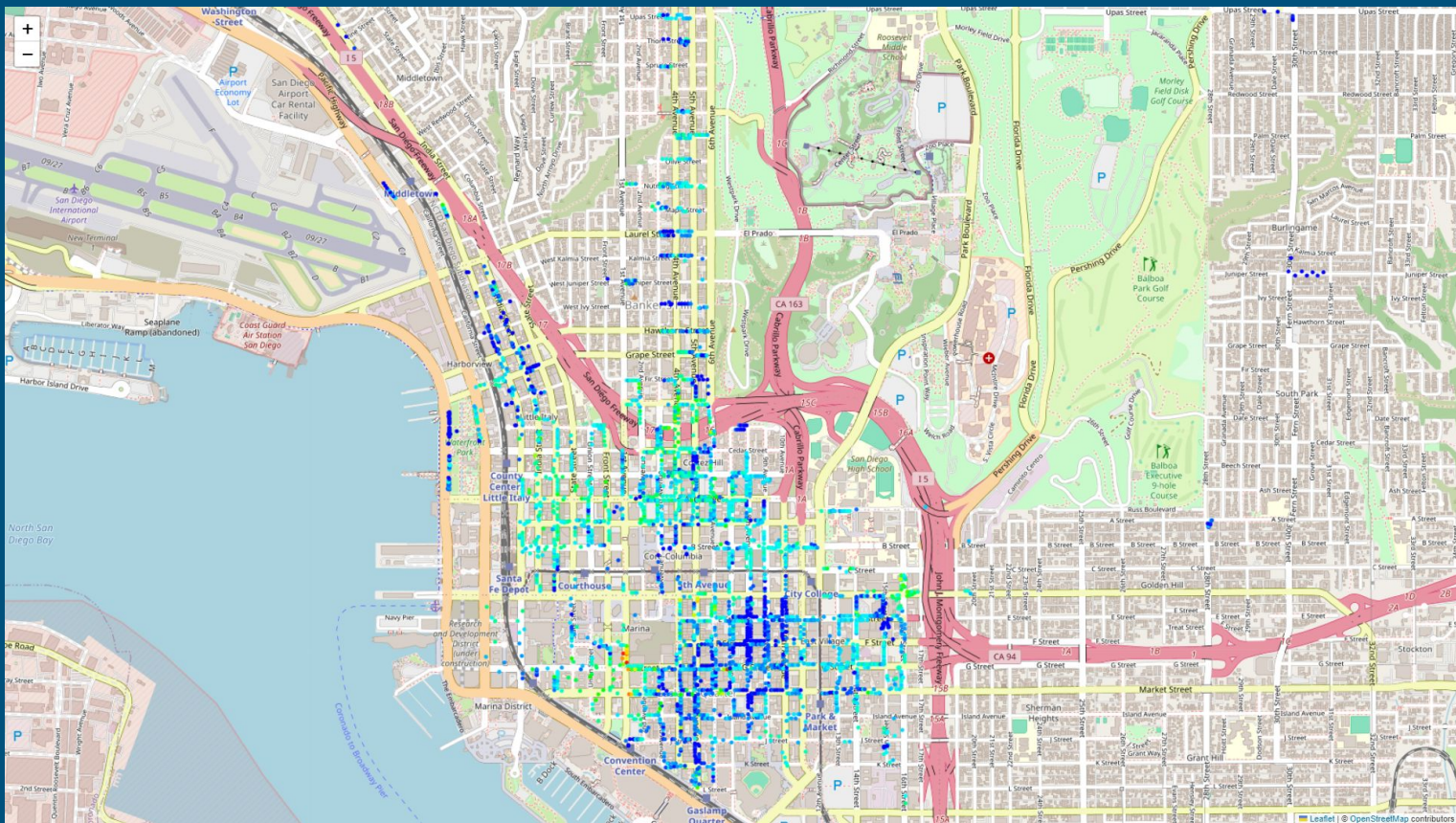
- Noticeable Drop at 2020
 - Possibly due to COVID
- Decline in Poles used
- Transactions corresponds to revenue
- Revenue Per Area follows same trend as Total Revenue



