CLUSTERING DISTRICTS OF ISTANBUL

DATA SCIENCE PROJECT

INTRODUCTION

Istanbul is a big city with huge population and great places to live. But with many options to open a restaurant, how we can determine the best places to open a restaurant in exactly true location that is supported with data science

In this project, Our stakeholders want to open a restaurant but they do not have any idea where to open it . Their restaurant is a fast-food chain that is really famous over the world. They want to open their restaurants first in Istanbul,since Istanbul is the biggest city in Turkey with their capacity and population and other advantages.

DATA

We will use following data for our project ;

1. Borough’s general information that includes population,annual income etc. From Wikipedia(https://en.wikipedia.org/wiki/List_of_districts_of_Istanbul)
2. Geopy Library to get location information of boroughs.
3. Foursquare Api will be used to get information of venues.

DATASET BEFORE CLEANED

	District	Population (2020)	Area (km²)	Density (per km²)	Mensual household income TL(USD)	Annual household income TL(USD)
0	Adalar	16033	11.05	1451	6.652₺ (918$)	79.821₺ (10,978$)
1	Arnavutköy	296709	450.35	659	2.030₺ (279$)	24.360₺ (3,350$)
2	Ataşehir	422594	25.23	16750	6.577₺ (904$)	78.924₺ (10,854$)
3	Avcılar	436897	42.01	10400	3.662₺ (503$)	43.938₺ (6,064$)
4	Bağcılar	737206	22.36	32970	3.197₺ (441$)	38.367₺ (5,295$)

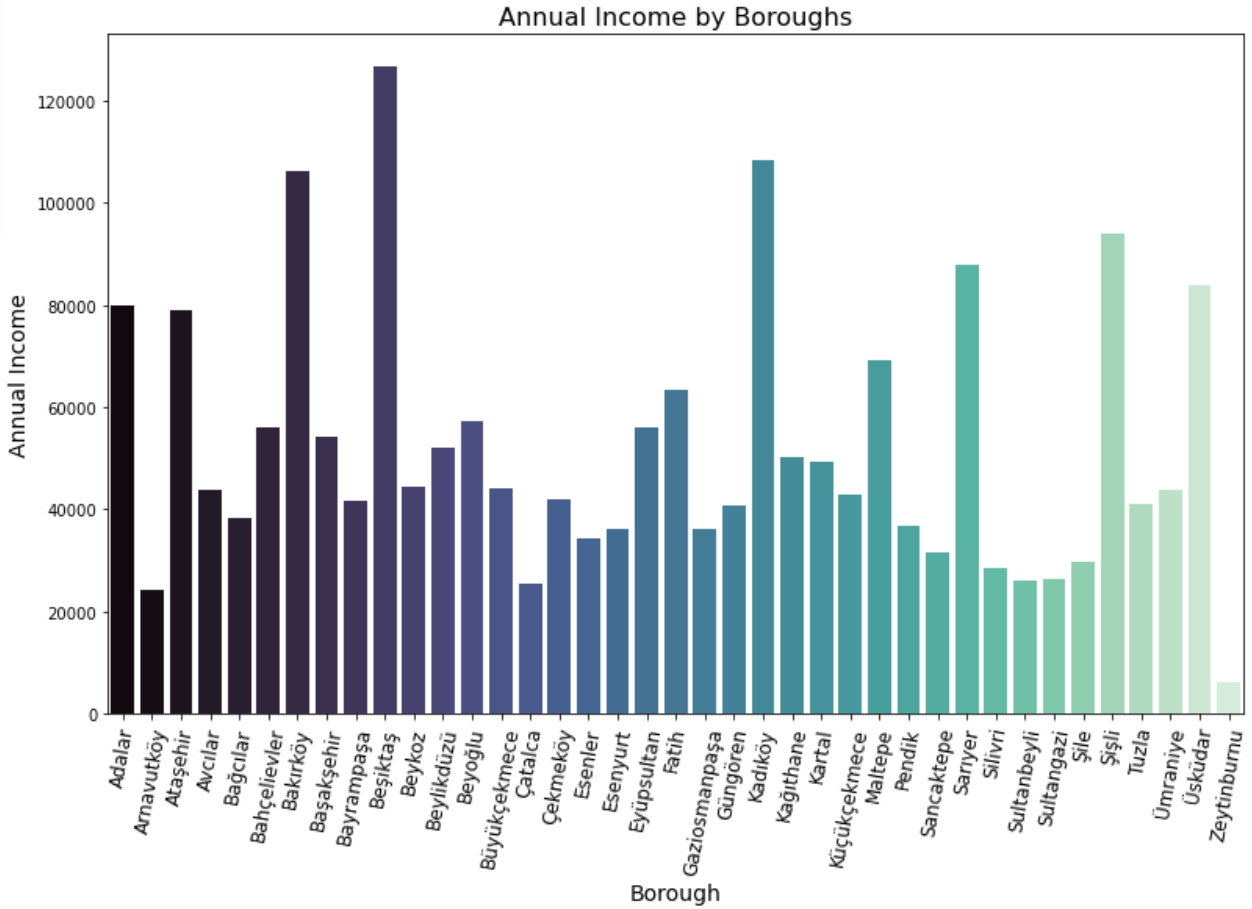
CLEANED DATASET

	Borough	Population	Area	Density	Mensual_Household_Income	Annual_Income
0	Adalar	16033	11	1451	6652	79821
1	Arnavutköy	296709	450	659	2030	24360
2	Ataşehir	422594	25	16750	6577	78924
3	Avcılar	436897	42	10400	3662	43938
4	Bağcılar	737206	22	32970	3197	38367

