capstone_project.md

Comparison of Venues Between Beyoğlu and Kadıköy

1. Problem Description & Discussion of the Background

Istanbul is one of the biggest cities in the world with a population over 15 million. It is also a big entartainment center for both tourists and residents. Until a few years ago, Beyoğlu was the number one borough for all kinds of entartainment venues, but it started to change after a few terrorist attacks and bad political decisions. After that Kadıköy borough which is located in the Asia side of the city increased its popularity. On the other hand, city authorities tries to attract people to Beyoğlu, and increase its popularity again.

In this project I will compare two boroughs of Istanbul which are centeral places for entertainment venues.

This will help investors that interested in opening a venue in the city. It will be helpful if we can provide information about density, location, and category information of venues to them.

2. Data Description

Based on the problem description following factors will be used:

- Number of venues in given borough
- Category of venues
- Density of venue categories for each borough
- Average house renting prices

To obtain above information I will use

- Python geopy library to convert an address into latitude and longitude values.
- Foursquare API to get number, category, and location information of nearby venues in selected boroughs.
- Finally Zingat website to get average house renting prices for two boroughs which also gives information about some demographic information of residents.

3. Methodology

I will first get venues near a selected venue for each borough, and then explore venues with Foursquare API. After getting the venues, I will extract venue categories and show top 10 category for each borough.

Exploratory Data Analysis

```
import numpy as np
import pandas as pd
pd.set_option('display.max_columns', None)
pd.set_option('display.max_rows', None)

import json

from geopy.geocoders import Nominatim

import requests
from pandas.io.json import json_normalize # tranform JSON file into a pandas dataframe

# Matplotlib and associated plotting modules
%matplotlib inline

import matplotlib as mpl
import matplotlib.pyplot as plt
mpl.style.use('ggplot')

import matplotlib.cm as cm
import matplotlib.colors as colors
```

```
import folium
```

Map of Istanbul

Get latitude and longitude values for Istanbul.

```
address = 'Istanbul, Turkey'

geolocator = Nominatim(user_agent="istanbul_explorer")
location = geolocator.geocode(address)
ist_latitude = location.latitude
ist_longitude = location.longitude
print('The geograpical coordinate of Istanbul are {}, {}.'.format(ist_latitude, ist_longitude))
```

```
The geograpical coordinate of Istanbul are 41.0096334, 28.9651646.
```

Get latitude and longitude values for Beyoğlu borough.

```
address = 'Beyoğlu, Istanbul, Turkey'

geolocator = Nominatim(user_agent="beyoglu_explorer")
location = geolocator.geocode(address)
bey_latitude = location.latitude
bey_longitude = location.longitude
print('The geograpical coordinate of Beyoğlu are {}, {}.'.format(bey_latitude, bey_longitude))
```

```
The geograpical coordinate of Beyoğlu are 41.0283456, 28.9739877.
```

Get latitude and longitude values for Kadıköy borough.

```
address = 'Kadıkoy, Istanbul, Turkey'

geolocator = Nominatim(user_agent="kadikoy_explorer")
location = geolocator.geocode(address)
kad_latitude = location.latitude
kad_longitude = location.longitude
print('The geograpical coordinate of Kadıköy are {}, {}.'.format(kad_latitude, kad_longitude))
```

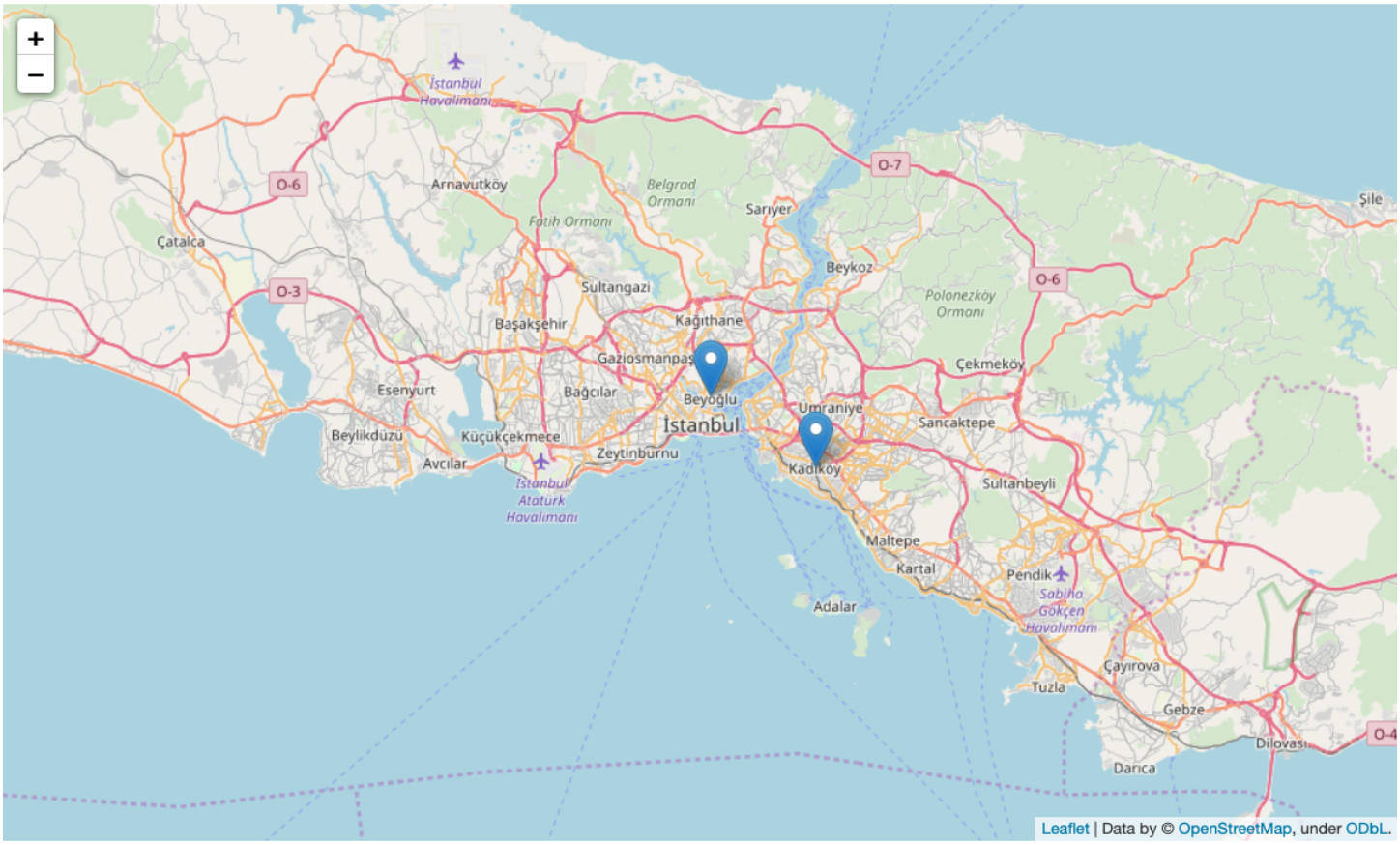
```
The geograpical coordinate of Kadıköy are 40.9768636, 29.074825.
```

Show the map of Istanbul with two boroughs marked.

```
ist_map = folium.Map(location=[ist_latitude, ist_longitude], zoom_start=10)

folium.Marker(location=[bey_latitude, bey_longitude], popup='Beyoğlu').add_to(ist_map)
folium.Marker(location=[kad_latitude, kad_longitude], popup='Kadıköy').add_to(ist_map)

ist_map
```