Visualize parking availability at different times of day

- Dataset: check-in/out times for cars per pole
- Check-out: space free; check-in: occupied.
- More check-outs: more availability; fewer: less availability
- Map shows estimated space availability throughout year

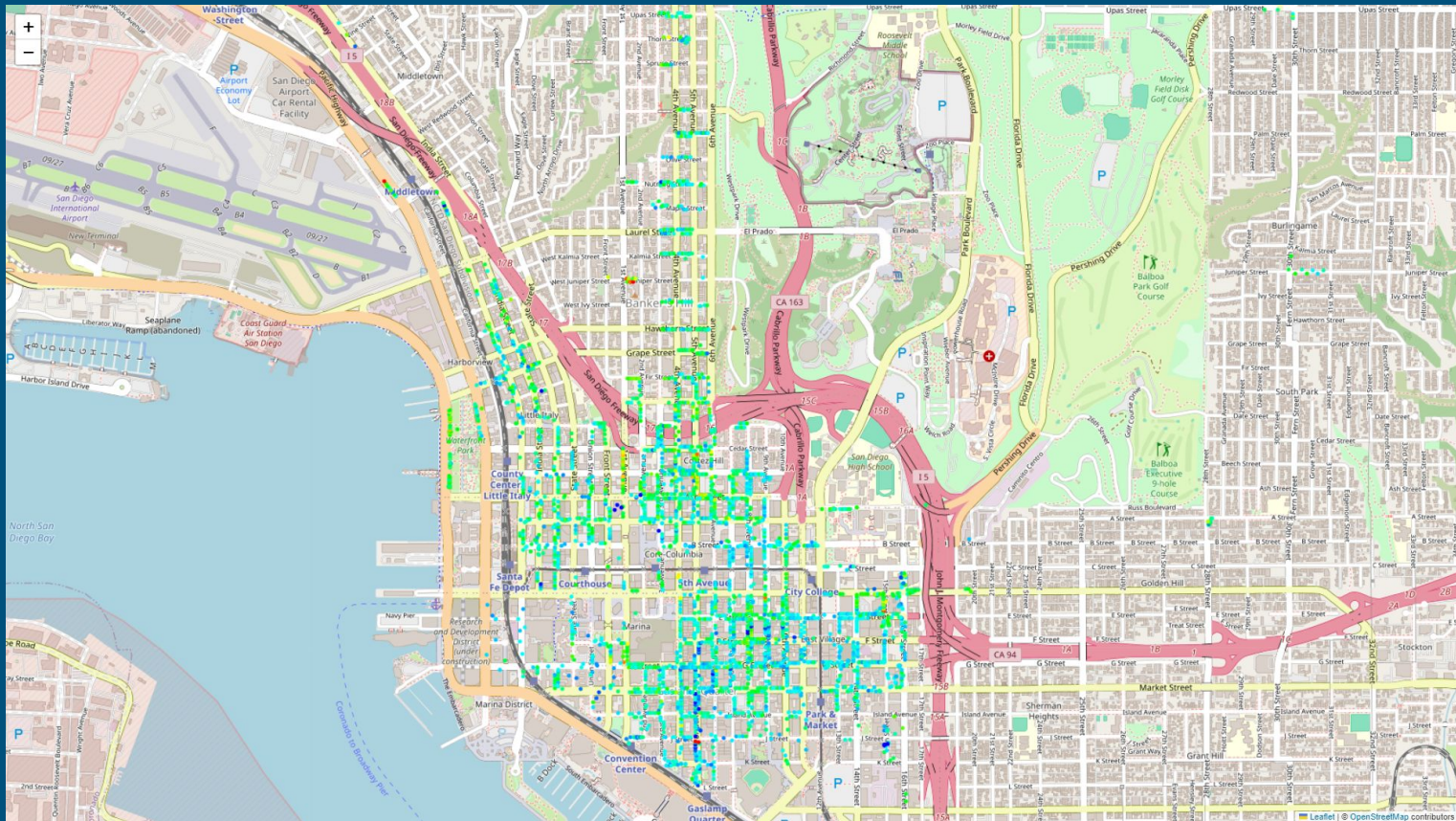
Morning



Low Availability

High Availability

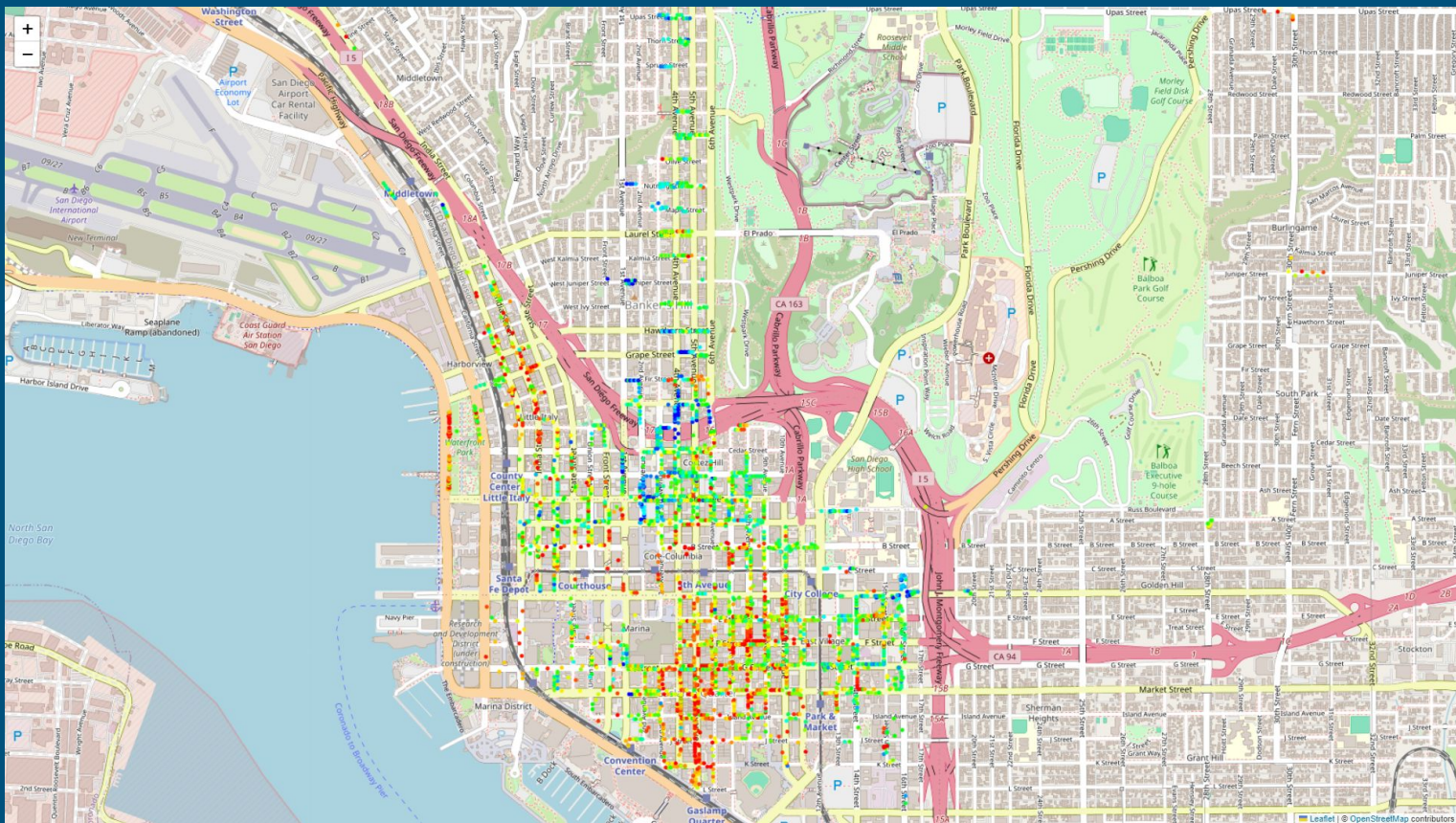
