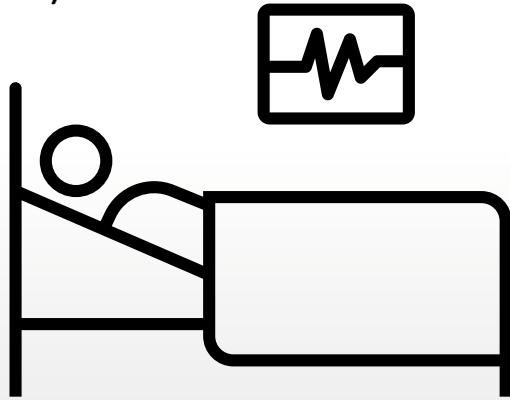


# **FAIR MARKET RENTS AND VENUES DATA ANALYSIS OF WASHINGTON METROPOLITAN AREA**

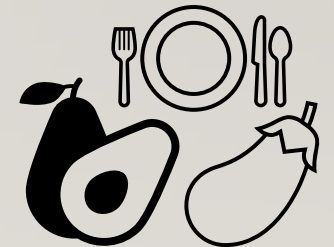
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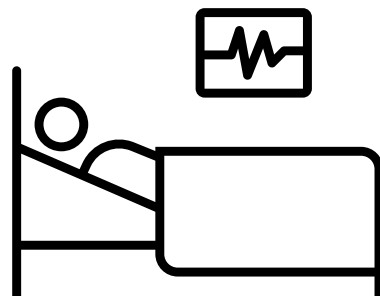
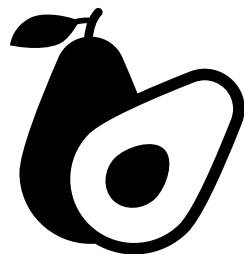
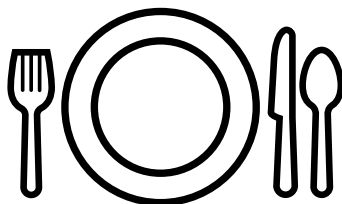
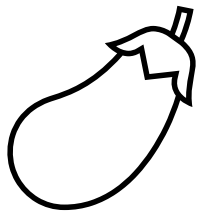
BATTLE OF NEIGHBORHOODS – IBM CAPSTONE PROJECT

About 37 million people in the United States are struggling with chronic kidney disease (CKD).



Mr. McDreamy who is currently living and working as a consultant in New York City, has been suffering from CKD for two years. Having once weekly hemodialysis treatment combined with low-protein diet led him to live in a district where all his daily needs can be met easily. For example, the Fresenius Kidney Care Dialysis Center he visits, is situated only ten minutes' drive away from his house and very close to vegan restaurants as well as Tesla supercharger stations where he leaves his Tesla charging when dining at a vegan restaurant in the neighborhood.



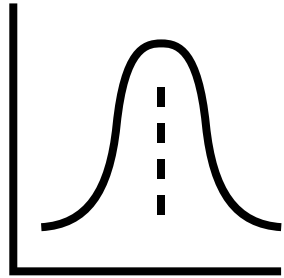


Last month, he accepted a new job offer in Washington DC and decided to move from New York City to DC in two months. Fortunately, there are more than 70 Fresenius Dialysis Centers in Washington Metropolitan Area where he can receive his treatment without any change in his dialysis care plan.

Now, he is looking for a district where the Fresenius dialysis center, vegan restaurants and Tesla supercharger/Destination Charger Stations are located close to each other. This project would help Mr. McDreamy prioritize his „must-haves“ during his neighborhood search and find an apartment that he can afford. Exploring 196 Zip Code Areas in Washington Metropolitan Area with additional information on fair market rents would facilitate his decision process and make him confident in his choice.

# DATA DESCRIPTION

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- Washington Metropolitan Area has more than 250 Neighborhoods. In order to explore them we will need a dataset that contains zip codes, latitude and longitude coordinates of each neighborhood.
- We will explore only 196 zip codes in Washington Metropolitan Area.