Data Exploring for Beyoğlu

I will take "Çiçek Pasajı" as a center point for Beyoğlu, because it is almost the mid point for famous Istiklal Street which contains most of the entertainment places

```
address = 'Çiçek Pasajı, Beyoğlu, Istanbul'

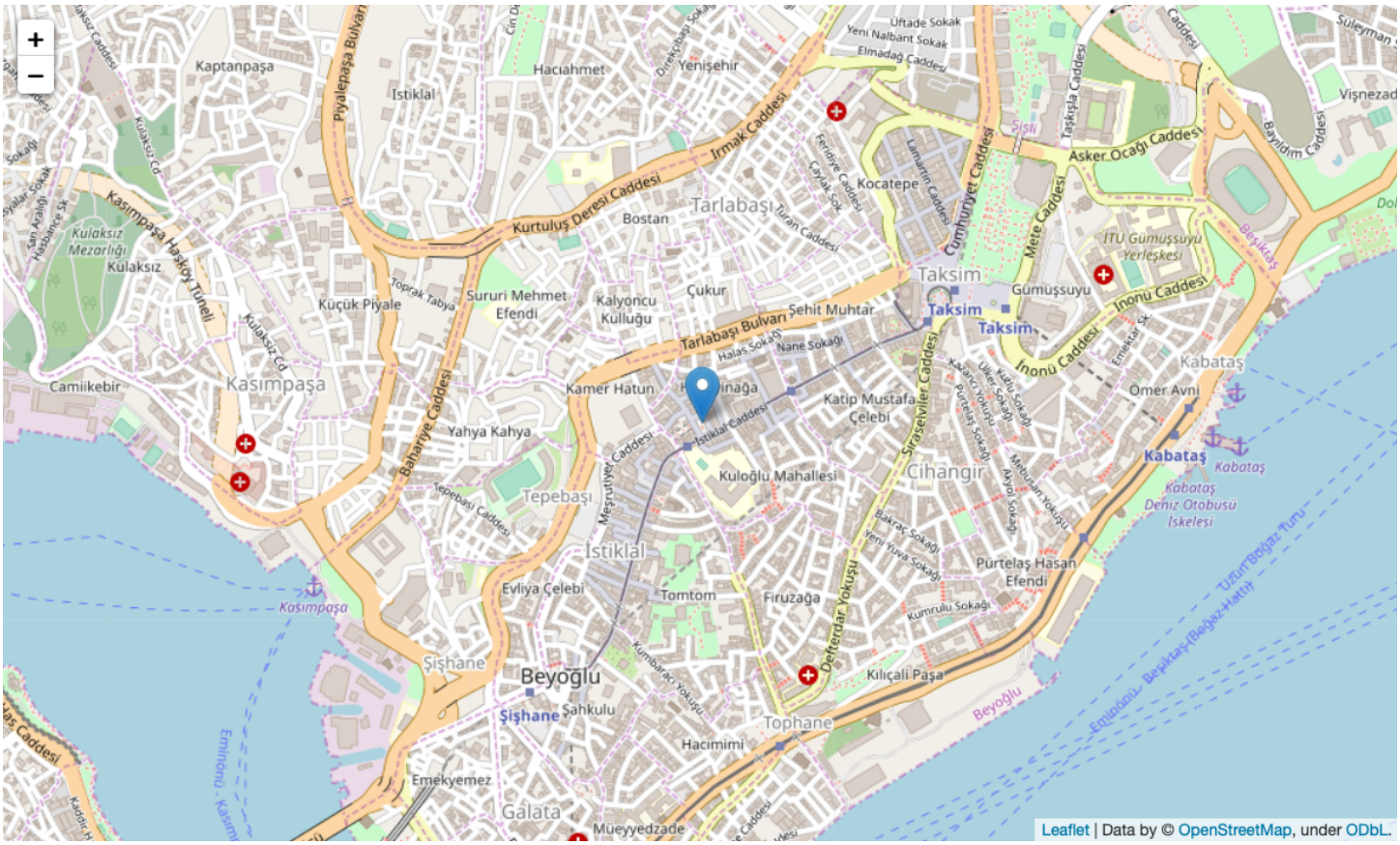
geolocator = Nominatim(user_agent="beyoglu_explorer")
location = geolocator.geocode(address)
cp_latitude = location.latitude
cp_longitude = location.longitude
print('The geograpical coordinate of Çiçek Pasajı are {}, {}.'.format(cp_latitude, cp_longitude))
```

```
The geograpical coordinate of Çiçek Pasajı are 41.0340997, 28.9779211.
```

```
beyoglu_map = folium.Map(location=[cp_latitude, cp_longitude], zoom_start=15)

folium.Marker(location=[cp_latitude, cp_longitude], popup='Çiçek Pasajı').add_to(beyoglu_map)

beyoglu_map
```