Noon



Low Availability

High Availability

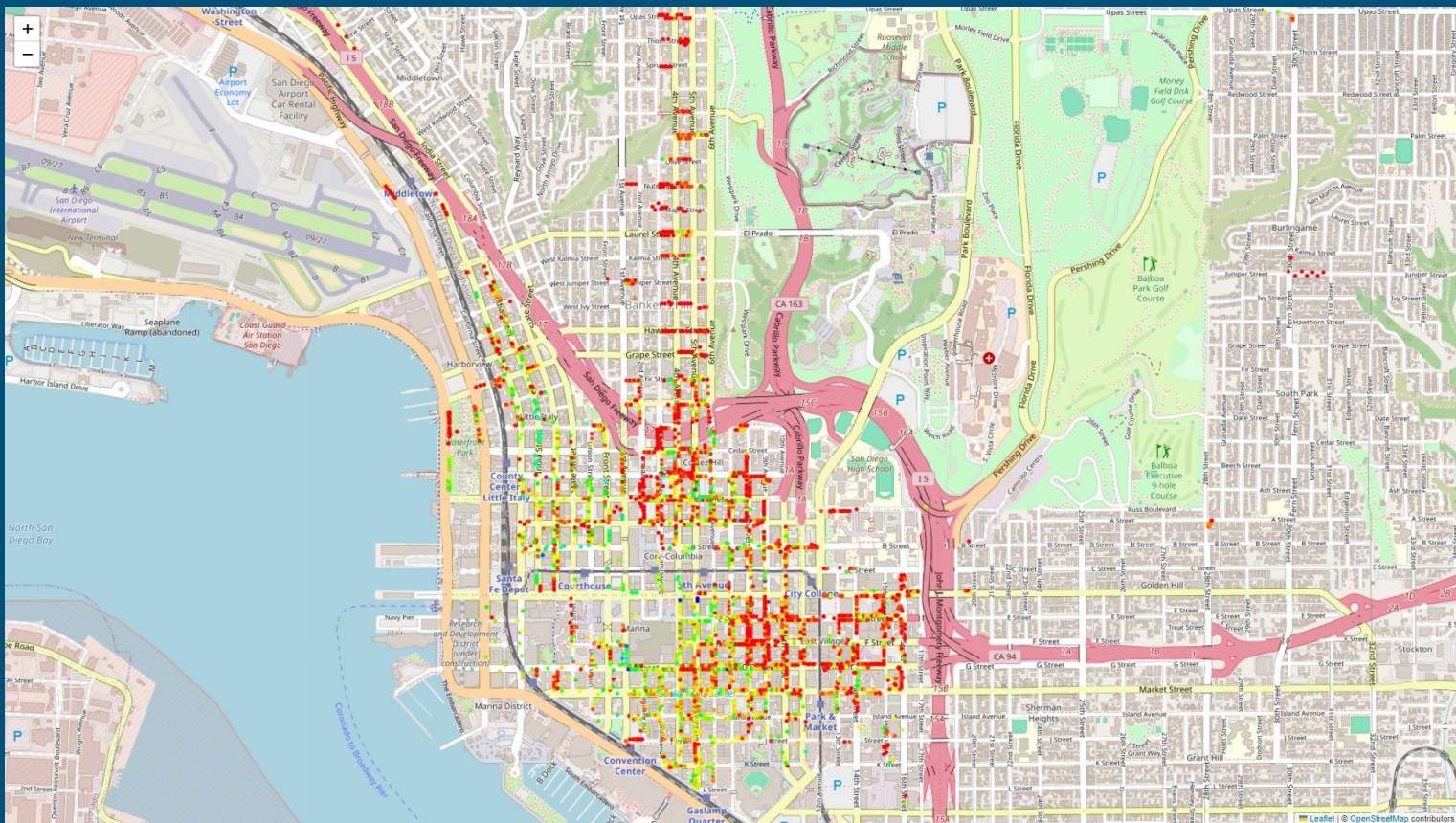
Evening



Low Availability

High Availability

Night



Low Availability

High Availability

Questions?