# SOURCE OF THE DATA

- **Foursquare API to explore the neighborhoods with additional parameters in the API such as category\_id and search\_query to specify the Fresenius Dialysis Centers and Vegan Restaurants in the neighborhoods.**
- **NREL API from National Laboratory of the U.S. Department of Energy: to fetch the details of a EV Charging station, such as Tesla Supercharger or Tesla Destination Charger and also find the nearest charging stations within a distance of a Zip Code Area in the Washington Metropolitan Area.**
- **Washington Metropolitan Area Fair Market Rents Dataset from the The U.S. Department of Housing and Urban Development's (HUD's) Office of Policy Development and Research (PD&R) which contains the Zip Codes and the Fair Market Rents for 1- 4 Bedroom Apartments.**
- **Latitude and longitude coordinates of each zip code downloaded from United States Zip Code Database.**

# METHODOLOGY

- Libraries:
  - Numpy - Library to handle data in a vectorized manner
  - Pandas - Library for data analysis
  - Sklearn - Python Machine Learning Library
  - Json - Library to handle JSON files
  - Geopy- to retrieve Location Data
  - Matplotlib – Python Plotting Module
  - Folium - Map rendering library
  - Requests - Library to handle requests



# FOURSQUARE API TO EXPLORE FRESENIUS DIALYSIS CENTERS

- Create the API request URL

url =

```
'https://api.foursquare.com/v2/venues/explore?&client_id={} &client_secret={} &v={} &query={} &categoryId={} &ll={},{} &radius={} &limit={} '.format(.....)
```

category\_id='4bf58dd8d48988d104941735', (Medical Center Category ID)

radius=3000,

LIMIT=40

# FOURSQUARE API TO EXPLORE VEGAN RESTAURANTS

- Create the API request URL

url =

```
'https://api.foursquare.com/v2/venues/explore?&client_id={}&client_secret={}&v={}&query={}&categoryId={}&ll={},{&radius={}&limit={}'.format(.....)
```

category\_id='4bf58dd8d48988d1d3941735', (Vegan Restaurants Category ID)

radius=2000,

LIMIT=30



# NREL API TO FIND THE NEAREST TESLA CHARGING STATIONS

- Create the API request URL

```
url = 'https://developer.nrel.gov/api/alt-fuel-  
stations/v1/nearest.json?latitude={}&longitude={}&fuel_type_co  
de={}&ev_network={}&limit={}&radius={}&api_key=.format(...  
.....)
```

```
fuel_type_code='ELEC',
```

```
ev_network='Tesla Destination, Tesla'
```

```
radius=2000,
```