Define Foursquare api credentials

```
CLIENT_ID = '***'
CLIENT_SECRET = '***'
VERSION = '20190916'
```

```
radius = 1500
LIMIT = 500
```

```
url = 'https://api.foursquare.com/v2/venues/search?client_id={}&client_secret={}&ll={},{}&v={}&radius={}&limit={}&inte
```

```
results = requests.get(url).json()
```

```
venues = results['response']['venues']
```

```
len(venues)
```

```
196
```

```
venues[:10]
```

```
[{'id': '4badf2dff964a520e7743be3',
  'name': 'Çiçek Pasajı',
  'location': {'address': 'Hüseyinağa Mah. İstiklal Cad. No:80',
   'lat': 41.03403052923271,
   'lng': 28.977969850612656,
   'labeledLatLngs': [{'label': 'display',
     'lat': 41.03403052923271,
     'lng': 28.977969850612656}],
```

```
   'distance': 8,
   'postalCode': '34435',
   'cc': 'TR',
   'city': 'Beyoğlu',
   'state': 'İstanbul',
   'country': 'Türkiye',
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    '34435 Beyoğlu',
    'Türkiye']},
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    'pluralName': 'Beer Gardens',
    'shortName': 'Beer Garden',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/nightlife/beergarden_',
     'suffix': '.png'},
    'primary': True}],
  'referralId': 'v-1568900982',
  'hasPerk': False},
 {'id': '4b50966af964a520632827e3',
  'name': 'İstiklal Caddesi',
  'location': {'lat': 41.034111494765284,
   'lng': 28.978815233800894,
   'distance': 75,
   'postalCode': '34400',
   'cc': 'TR',
   'city': 'Beyoğlu',
   'state': 'İstanbul',
   'country': 'Türkiye',
   'formattedAddress': ['34400 Beyoğlu', 'Türkiye']},
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    'name': 'Road',
    'pluralName': 'Roads',
    'shortName': 'Road',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/travel/highway_',
     'suffix': '.png'},
    'primary': True}],
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  'referralId': 'v-1568900982',
  'hasPerk': False},
 {'id': '4fce4205e4b0b705e8c6add5',
  'name': 'Stop Restaurant',
  'location': {'address': 'Istiklal caddesi Çiçek Pasajı No : 14 Beyoğlu',
   'lat': 41.034158872984385,
   'lng': 28.97795430036129,
   'labeledLatLngs': [{'label': 'display',
     'lat': 41.034158872984385,
     'lng': 28.97795430036129}],
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   'cc': 'TR',
   'city': 'İstanbul',
   'state': 'İstanbul',
   'country': 'Türkiye',
   'formattedAddress': ['Istiklal caddesi Çiçek Pasajı No : 14 Beyoğlu',
    'İstanbul',
    'Türkiye']},
  'categories': [{'id': '4f04af1f2fb6e1c99f3db0bb',
    'name': 'Turkish Restaurant',
    'pluralName': 'Turkish Restaurants',
    'shortName': 'Turkish',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/turkish_',
     'suffix': '.png'},
    'primary': True}],
  'referralId': 'v-1568900982',
  'hasPerk': False},
 {'id': '548cb4f6498e73a77bb97b38',
  'name': 'Çiçek Pasajı Stop Restaurant',
  'location': {'address': 'Beyoğlu',
   'lat': 41.03413509814825,
   'lng': 28.97795382637689,
   'labeledLatLngs': [{'label': 'display',
     'lat': 41.03413509814825,
     'lng': 28.97795382637689}],
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   'cc': 'TR',
   'city': 'İstanbul',
```

```
   'state': 'İstanbul',
   'country': 'Türkiye',
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    'name': 'Dive Bar',
    'pluralName': 'Dive Bars',
    'shortName': 'Dive Bar',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/nightlife/divebar_',
     'suffix': '.png'},
    'primary': True}],
  'referralId': 'v-1568900982',
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 {'id': '4ba3bb2ef964a5204b5938e3',
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   'lat': 41.03395289068489,
   'lng': 28.97781201585364,
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     'lng': 28.97781201585364}],
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   'cc': 'TR',
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   'state': 'İstanbul',
   'country': 'Türkiye',
   'formattedAddress': ['Sahne Sok. No:1-3 Beyoğlu (Balık Pazarı)',
    'Beyoğlu',
    'Türkiye']},
  'categories': [{'id': '5283c7b4e4b094cb91ec88d6',
    'name': 'Kokoreç Restaurant',
    'pluralName': 'Kokoreç Restaurants',
    'shortName': 'Kokoreç',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/turkish_',
     'suffix': '.png'},
    'primary': True}],
  'referralId': 'v-1568900982',
  'hasPerk': False},
 {'id': '4bb773067421a5934e72c040',
  'name': 'Ceneviz Meyhanesi',
  'location': {'address': 'İstiklal Cad. Tarihi Çiçek Pasajı No:12 Beyoğlu',
   'lat': 41.03413038514427,
   'lng': 28.977840673521897,
   'labeledLatLngs': [{'label': 'display',
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     'lng': 28.977840673521897}],
   'distance': 7,
   'cc': 'TR',
   'city': 'Hüseyinağa',
   'state': 'İstanbul',
   'country': 'Türkiye',
   'formattedAddress': ['İstiklal Cad. Tarihi Çiçek Pasajı No:12 Beyoğlu',
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    'Türkiye']},
  'categories': [{'id': '4bf58dd8d48988d11a941735',
    'name': 'Other Nightlife',
    'pluralName': 'Other Nightlife',
    'shortName': 'Nightlife',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/nightlife/default_',
     'suffix': '.png'},
    'primary': True}],
  'referralId': 'v-1568900982',
  'hasPerk': False},
 {'id': '4cd103d96449a0936af0cdcf',
  'name': 'Taksim',
  'location': {'lat': 41.03416813975303,
   'lng': 28.9817826991163,
   'distance': 324,
   'cc': 'TR',
   'city': 'İstanbul',
   'state': 'İstanbul',
   'country': 'Türkiye',
   'formattedAddress': ['İstanbul', 'Türkiye']},
  'categories': [{'id': '4bf58dd8d48988d162941735',
    'name': 'Other Great Outdoors',
```

```
    'pluralName': 'Other Great Outdoors',
    'shortName': 'Other Outdoors',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/parks_outdoors/outdoors_',
     'suffix': '.png'},
    'primary': True}],
  'referralId': 'v-1568900982',
  'hasPerk': False},
 {'id': '531237db498e35fff7983ed3',
  'name': 'Kimene Restaurant',
  'location': {'lat': 41.03410818078912,
   'lng': 28.977979936960274,
   'labeledLatLngs': [{'label': 'display',
     'lat': 41.03410818078912,
     'lng': 28.977979936960274}],
   'distance': 5,
   'cc': 'TR',
   'country': 'Türkiye',
   'formattedAddress': ['Türkiye']},
  'categories': [{'id': '4bf58dd8d48988d1cc941735',
    'name': 'Steakhouse',
    'pluralName': 'Steakhouses',
    'shortName': 'Steakhouse',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/steakhouse_',
     'suffix': '.png'},
    'primary': True}],
  'referralId': 'v-1568900982',
  'hasPerk': False},
 {'id': '4d5feeff14963704bc25de94',
  'name': 'Manolya Restoran',
  'location': {'address': 'İstiklal Cd. Çiçek Pasajı',
   'crossStreet': 'İstiklal Caddesi',
   'lat': 41.0340612775958,
   'lng': 28.977947977338776,
   'labeledLatLngs': [{'label': 'display',
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     'lng': 28.977947977338776}],
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   'city': 'İstanbul',
   'state': 'İstanbul',
   'country': 'Türkiye',
   'formattedAddress': ['İstiklal Cd. Çiçek Pasajı (İstiklal Caddesi)',
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    'Türkiye']},
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    'name': 'Restaurant',
    'pluralName': 'Restaurants',
    'shortName': 'Restaurant',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/default_',
     'suffix': '.png'},
    'primary': True}],
  'referralId': 'v-1568900982',
  'hasPerk': False},
 {'id': '4e67c44714952e0a13089916',
  'name': 'Tarihi Cicek Pasaji - Kime Ne Restaurant',
  'location': {'address': 'Beyoglu',
   'crossStreet': 'Istiklal Caddesi',
   'lat': 41.034033663917235,
   'lng': 28.977983894650826,
   'labeledLatLngs': [{'label': 'display',
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     'lng': 28.977983894650826}],
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   'city': 'İstanbul',
   'state': 'İstanbul',
   'country': 'Türkiye',
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  'categories': [{'id': '4bf58dd8d48988d1c4941735',
    'name': 'Restaurant',
    'pluralName': 'Restaurants',
    'shortName': 'Restaurant',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/default_',
     'suffix': '.png'},
```

```
    'primary': True}],
  'referralId': 'v-1568900982',
  'hasPerk': False}]
```

```
json_normalize(venues).head()
```

<style scoped> .dataframe tbody tr th:only-of-type { vertical-align: middle; }

```
.dataframe tbody tr th {
    vertical-align: top;
}

.dataframe thead th {
    text-align: right;
}
```

</style>

	id	name	categories	referralId	hasPerk	location.add
0	4badf2dff964a520e7743be3	Çiçek Pasajı	[{'id': '4bf58dd8d48988d117941735', 'name': 'B...	v-1568900982	False	Hüseyinağa M İstiklal Cad. No:80
1	4b50966af964a520632827e3	İstiklal Caddesi	[{'id': '4bf58dd8d48988d1f9931735', 'name': 'R...	v-1568900982	False	NaN
2	4fce4205e4b0b705e8c6add5	Stop Restaurant	[{'id': '4f04af1f2fb6e1c99f3db0bb', 'name': 'T...	v-1568900982	False	Istiklal cadde Çiçek Pasajı M 14 Beyoğlu
3	548cb4f6498e73a77bb97b38	Çiçek Pasajı Stop Restaurant	[{'id': '4bf58dd8d48988d118941735', 'name': 'D...	v-1568900982	False	Beyoğlu
4	4ba3bb2ef964a5204b5938e3	Şampiyon Kokoreç	[{'id': '5283c7b4e4b094cb91ec88d6', 'name': 'K...	v-1568900982	False	Sahne Sok. N 3 Beyoğlu

Define a function to extract category of the venue

```
def get_category_type(row):
    try:
        categories_list = row['categories']
    except:
        categories_list = row['venue.categories']

    if len(categories_list) == 0:
        return None
    else:
        return categories_list[0]['name']
```

Convert venues json result to DataFrame and get categories

```
nearby_venues = json_normalize(venues) # flatten JSON

# filter columns
filtered_columns = ['name', 'categories', 'location.lat', 'location.lng', 'location.address']
nearby_venues = nearby_venues.loc[:, filtered_columns]

# filter the category for each row
nearby_venues['categories'] = nearby_venues.apply(get_category_type, axis=1)
```

```
# clean columns
nearby_venues.columns = [col.split(".")[-1] for col in nearby_venues.columns]

nearby_venues.head(10)
```

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.dataframe tbody tr th {
    vertical-align: top;
}

.dataframe thead th {
    text-align: right;
}
```

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	name	categories	lat	lng	address
0	Çiçek Pasajı	Beer Garden	41.034031	28.977970	Hüseyinağa Mah. İstiklal Cad. No:80
1	İstiklal Caddesi	Road	41.034111	28.978815	NaN
2	Stop Restaurant	Turkish Restaurant	41.034159	28.977954	Istiklal caddesi Çiçek Pasajı No : 14 Beyoğlu
3	Çiçek Pasajı Stop Restaurant	Dive Bar	41.034135	28.977954	Beyoğlu
4	Şampiyon Kokoreç	Kokoreç Restaurant	41.033953	28.977812	Sahne Sok. No:1-3 Beyoğlu
5	Ceneviz Meyhanesi	Other Nightlife	41.034130	28.977841	İstiklal Cad. Tarihi Çiçek Pasajı No:12 Beyoğlu
6	Taksim	Other Great Outdoors	41.034168	28.981783	NaN
7	Kimene Restaurant	Steakhouse	41.034108	28.977980	NaN
8	Manolya Restoran	Restaurant	41.034061	28.977948	İstiklal Cd. Çiçek Pasajı
9	Tarihi Cicek Pasaji - Kime Ne Restaurant	Restaurant	41.034034	28.977984	Beyoglu

```
print('{} venues were returned by Foursquare.'.format(nearby_venues.shape[0]))
```

```
196 venues were returned by Foursquare.
```

Check how many venues were returned for each category.