- Missing Values Checked
- Deleting TRY and USD Symbol
- Changed column name

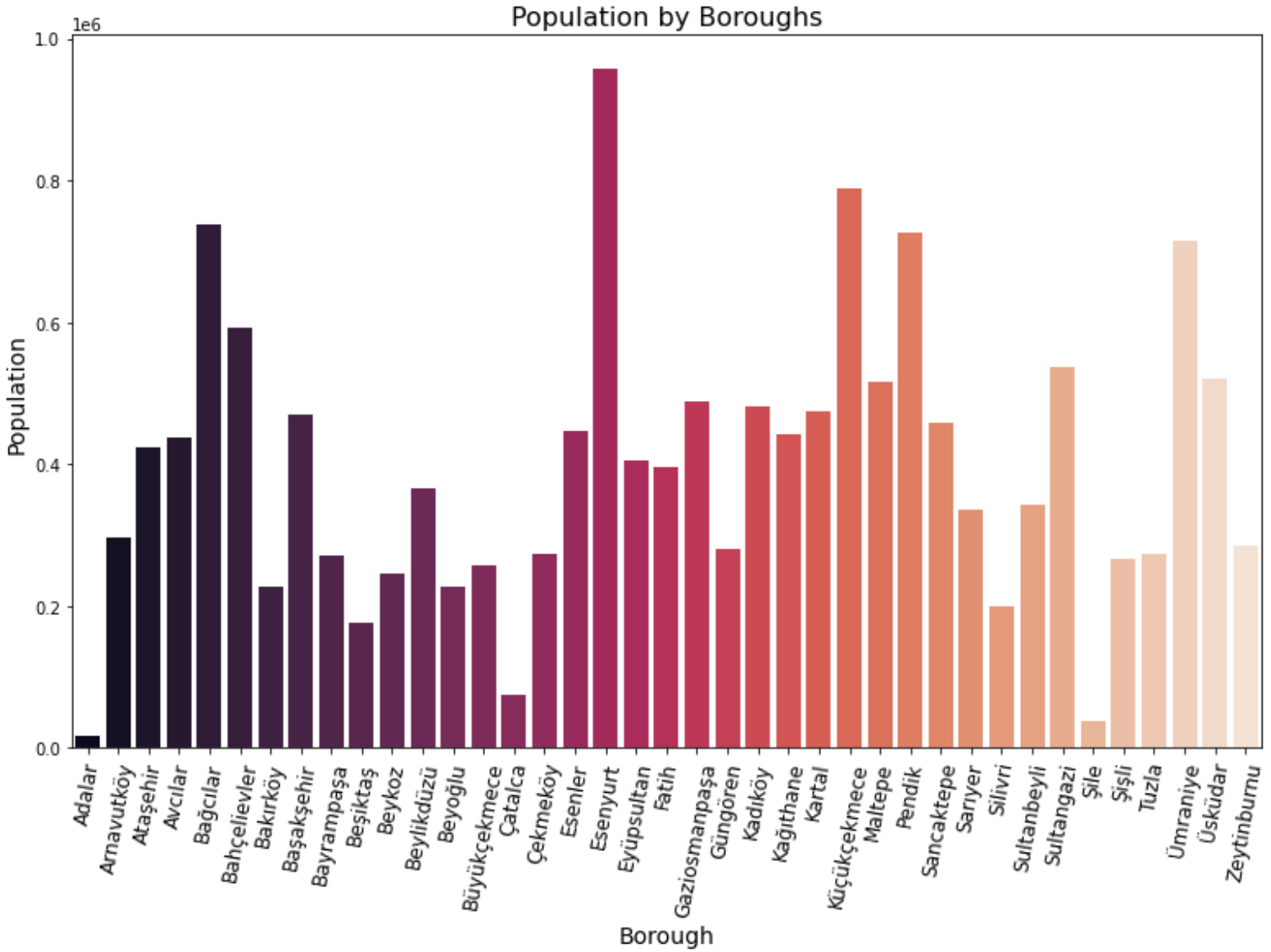
- Most Boroughs has annual income between 20000-40000 TRY