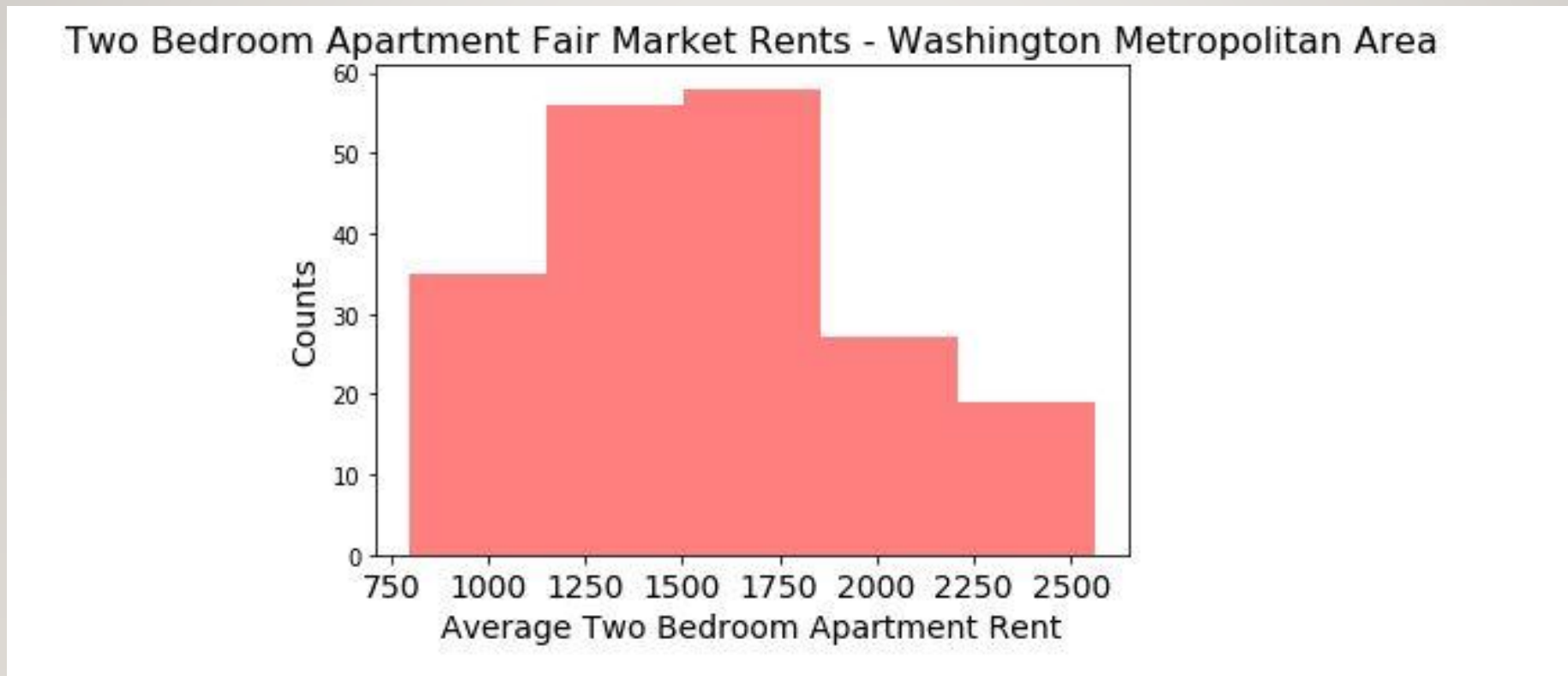
```
LIMIT=30
```

## Analysing Two Bedroom Apartment Fair Market Rents in Washington Metropolitan Area

---

	ZipCode	Two-Bedroom_AvgPrice_USD
count	195.000000	195.000000
mean	21256.923077	1556.410256
std	1133.431106	446.323395
min	20001.000000	800.000000
25%	20179.000000	1215.000000
50%	21212.000000	1580.000000
75%	22306.500000	1850.000000
max	23117.000000	2560.000000

## Analysing Two Bedroom Apartment Fair Market Rents in Washington Metropolitan Area



## Analysing Two Bedroom Apartment Fair Market Rents in Washington Metropolitan Area

	ZipCode	Two-Bedroom_AvgPrice_USD	primary_city	county	Level_labels
0	22821	800	Dayton	Rockingham County	Low Level Rent
1	22815	800	Broadway	Rockingham County	Low Level Rent
2	22831	800	Hinton	Rockingham County	Low Level Rent
3	22844	800	New Market	Shenandoah County	Low Level Rent
4	22853	810	Timberville	Rockingham County	Low Level Rent



## Grouping each Zip Code Area by the number of venues

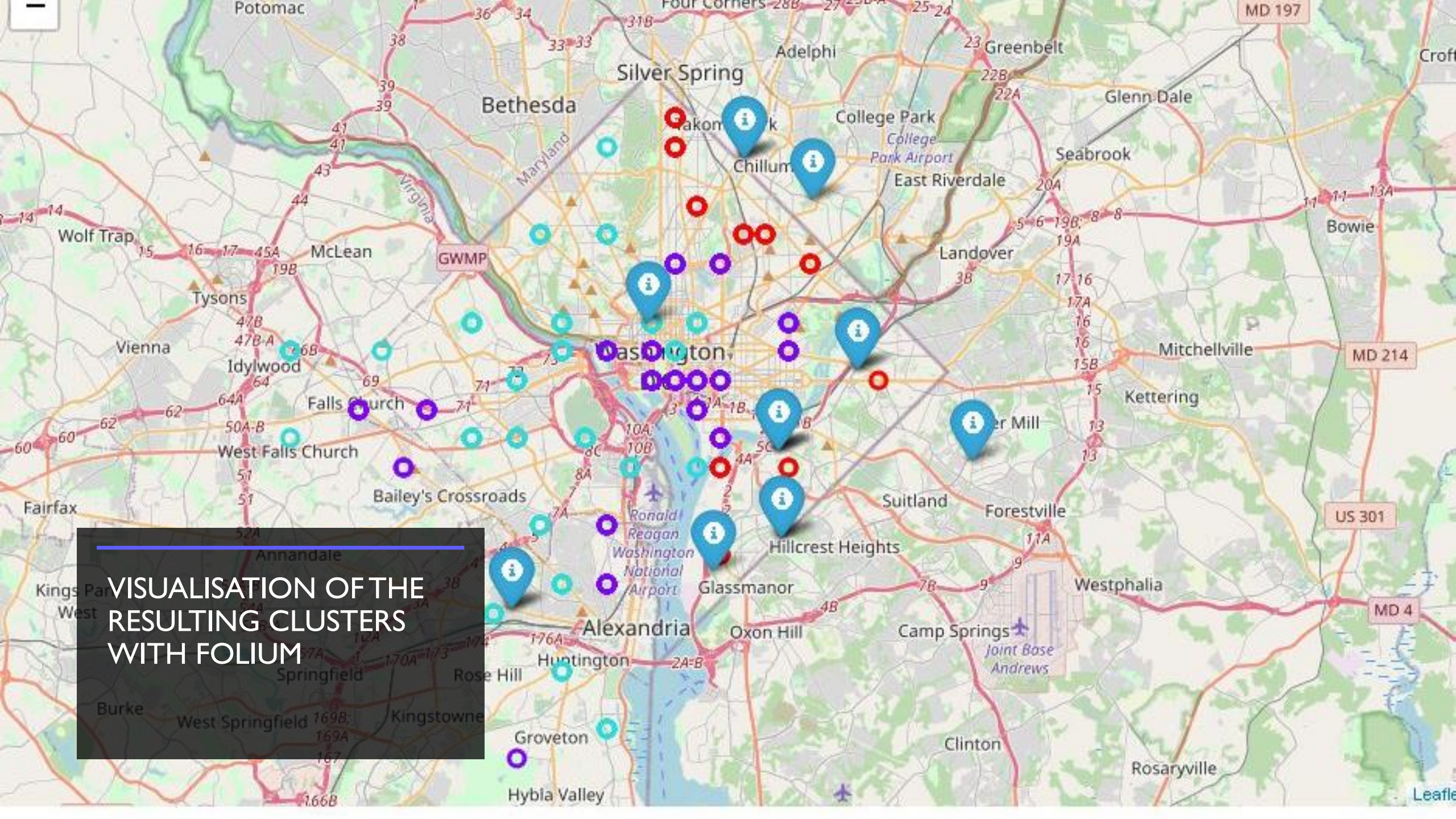
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	ZipCode	Join
0	20001	17 Vegetarian / Vegan Restaurant, 5 Tesla Dest...
1	20002	4 Vegetarian / Vegan Restaurant, 1 Pie Shop, 1...
2	20003	4 Vegetarian / Vegan Restaurant, 3 Tesla Desti...
3	20004	14 Vegetarian / Vegan Restaurant, 5 Tesla Dest...
4	20005	20 Vegetarian / Vegan Restaurant, 5 Tesla Dest...
5	20006	20 Vegetarian / Vegan Restaurant, 5 Tesla Dest...
6	20007	10 Vegetarian / Vegan Restaurant, 3 Tesla Dest...