```
nearby_venues.groupby('categories', as_index=False).count()
```

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	categories	name	lat	lng	address

	categories	name	lat	lng	address
0	ATM	1	1	1	1
1	Accessories Store	1	1	1	0
2	Airport	1	1	1	0
3	American Restaurant	2	2	2	2
4	Antique Shop	2	2	2	1
5	Art Gallery	1	1	1	0
6	Art Studio	1	1	1	1
7	Arts & Crafts Store	1	1	1	0
8	Auditorium	1	1	1	1
9	Bagel Shop	1	1	1	0
10	Bakery	1	1	1	0
11	Bank	3	3	3	2
12	Bar	6	6	6	4
13	Beer Garden	2	2	2	2
14	Bookstore	7	7	7	2
15	Boutique	1	1	1	0
16	Breakfast Spot	1	1	1	1
17	Brewery	1	1	1	1
18	Building	6	6	6	2
19	Business Service	1	1	1	0
20	Café	7	7	7	5
21	Campground	1	1	1	0
22	Church	1	1	1	1
23	Clothing Store	3	3	3	2
24	College Classroom	1	1	1	0
25	College Gym	1	1	1	1
26	Comfort Food Restaurant	1	1	1	1
27	Conference Room	1	1	1	0
28	Convention Center	1	1	1	1
29	Cosmetics Shop	3	3	3	2
30	Coworking Space	3	3	3	3
31	Deli / Bodega	1	1	1	1
32	Dentist's Office	1	1	1	0
33	Department Store	2	2	2	1
34	Dessert Shop	4	4	4	3
35	Dive Bar	3	3	3	2
36	Doner Restaurant	1	1	1	1

	categories	name	lat	lng	address
37	Electronics Store	1	1	1	0
38	Entertainment Service	1	1	1	1
39	Event Space	1	1	1	1
40	Fish & Chips Shop	1	1	1	0
41	Fish Market	1	1	1	1
42	Flower Shop	1	1	1	0
43	Food Truck	1	1	1	0
44	General Entertainment	2	2	2	1
45	Gift Shop	2	2	2	2
46	Historic Site	1	1	1	1
47	Hobby Shop	1	1	1	1
48	Hotel	3	3	3	3
49	Hotel Bar	1	1	1	0
50	Indie Movie Theater	1	1	1	1
51	Jazz Club	1	1	1	0
52	Jewelry Store	1	1	1	1
53	Kebab Restaurant	2	2	2	1
54	Kofte Place	1	1	1	0
55	Kokoreç Restaurant	4	4	4	4
56	Kuruyemişçi	2	2	2	1
57	Language School	2	2	2	1
58	Library	1	1	1	1
59	Lounge	3	3	3	0
60	Meeting Room	2	2	2	0
61	Men's Store	1	1	1	0
62	Meyhane	3	3	3	3
63	Middle Eastern Restaurant	1	1	1	0
64	Miscellaneous Shop	2	2	2	0
65	Mobile Phone Shop	1	1	1	1
66	Movie Theater	1	1	1	1
67	Nail Salon	1	1	1	0
68	Nightclub	8	8	8	4
69	Non-Profit	1	1	1	1
70	Office	6	6	6	2
71	Other Event	2	2	2	1
72	Other Great Outdoors	1	1	1	0
73	Other Nightlife	1	1	1	1

	categories	name	lat	lng	address
74	Photography Lab	1	1	1	1
75	Photography Studio	1	1	1	1
76	Pizza Place	1	1	1	0
77	Real Estate Office	1	1	1	1
78	Recording Studio	1	1	1	0
79	Residential Building (Apartment / Condo)	1	1	1	0
80	Restaurant	11	11	11	9
81	Road	1	1	1	0
82	Rock Club	1	1	1	1
83	Salon / Barbershop	4	4	4	2
84	School	1	1	1	1
85	Seafood Restaurant	7	7	7	6
86	Shoe Repair	2	2	2	1
87	Shoe Store	1	1	1	0
88	Shop & Service	1	1	1	0
89	Shopping Plaza	1	1	1	0
90	Snack Place	1	1	1	0
91	Souvenir Shop	1	1	1	1
92	Steakhouse	1	1	1	0
93	Student Center	1	1	1	0
94	Tattoo Parlor	2	2	2	2
95	Thrift / Vintage Store	1	1	1	0
96	Turkish Home Cooking Restaurant	1	1	1	1
97	Turkish Restaurant	7	7	7	3
98	Winery	1	1	1	0

Create a dataframe for category counts

```
category_counts_df = nearby_venues['categories'].value_counts().to_frame()
```

```
category_counts_df.head(10)
```

<style scoped> .dataframe tbody tr th:only-of-type { vertical-align: middle; }

```
.dataframe tbody tr th {
    vertical-align: top;
}

.dataframe thead th {
    text-align: right;
}
```

</style>

	categories

	categories
Restaurant	11
Nightclub	8
Seafood Restaurant	7
Bookstore	7
Turkish Restaurant	7
Café	7
Office	6
Building	6
Bar	6
Kokoreç Restaurant	4

Top 10 categories

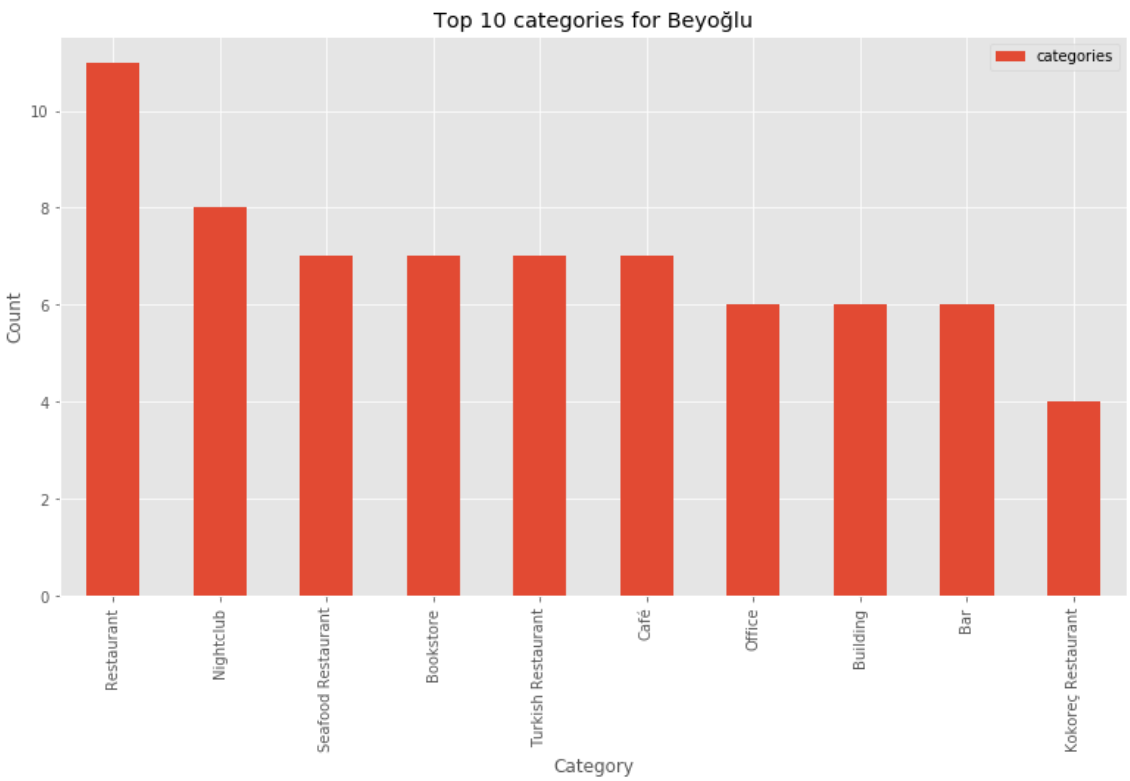
```
category_top_10 = category_counts_df.head(10)
```

Plot the top 10 categories.