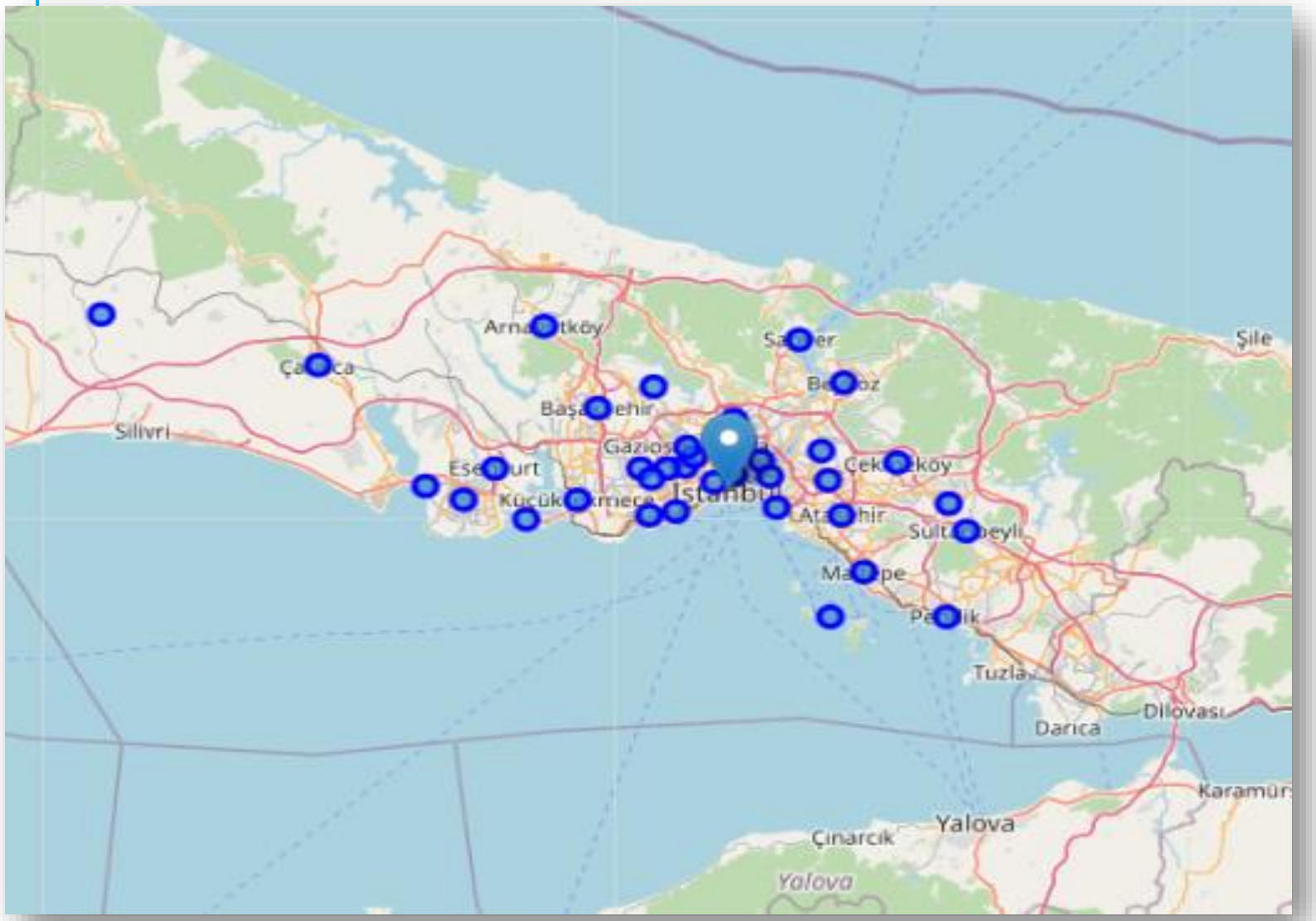
- People in Besiktas has the highest annual income
- Zeytinburnu is the district which has lowest annual income