## Resulting Clusters

	ZipCode	Bedroom_AvgPrice_USD	Two- Level_Labels	Cluster_Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	Join	lat	lng
0	20001	2220	High-1 Level Rent	2	High-1 Level Rent	Vegetarian / Vegan Restaurant	Tesla Destination	17 Vegetarian / Vegan Restaurant, 5 Tesla Dest...	38.91	-77.02
1	20001	2220	High-1 Level Rent	2	High-1 Level Rent	Vegetarian / Vegan Restaurant	Tesla Destination	17 Vegetarian / Vegan Restaurant, 5 Tesla Dest...	38.91	-77.02
2	20001	2220	High-1 Level Rent	2	High-1 Level Rent	Vegetarian / Vegan Restaurant	Tesla Destination	17 Vegetarian / Vegan Restaurant, 5 Tesla Dest...	38.91	-77.02
3	20001	2220	High-1 Level Rent	2	High-1 Level Rent	Vegetarian / Vegan Restaurant	Tesla Destination	17 Vegetarian / Vegan Restaurant, 5 Tesla Dest...	38.91	-77.02
4	20001	2220	High-1 Level Rent	2	High-1 Level Rent	Vegetarian / Vegan Restaurant	Tesla Destination	17 Vegetarian / Vegan Restaurant, 5 Tesla Dest...	38.91	-77.02