```
category_top_10.plot(kind='bar', figsize=(13, 7))

plt.title('Top 10 categories for Beyoğlu')
plt.xlabel('Category')
plt.ylabel('Count')

plt.show()
```



Create empty dataframe for putting top 10 categories.

```
num_top_venues = 10

indicators = ['st', 'nd', 'rd']
```

```
# create columns according to number of top venues
columns = ['Borough']
for ind in np.arange(num_top_venues):
    try:
        columns.append('{}{} Most Common Venue'.format(ind+1, indicators[ind]))
    except:
        columns.append('{}th Most Common Venue'.format(ind+1))

beyoglu_top_10_categories_df = pd.DataFrame(columns=columns)
```

```
beyoglu_top_10_categories_df
```

<style scoped> .dataframe tbody tr th:only-of-type { vertical-align: middle; }

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.dataframe tbody tr th {
    vertical-align: top;
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	Borough	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue

Fill the dataframe with values for Beyoğlu borough.

```
beyoglu_top_10_categories_df.loc[0] = ['Beyoğlu'] + list(category_counts_df.head(10).index.values)
```

```
beyoglu_top_10_categories_df
```

<style scoped> .dataframe tbody tr th:only-of-type { vertical-align: middle; }

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    vertical-align: top;
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	Borough	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Com Ve
0	Beyoğlu	Restaurant	Nightclub	Seafood Restaurant	Bookstore	Turkish Restaurant	Café	Office	Building	Bar

Get average rent price for Beyoğlu.

```
from rent_price_parser import get_average_prices
```

```
beyoglu_avg_rent, _ = get_average_prices()
```

```
*** Parsing url: https://www.zingat.com/beyoglu-bolge-raporu ...
*** Response status: 200
Avg. Rent Price for BEYOGLU: 3.413

*** Parsing url: https://www.zingat.com/kadikoy-bolge-raporu ...
*** Response status: 200
Avg. Rent Price for KADIKOY: 2.179
```

```
beyoglu_top_10_categories_df['Average Rent'] = beyoglu_avg_rent * 1000
```

```
beyoglu_top_10_categories_df
```

<style scoped> .dataframe tbody tr th:only-of-type { vertical-align: middle; }

```
.dataframe tbody tr th {
    vertical-align: top;
}

.dataframe thead th {
    text-align: right;
}
```

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	Borough	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Com Ve
0	Beyoğlu	Restaurant	Nightclub	Seafood Restaurant	Bookstore	Turkish Restaurant	Café	Office	Building	Bar

Data Exploring for Kadıköy

I will take "Moda Sahnesi" as center to explore venues for Kadıköy borough.

```
address = 'Moda Sahnesi, Kadıköy, Istanbul'

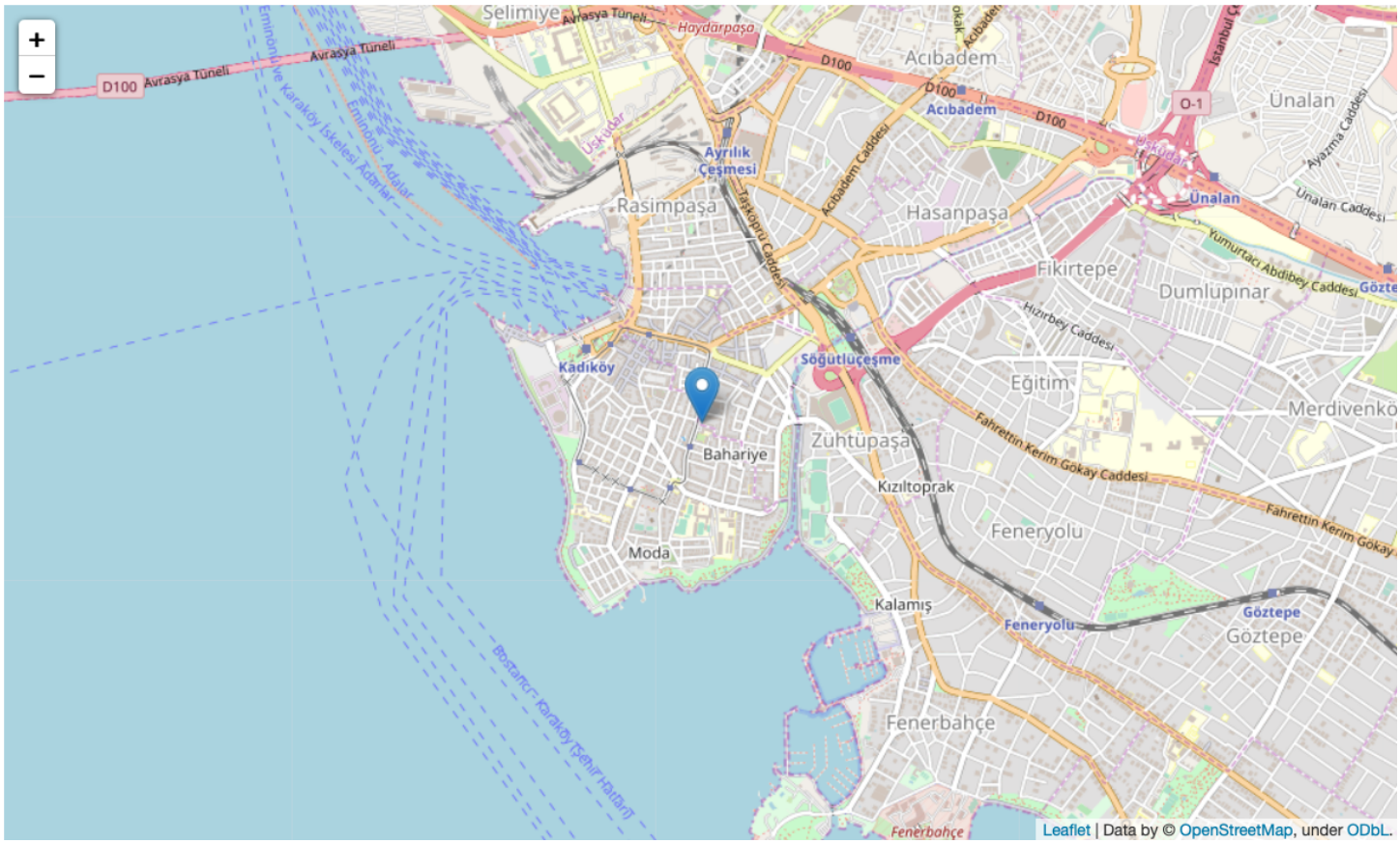
geolocator = Nominatim(user_agent="kadikoy_explorer")
location = geolocator.geocode(address)
moda_latitude = location.latitude
moda_longitude = location.longitude
print('The geograpical coordinate of Moda Sahnesi are {}, {}.'.format(moda_latitude, moda_longitude))
```