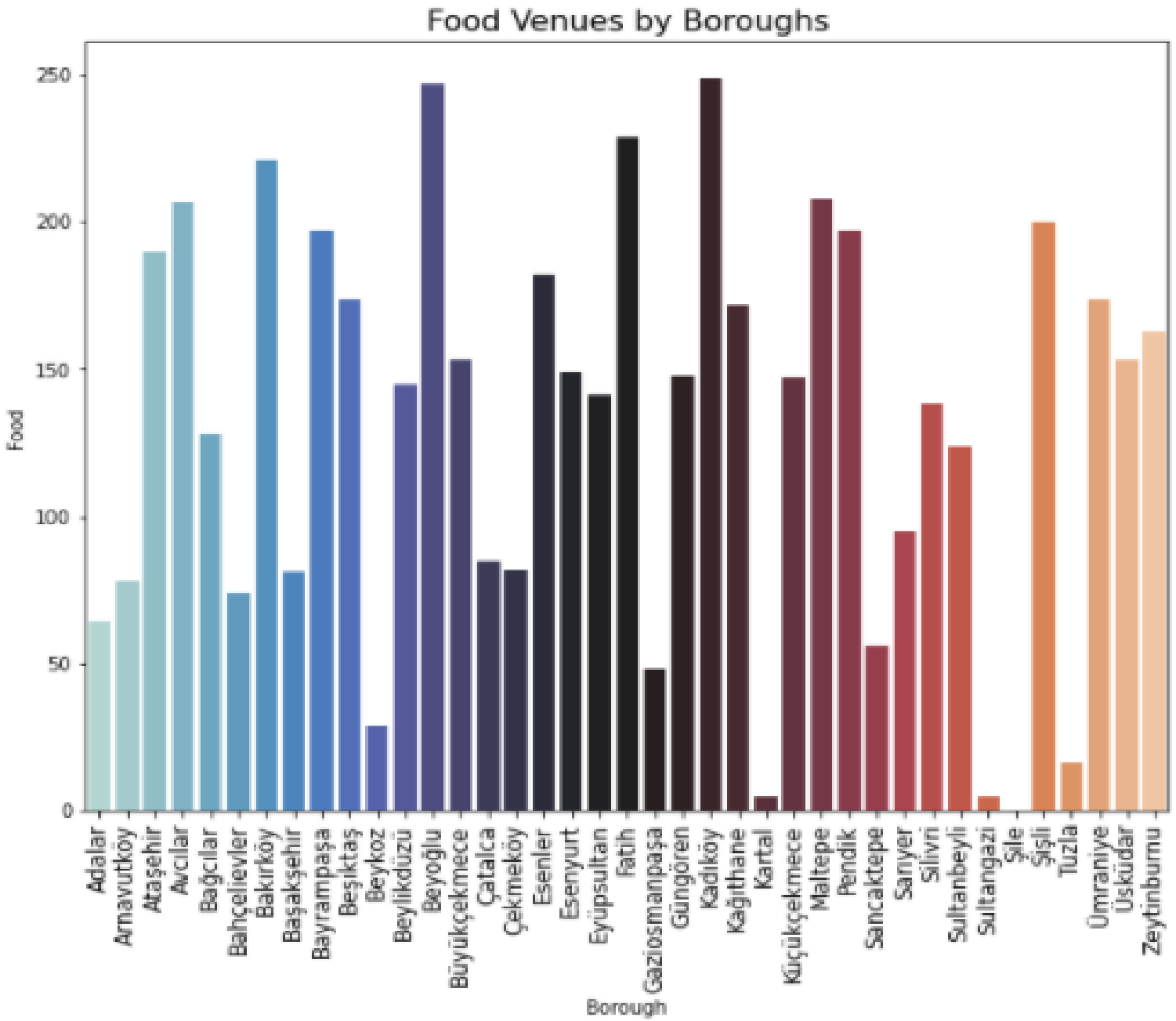
POPULATION BY BOROUGHS

- Esenyurt has the highest population whereas Adalar has the lowest value.