**VISUALISATION OF THE  
RESULTING CLUSTERS  
WITH FOLIUM**

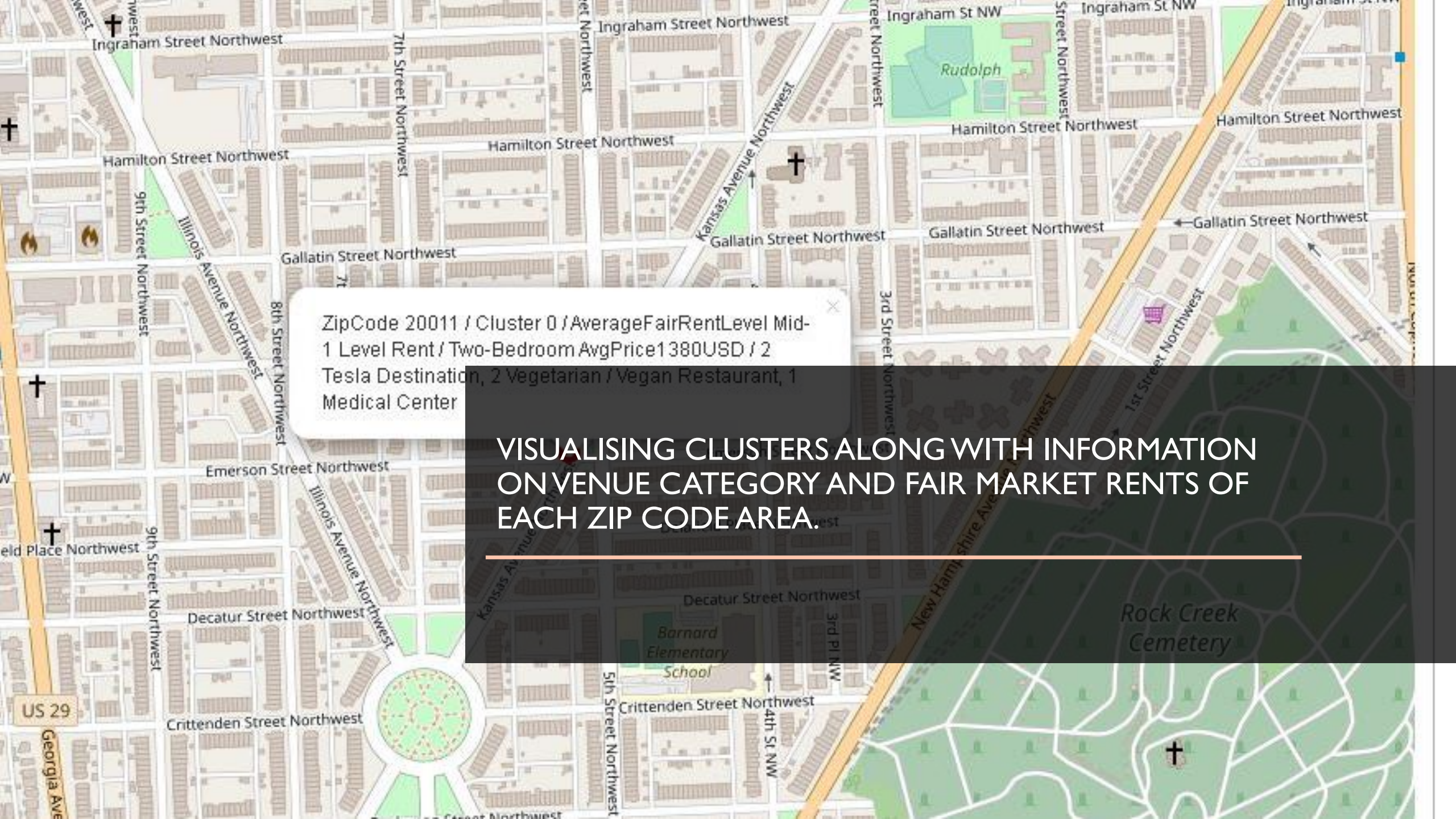


# CONCLUSION

In this notebook, one can easily search for venues that are located close to each other in a zip code area within a specified radius. In Addition to venues, information on average Fair Market Rents of each zip code area will be provided.

In our Example, Mr. McDreamy who is currently planning to move from New York City to Washington D.C., is looking for a neighborhood that is situated close to Fresenius Dialysis Centers, Vegan Restaurants and Tesla Charging Stations. Additionally, he wants to get information on Fair Market Rents of each neighborhood in Washington Metropolitan Area.

- ZipCode 20011
- Cluster 0
- Average Fair Rent Level: Mid-I Level
- Two-Bedroom Average Price 1380 USD
- 2 Tesla Destination Charging Stations
- 2 Vegetarian/Vegan Restaurant
- 1 Medical Center (Fresenius Dialysis Center)



ZipCode 20011 / Cluster 0 / AverageFairRentLevel Mid-1 Level Rent / Two-Bedroom AvgPrice1380USD / 2 Tesla Destination, 2 Vegetarian / Vegan Restaurant, 1 Medical Center

VISUALISING CLUSTERS ALONG WITH INFORMATION ON VENUE CATEGORY AND FAIR MARKET RENTS OF EACH ZIP CODE AREA.



# DISCUSSION

- This project can especially help those who are asking themselves „Where should I live?“ when planning to move to another place.
- One can prioritize „must-haves“ during exploring neighborhoods, add new venue categories, and compare rents or house prices in each neighborhood.
- The crime rates of a neighborhood may also play a role in deciding where to live. If one wants to factor in crime statistics when making a decision, the crime dataset can be downloaded from Metropolitan Police Department and used when clustering neighborhoods in Washington Metropolitan Area.
- It's up to user to add additional factors when applying k-means clustering algorithm.