```
The geograpical coordinate of Moda Sahnesi are 40.9870051, 29.0286426.
```

```
kadikoy_map = folium.Map(location=[moda_latitude, moda_longitude], zoom_start=14)
```

```
folium.Marker(location=[moda_latitude, moda_longitude], popup='Moda Sahnesi').add_to(kadikoy_map)

kadikoy_map
```




```
url2 = 'https://api.foursquare.com/v2/venues/search?client_id={}&client_secret={}&ll={},{}&v={}&radius={}&limit={}&int
```

```
results_moda = requests.get(url2).json()
```

```
kad_venues = results_moda['response']['venues']
```

```
len(kad_venues)
```

```
189
```

```
kad_venues[:10]
```

```
[{'id': '570be2c7498e269d167a1c63',
  'name': 'Moda Sahnesi',
  'location': {'address': 'General Asım Gündüz Cad. (Bahariye Cad.) Halil Etham Sk. No: 34/27',
   'crossStreet': 'Bahariye Caddesi',
   'lat': 40.98699785241428,
   'lng': 29.028515563943444,
   'labeledLatLngs': [{'label': 'display',
     'lat': 40.98699785241428,
     'lng': 29.028515563943444}],
   'distance': 10,
   'postalCode': '34714',
   'cc': 'TR',
   'neighborhood': 'Caferağa',
   'city': 'İstanbul',
   'state': 'İstanbul',
```

```
   'country': 'Türkiye',
   'formattedAddress': ['General Asım Gündüz Cad. (Bahariye Cad.) Halil Etham Sk. No: 34/27 (Bahariye Caddesi)',
    '34714 İstanbul',
    'Türkiye']},
  'categories': [{'id': '4bf58dd8d48988d137941735',
    'name': 'Theater',
    'pluralName': 'Theaters',
    'shortName': 'Theater',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_entertainment/performingarts_theater_',
     'suffix': '.png'},
    'primary': True}],
  'venuePage': {'id': '177024833'},
  'referralId': 'v-1568901109',
  'hasPerk': False},
 {'id': '5b0d4dac59c423002c997704',
  'name': 'Kamo Kitabevi',
  'location': {'address': 'Bahariye caddesi Halil Ethem sokak Kafkas pasajı no:32/9 kadıköy',
   'crossStreet': 'Bahariye caddesi',
   'lat': 40.98697147474497,
   'lng': 29.02873941540752,
   'labeledLatLngs': [{'label': 'display',
     'lat': 40.98697147474497,
     'lng': 29.02873941540752}],
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   'postalCode': '34710',
   'cc': 'TR',
   'city': 'İstanbul',
   'state': 'İstanbul',
   'country': 'Türkiye',
   'formattedAddress': ['Bahariye caddesi Halil Ethem sokak Kafkas pasajı no:32/9 kadıköy (Bahariye caddesi)',
    '34710 istanbul',
    'Türkiye']},
  'categories': [{'id': '52f2ab2ebcbc57f1066b8b30',
    'name': 'Used Bookstore',
    'pluralName': 'Used Bookstores',
    'shortName': 'Used Bookstore',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/bookstore_',
     'suffix': '.png'},
    'primary': True}],
  'referralId': 'v-1568901109',
  'hasPerk': False},
 {'id': '4cb1d3d25430b713620a3816',
  'name': 'Kadıköy Halk Eğitim Merkezi',
  'location': {'address': 'Bahariye Cad. No:39',
   'lat': 40.98681445940722,
   'lng': 29.028980631454242,
   'labeledLatLngs': [{'label': 'display',
     'lat': 40.98681445940722,
     'lng': 29.028980631454242}],
   'distance': 35,
   'cc': 'TR',
   'city': 'İstanbul',
   'state': 'İstanbul',
   'country': 'Türkiye',
   'formattedAddress': ['Bahariye Cad. No:39', 'İstanbul', 'Türkiye']},
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    'name': 'Theater',
    'pluralName': 'Theaters',
    'shortName': 'Theater',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_entertainment/performingarts_theater_',
     'suffix': '.png'},
    'primary': True}],
  'venuePage': {'id': '98679464'},
  'referralId': 'v-1568901109',
  'hasPerk': False},
 {'id': '58e1177051666a461ee699d4',
  'name': 'Somunarası&Balkan Köftecisi Kadıköy',
  'location': {'lat': 40.98722470185736,
   'lng': 29.02827048393922,
   'labeledLatLngs': [{'label': 'display',
     'lat': 40.98722470185736,
     'lng': 29.02827048393922}],
   'distance': 39,
   'cc': 'TR',
   'neighborhood': 'Osmanağa',
```

```
   'city': 'İstanbul',
   'state': 'İstanbul',
   'country': 'Türkiye',
   'formattedAddress': ['İstanbul', 'Türkiye']},
  'categories': [{'id': '5283c7b4e4b094cb91ec88db',
    'name': 'Kofte Place',
    'pluralName': 'Kofte Places',
    'shortName': 'Kofte',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/turkish_',
     'suffix': '.png'},
    'primary': True}],
  'referralId': 'v-1568901109',
  'hasPerk': False},
 {'id': '5343b913498e8e4bbd87f139',
  'name': 'Kafkas Inguş Dostluk Derneği',
  'location': {'lat': 40.9868621835702,
   'lng': 29.028720166516855,
   'labeledLatLngs': [{'label': 'display',
     'lat': 40.9868621835702,
     'lng': 29.028720166516855}],
   'distance': 17,
   'cc': 'TR',
   'country': 'Türkiye',
   'formattedAddress': ['Türkiye']},
  'categories': [{'id': '52e81612bcbc57f1066b7a33',
    'name': 'Social Club',
    'pluralName': 'Social Clubs',
    'shortName': 'Social Club',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/building/default_',
     'suffix': '.png'},
    'primary': True}],
  'referralId': 'v-1568901109',
  'hasPerk': False},
 {'id': '55070d1b498edf5e04619e8a',
  'name': 'Moda Sahaflar Çarşısı',
  'location': {'lat': 40.98706143066271,
   'lng': 29.029106610726412,
   'labeledLatLngs': [{'label': 'display',
     'lat': 40.98706143066271,
     'lng': 29.029106610726412}],
   'distance': 39,
   'cc': 'TR',
   'country': 'Türkiye',
   'formattedAddress': ['Türkiye']},
  'categories': [{'id': '52f2ab2ebcbc57f1066b8b30',
    'name': 'Used Bookstore',
    'pluralName': 'Used Bookstores',
    'shortName': 'Used Bookstore',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/bookstore_',
     'suffix': '.png'},
    'primary': True}],
  'referralId': 'v-1568901109',
  'hasPerk': False},
 {'id': '532f2e31498e224e7c7ba118',
  'name': 'Artemis Sahaf',
  'location': {'address': 'Bahariye Caddesi Kafkas Pasajı 37/16',
   'lat': 40.98709330932396,
   'lng': 29.028765630592066,
   'labeledLatLngs': [{'label': 'display',
     'lat': 40.98709330932396,
     'lng': 29.028765630592066}],
   'distance': 14,
   'cc': 'TR',
   'city': 'Kadıköy',
   'state': 'İstanbul',
   'country': 'Türkiye',
   'formattedAddress': ['Bahariye Caddesi Kafkas Pasajı 37/16',
    'Kadıköy',
    'Türkiye']},
  'categories': [{'id': '52f2ab2ebcbc57f1066b8b30',
    'name': 'Used Bookstore',
    'pluralName': 'Used Bookstores',
    'shortName': 'Used Bookstore',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/bookstore_',
     'suffix': '.png'},
```