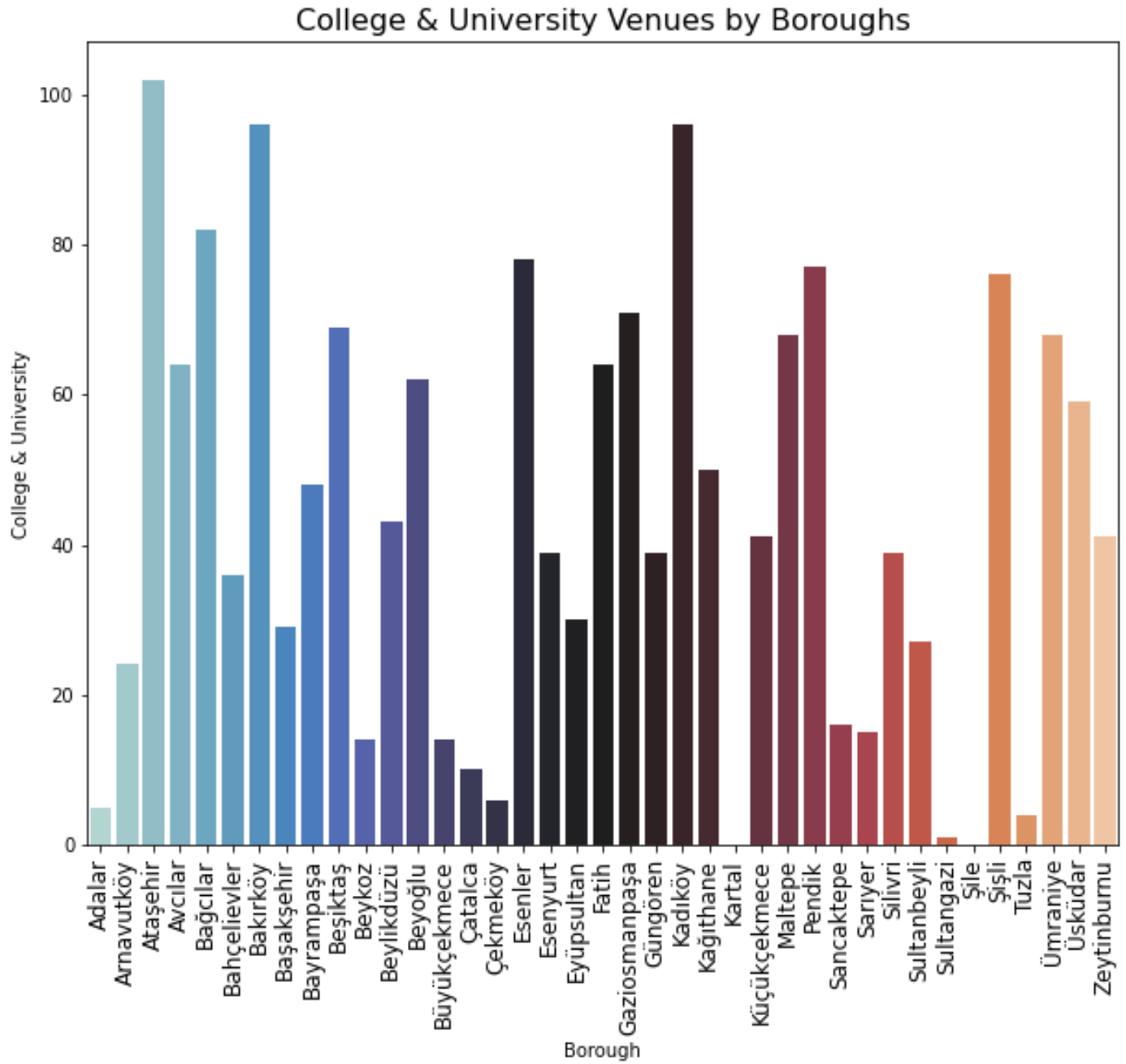


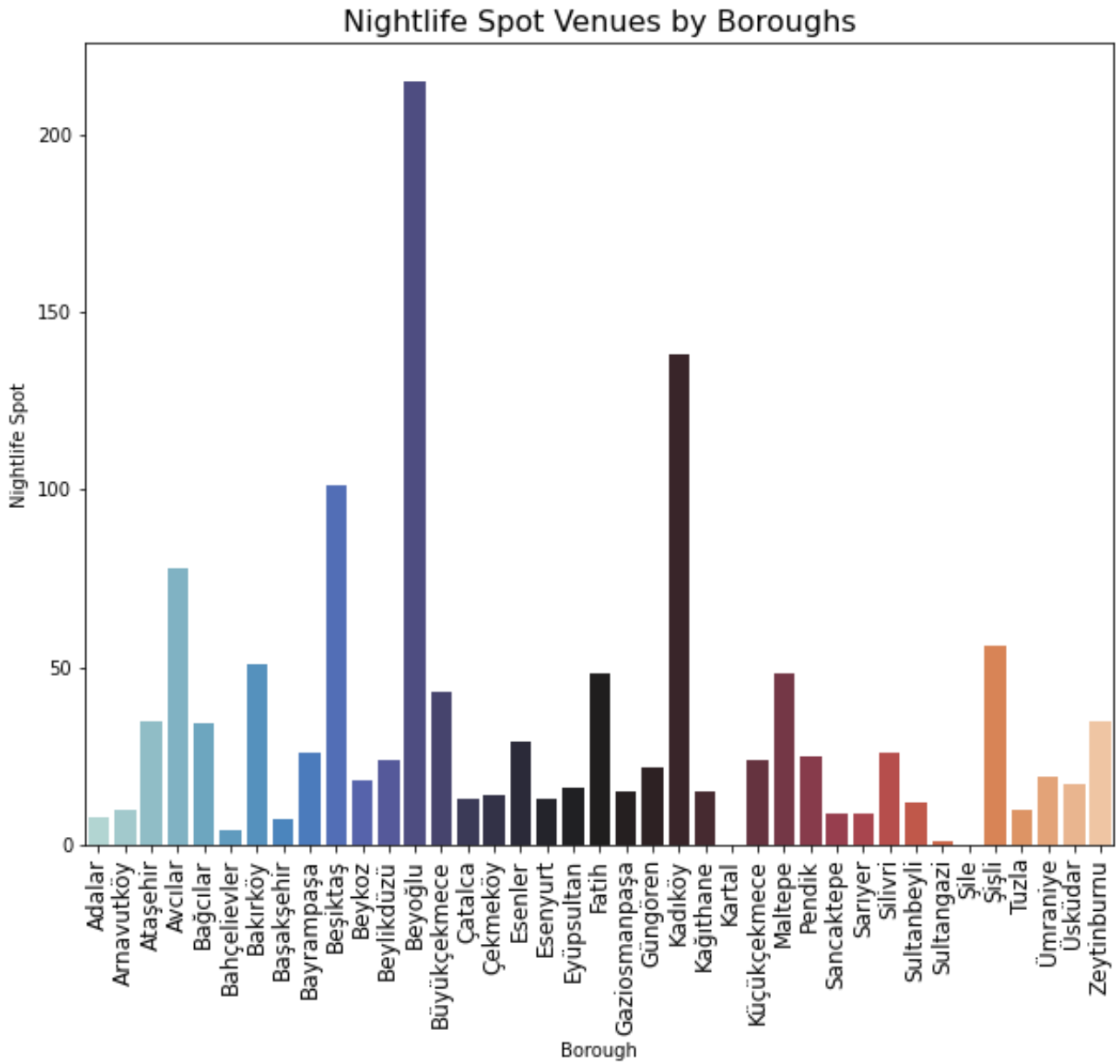
- Most of the boroughs are closer each other .
- A couple of district such as Kadikoy, Besiktas, Maltepe are so close to sea.



- Beyoglu and Kadikoy have the higher number of food venues.
- There is only several places in Sile,Sultangazi and Kartal.