```
    'primary': True}],
  'referralId': 'v-1568901109',
  'hasPerk': False},
 {'id': '5338313d498ebde29661035b',
  'name': 'Raremancers',
  'location': {'address': 'Kafkas Pasajı No:32/36',
   'crossStreet': 'Kadıköy',
   'lat': 40.986974620500064,
   'lng': 29.028912108245052,
   'labeledLatLngs': [{'label': 'display',
     'lat': 40.986974620500064,
     'lng': 29.028912108245052}],
   'distance': 22,
   'cc': 'TR',
   'city': 'İstanbul',
   'state': 'İstanbul',
   'country': 'Türkiye',
   'formattedAddress': ['Kafkas Pasajı No:32/36 (Kadıköy)',
    'İstanbul',
    'Türkiye']},
  'categories': [{'id': '4bf58dd8d48988d114951735',
    'name': 'Bookstore',
    'pluralName': 'Bookstores',
    'shortName': 'Bookstore',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/bookstore_',
     'suffix': '.png'},
    'primary': True}],
  'referralId': 'v-1568901109',
  'hasPerk': False},
 {'id': '4c5a99832091a5934dab5fd0',
  'name': 'Be Nu Me',
  'location': {'address': 'Bahariye',
   'lat': 40.986948428213715,
   'lng': 29.028339120194385,
   'labeledLatLngs': [{'label': 'display',
     'lat': 40.986948428213715,
     'lng': 29.028339120194385}],
   'distance': 26,
   'cc': 'TR',
   'city': 'İstanbul',
   'state': 'İstanbul',
   'country': 'Türkiye',
   'formattedAddress': ['Bahariye', 'Istanbul', 'Türkiye']},
  'categories': [{'id': '4bf58dd8d48988d16e941735',
    'name': 'Fast Food Restaurant',
    'pluralName': 'Fast Food Restaurants',
    'shortName': 'Fast Food',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/fastfood_',
     'suffix': '.png'},
    'primary': True}],
  'referralId': 'v-1568901109',
  'hasPerk': False},
 {'id': '59cd251517556275f59f00e7',
  'name': 'penguen cafe',
  'location': {'crossStreet': 'Bahariye Caddesi',
   'lat': 40.98713969057004,
   'lng': 29.029119209743257,
   'labeledLatLngs': [{'label': 'display',
     'lat': 40.98713969057004,
     'lng': 29.029119209743257}],
   'distance': 42,
   'cc': 'TR',
   'city': 'İstanbul',
   'state': 'İstanbul',
   'country': 'Türkiye',
   'formattedAddress': ['Bahariye Caddesi', 'İstanbul', 'Türkiye']},
  'categories': [{'id': '4bf58dd8d48988d16d941735',
    'name': 'Café',
    'pluralName': 'Cafés',
    'shortName': 'Café',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/cafe_',
     'suffix': '.png'},
    'primary': True}],
  'referralId': 'v-1568901109',
  'hasPerk': False}]
```

```
kad_nearby_venues = json_normalize(kad_venues) # flatten JSON

# filter columns
filtered_columns = ['name', 'categories', 'location.lat', 'location.lng', 'location.address']
kad_nearby_venues = kad_nearby_venues.loc[:, filtered_columns]

# filter the category for each row
kad_nearby_venues['categories'] = kad_nearby_venues.apply(get_category_type, axis=1)

# clean columns
kad_nearby_venues.columns = [col.split(".")[-1] for col in kad_nearby_venues.columns]

kad_nearby_venues.head(10)
```

<style scoped> .dataframe tbody tr th:only-of-type { vertical-align: middle; }

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.dataframe tbody tr th {
    vertical-align: top;
}

.dataframe thead th {
    text-align: right;
}
```

</style>

	name	categories	lat	lng	address
0	Moda Sahnesi	Theater	40.986998	29.028516	General Asım Gündüz Cad. (Bahariye Cad.) Halil...
1	Kamo Kitabevi	Used Bookstore	40.986971	29.028739	Bahariye caddesi Halil Ethem sokak Kafkas pasa...
2	Kadıköy Halk Eğitim Merkezi	Theater	40.986814	29.028981	Bahariye Cad. No:39
3	Somunarası&Balkan Köftecisi Kadıköy	Kofte Place	40.987225	29.028270	NaN
4	Kafkas Inguş Dostluk Derneği	Social Club	40.986862	29.028720	NaN
5	Moda Sahaflar Çarşısı	Used Bookstore	40.987061	29.029107	NaN
6	Artemis Sahaf	Used Bookstore	40.987093	29.028766	Bahariye Caddesi Kafkas Pasajı 37/16
7	Raremancers	Bookstore	40.986975	29.028912	Kafkas Pasajı No:32/36
8	Be Nu Me	Fast Food Restaurant	40.986948	29.028339	Bahariye
9	penguen cafe	Café	40.987140	29.029119	NaN

```
print('{} venues were returned by Foursquare.'.format(kad_nearby_venues.shape[0]))
```

```
189 venues were returned by Foursquare.
```

```
kad_category_counts_df = kad_nearby_venues['categories'].value_counts().to_frame()
```

```
kad_category_counts_df.head(10)
```

<style scoped> .dataframe tbody tr th:only-of-type { vertical-align: middle; }

```
.dataframe tbody tr th {
    vertical-align: top;
```

```
}

.dataframe thead th {
    text-align: right;
}
```

</style>

	categories
Office	20
Coworking Space	16
Dentist's Office	8
Building	7
Café	7
Business Center	7
Theater	6
Art Gallery	6
Courthouse	6
Used Bookstore	4

Top 10 categories

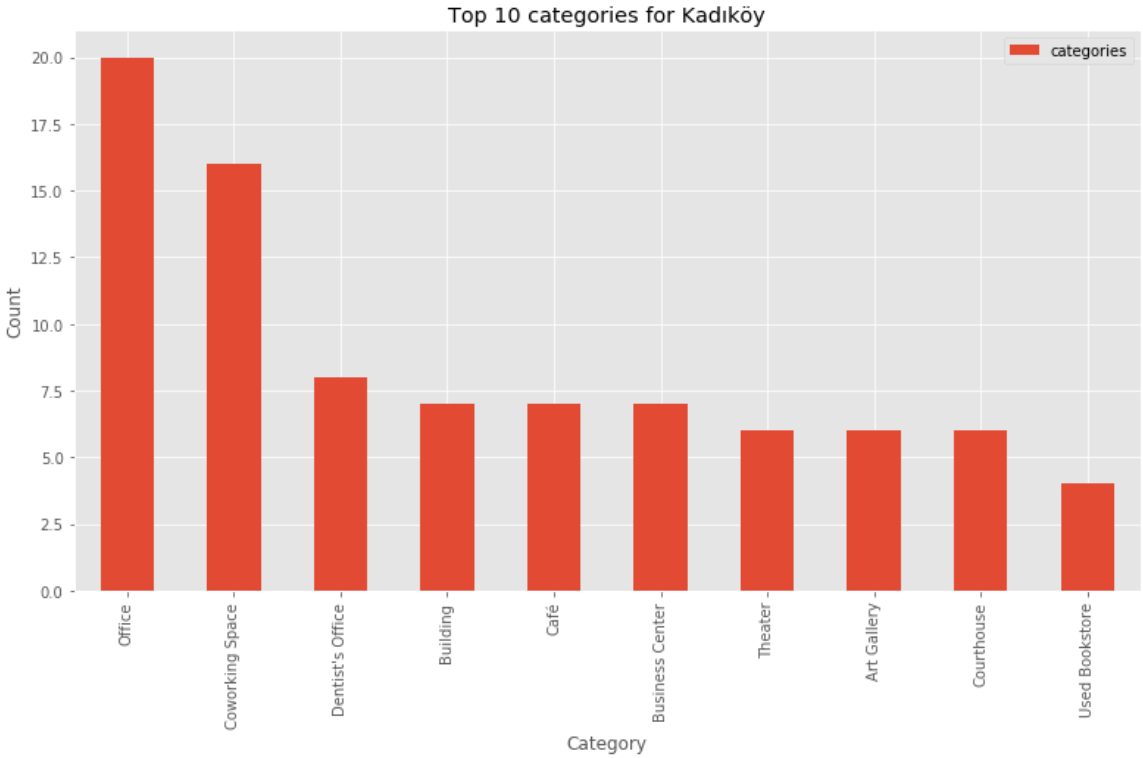
```
kad_category_top_10 = kad_category_counts_df.head(10)
```

Plot the top 10 categories.

```
kad_category_top_10.plot(kind='bar', figsize=(13, 7))

plt.title('Top 10 categories for Kadıköy')
plt.xlabel('Category')
plt.ylabel('Count')

plt.show()
```



Create empty dataframe for putting top 10 categories.

```
num_top_venues = 10

indicators = ['st', 'nd', 'rd']

# create columns according to number of top venues
columns = ['Borough']
for ind in np.arange(num_top_venues):
    try:
        columns.append('{}{} Most Common Venue'.format(ind+1, indicators[ind]))
    except:
        columns.append('{}th Most Common Venue'.format(ind+1))

kadikoy_top_10_categories_df = pd.DataFrame(columns=columns)
```

Fill the dataframe.

```
kadikoy_top_10_categories_df.loc[0] = ['Kadıköy'] + list(kad_category_counts_df.head(10).index.values)
```

```
kadikoy_top_10_categories_df
```

<style scoped> .dataframe tbody tr th:only-of-type { vertical-align: middle; }

```
.dataframe tbody tr th {
    vertical-align: top;
}

.dataframe thead th {
    text-align: right;
}
```

</style>

	Borough	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Mo Comm Venu

	Borough	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Mc Comm Venu
0	Kadıköy	Office	Coworking Space	Dentist's Office	Building	Café	Business Center	Theater	Art Gallery	Courtho

Get average rent price for Kadıköy.

```
_, kadikoy_avg_rent = get_average_prices()
```

```
*** Parsing url: https://www.zingat.com/beyoglu-bolge-raporu ...
*** Response status: 200
Avg. Rent Price for BEYOGLU: 3.413

*** Parsing url: https://www.zingat.com/kadikoy-bolge-raporu ...
*** Response status: 200
Avg. Rent Price for KADIKOY: 2.179
```

```
kadikoy_top_10_categories_df['Average Rent'] = kadikoy_avg_rent * 1000
```

```
kadikoy_top_10_categories_df
```

<style scoped> .dataframe tbody tr th:only-of-type { vertical-align: middle; }

```
.dataframe tbody tr th {
    vertical-align: top;
}

.dataframe thead th {
    text-align: right;
}
```

</style>

	Borough	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Mc Comm Venu
0	Kadıköy	Office	Coworking Space	Dentist's Office	Building	Café	Business Center	Theater	Art Gallery	Courtho

Create a new merged dataframe for results.

```
results_df = pd.DataFrame(columns=beyoglu_top_10_categories_df.columns)
```

```
results_df.loc[0] = beyoglu_top_10_categories_df.loc[0]
results_df.loc[1] = kadikoy_top_10_categories_df.loc[0]
```

```
results_df
```

<style scoped> .dataframe tbody tr th:only-of-type { vertical-align: middle; }

```
.dataframe tbody tr th {
    vertical-align: top;
}
```

```
.dataframe thead th {
    text-align: right;
}
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</style>

	Borough	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9t C
0	Beyoğlu	Restaurant	Nightclub	Seafood Restaurant	Bookstore	Turkish Restaurant	Café	Office	Building	Bar
1	Kadıköy	Office	Coworking Space	Dentist's Office	Building	Café	Business Center	Theater	Art Gallery	Cou

Plot results side by side.

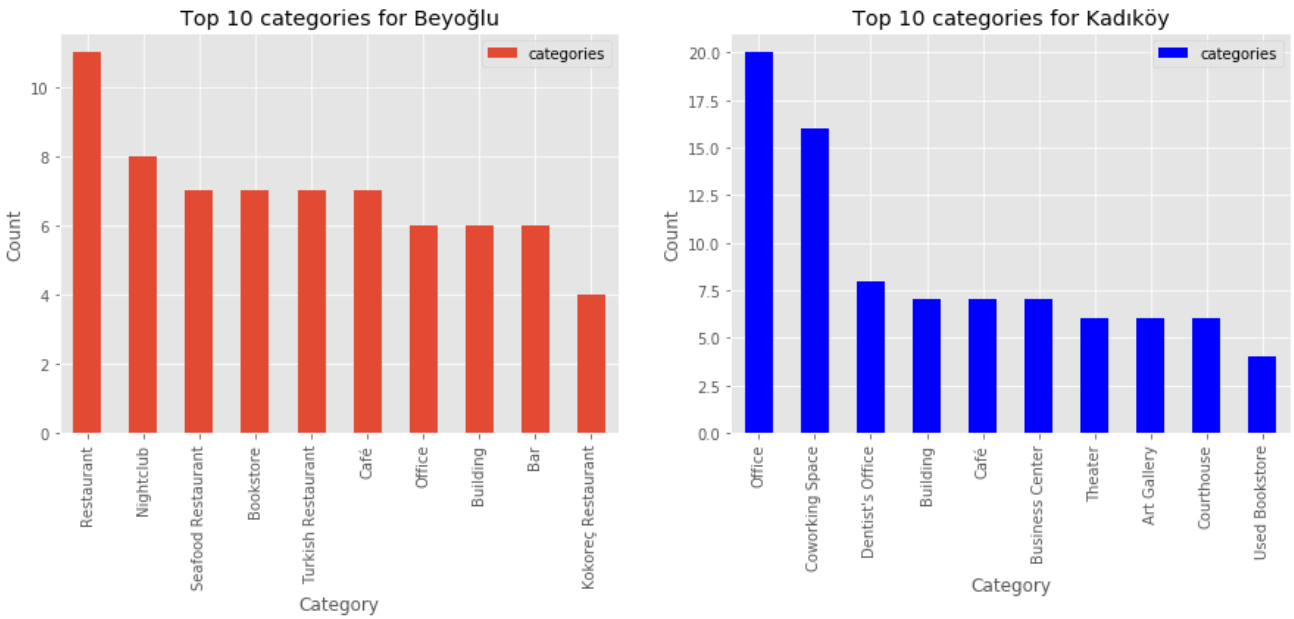
```
fig = plt.figure()

ax0 = fig.add_subplot(121)
ax1 = fig.add_subplot(122)

# Subplot 1 for Beyoğlu
category_top_10.plot(kind='bar', figsize=(15, 5), ax=ax0)
ax0.set_title('Top 10 categories for Beyoğlu')
ax0.set_xlabel('Category')
ax0.set_ylabel('Count')

# Subplot 2 for Kadıköy
kad_category_top_10.plot(kind='bar', color='blue', figsize=(15, 5), ax=ax1)
ax1.set_title('Top 10 categories for Kadıköy')
ax1.set_xlabel('Category')
ax1.set_ylabel('Count')

plt.show()
```



4. Results and Discussion

In this project, I started with explaining the intention of project, and gave a brief background information about Istanbul. I selected the two popular boroughs of Istanbul, and showed them on the map.

First, I started to analyze venues for Beyoğlu borough. I received the venue information near the middle point of Istiklal Street, and then extracted categories of venues. Then I obtained the top 10 venue categories. Finally, I showed the top 10 result as a bar plot.

I repeated the same process for Kadıköy borough, and merged the results.

I also received the average house renting prices for both boroughs by parsing a real estate website.

Since I selected a small part of the boroughs, it may not give exact opinion, but it gives a general idea about venues, their densities and types in the determined areas.

5. Conclusion

Purpose of this project was to give an idea to investors that will open a venue in a popular place of Istanbul.

In spite of Beyoğlu lost its popularity recently, it is still a good option to opening an entartainment based place. On the other hand, renting price averages are much more expensive than Kadıköy.

This data can give information not just to investors, but also to city authorities to take action.