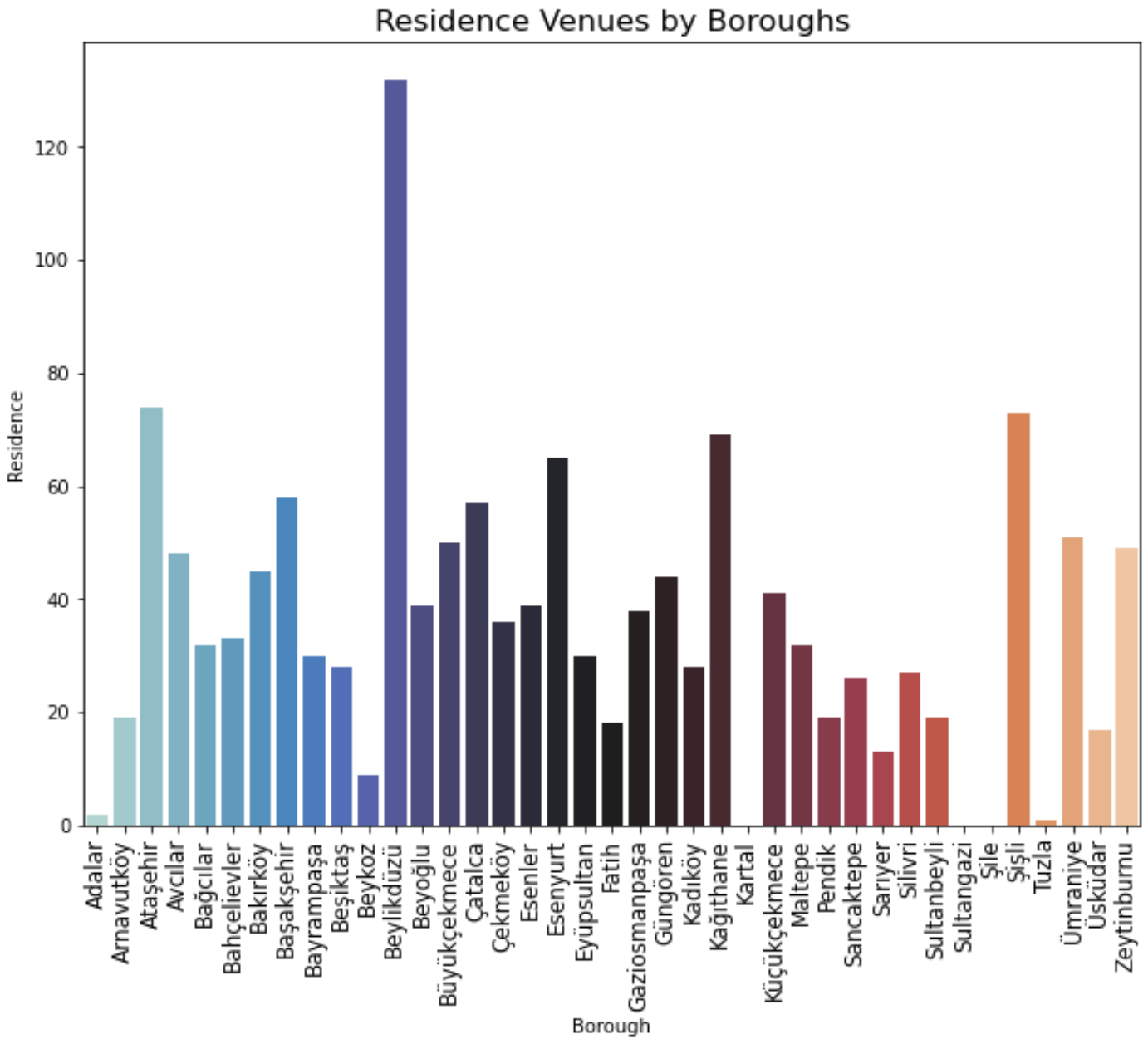
Most of the colleges and universities are in Atasehir,Kadikoy,Bakirkoy
There are several schools in Adalar,Kartal,Sultangazi





- Most of Night spot is observed in Beyoglu and Kadikoy.

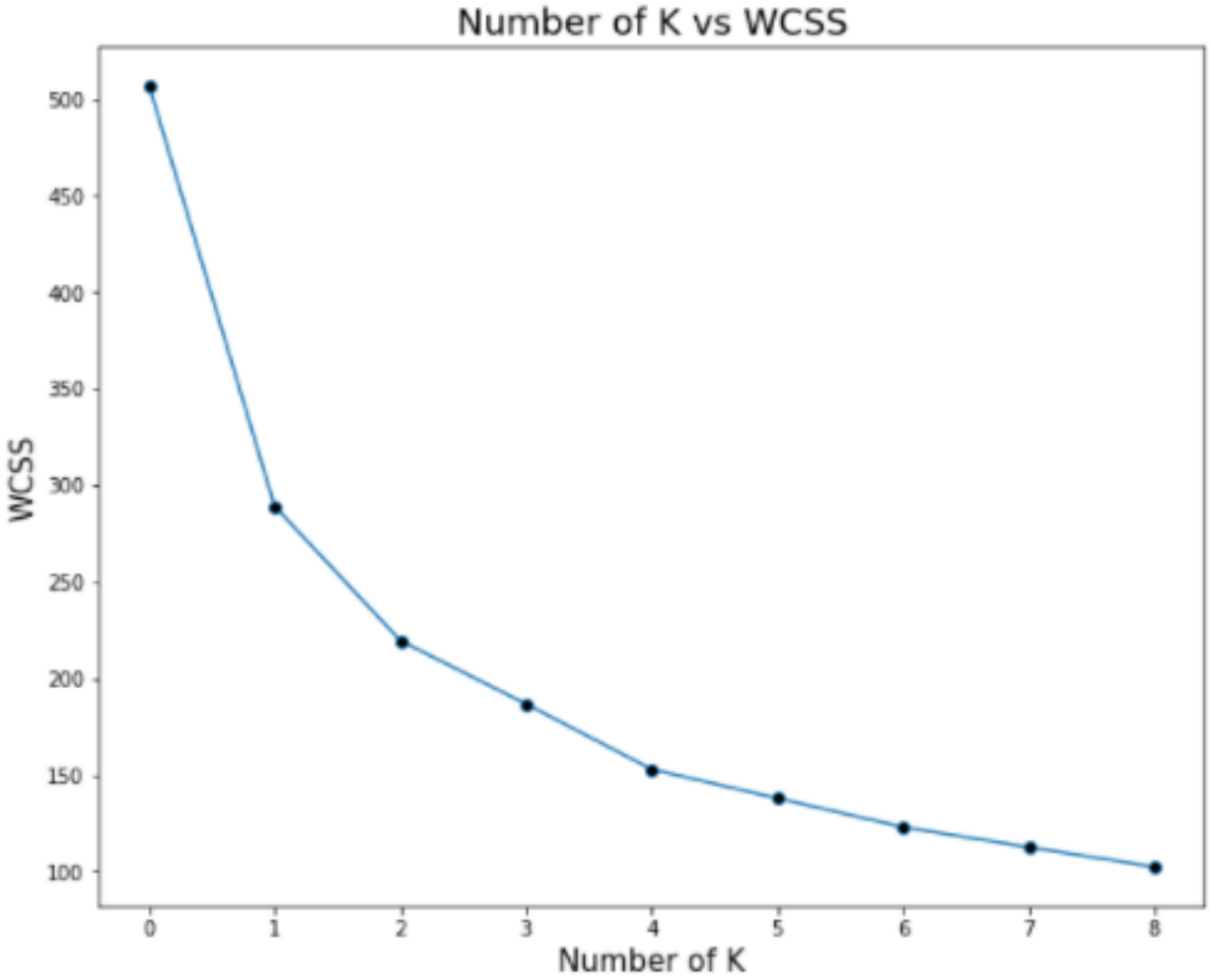
- Number of Residence in Beylikduzu is significantly high.
- There is no residence observed in Sile,Sultangazi and Kartal.



CLUSTERING GROUPING BOROUGHS

We have some common venue categories in boroughs. In this reason I used unsupervised learning algorithm. K-Means algorithm will help us group boroughs with their similar features

CHOOSING NUMBER OF CLUSTER WITH ELBOW METHOD



Before proceed K-Means Algorithm, K value selected. In this study, K value will be 3.

CLUSTER 0

	Borough	Population	Density	Annual_Income	Arts & Entertainment	College & University	Food	Nightlife Spot	Outdoors & Recreation	Professional & Other Places	Residence	Shop & Service	Travel & Transport	Labels
0	Bakırköy	226229	7633	106140	53	96	221	51	109	161	45	148	71	0
1	Beşiktaş	176513	9801	126720	73	69	174	101	80	118	28	76	95	0
2	Beyoğlu	226396	25409	57275	150	62	247	215	92	193	39	173	156	0
3	Kadıköy	481983	19210	108300	139	96	249	138	107	148	28	160	120	0
4	Şişli	266793	24911	93864	63	76	200	56	100	151	73	116	95	0

CLUSTER 1

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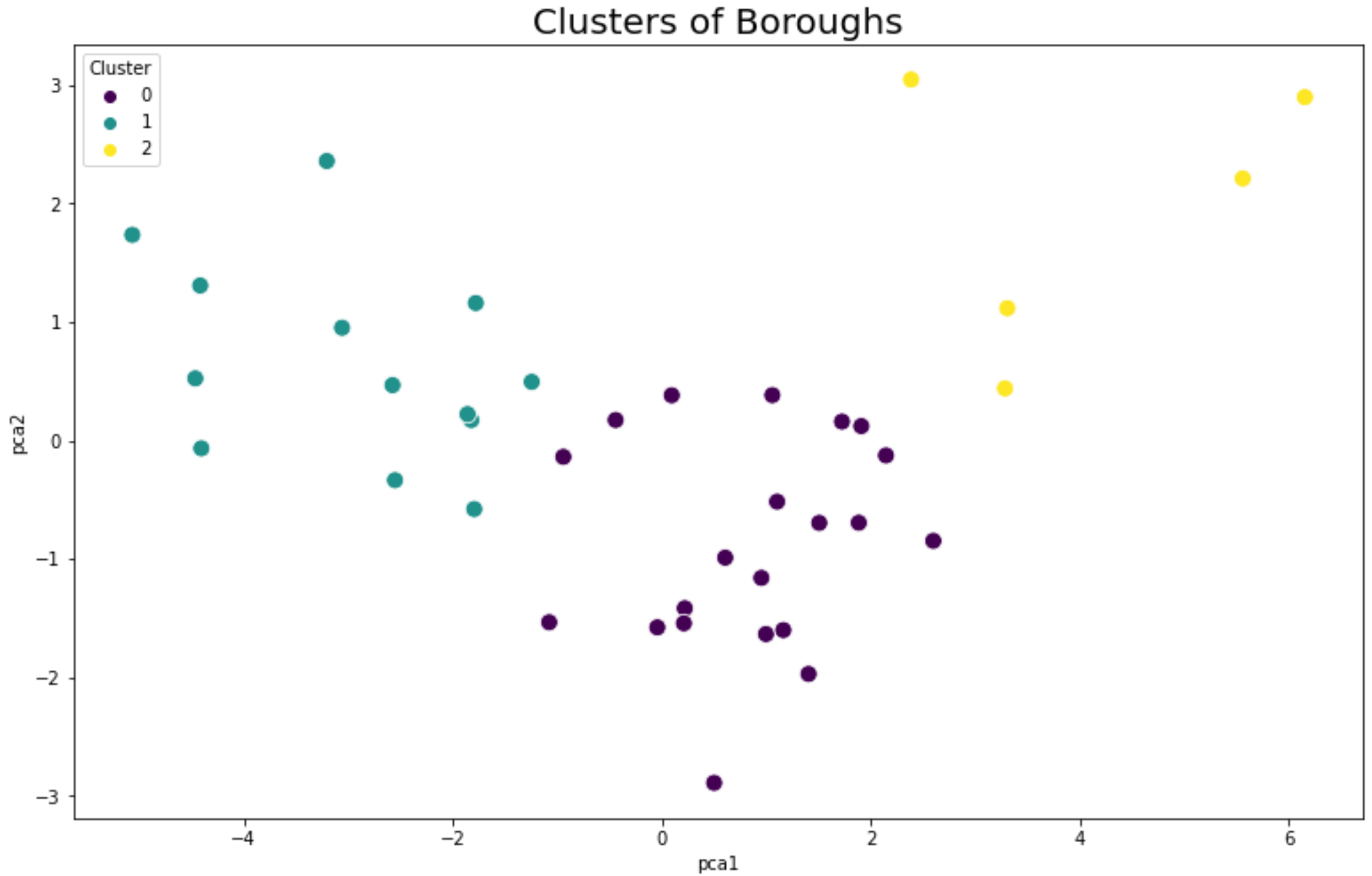
	Borough	Population	Density	Annual_Income	Arts & Entertainment	College & University	Food	Nightlife Spot	Outdoors & Recreation	Professional & Other Places	Residence	Shop & Service	Travel & Transport	Labels
0	Ataşehir	422594	16750	78924	28	102	190	35	106	162	74	113	54	1
1	Avcılar	436897	10400	43938	41	64	207	78	101	114	48	105	75	1
2	Bağcılar	737206	32970	38367	52	82	128	34	111	107	32	103	26	1
3	Bahçelievler	592371	35642	56088	12	36	74	4	69	72	33	65	11	1
4	Bayrampaşa	269950	28091	41762	43	48	197	26	109	161	30	149	43	1
5	Beylikdüzü	365572	9676	51924	27	43	145	24	82	91	132	77	15	1
6	Esenler	446276	24215	34164	30	78	182	29	99	113	39	74	97	1
7	Esenyurt	957398	22198	36288	23	39	149	13	81	127	65	115	18	1
8	Eyüpsultan	405845	1777	56044	11	30	141	16	80	136	30	62	45	1
9	Fatih	396594	25439	63378	35	64	229	48	102	160	18	109	60	1
10	Gaziosmanpaşa	487778	41478	36228	43	71	48	15	67	125	38	72	37	1
11	Güngören	280299	38876	40656	32	39	148	22	87	144	44	118	35	1
12	Kağıthane	442415	29752	50260	23	50	172	15	93	145	69	83	34	1
13	Küçükçekmece	789633	21034	42804	36	41	147	24	86	83	41	67	24	1
14	Maltepe	515021	9723	69259	46	68	208	48	97	112	32	114	57	1
15	Pendik	726481	4036	36664	38	77	197	25	81	109	19	102	78	1
16	Silivri	200215	230	28464	30	39	138	26	85	134	27	126	39	1
17	Sultanbeyli	343318	11782	26064	25	27	124	12	56	112	19	91	31	1
18	Ümraniye	713803	15754	43641	25	68	174	19	89	122	51	113	52	1
19	Üsküdar	520771	14740	83839	43	59	153	17	87	117	17	87	76	1
20	Zeytinburnu	283657	24474	6036	31	41	163	35	75	115	49	135	47	1

CLUSTER 2

	Borough	Population	Density	Annual_Income	Arts & Entertainment	College & University	Food	Nightlife Spot	Outdoors & Recreation	Professional & Other Places	Residence	Shop & Service	Travel & Transport	Labels
0	Adalar	16033	1451	79821	5	5	64	8	46	25	2	7	26	2
1	Arnavutköy	296709	659	24360	17	24	78	10	51	101	19	90	13	2
2	Başakşehir	469924	4506	54152	3	29	81	7	48	89	58	57	5	2
3	Beykoz	246110	793	44316	6	14	29	18	45	76	9	20	5	2
4	Büyükçekmece	257362	1849	44049	10	14	153	43	76	58	50	55	25	2
5	Çatalca	74975	67	25536	6	10	85	13	53	106	57	85	12	2
6	Çekmeköy	273658	1848	42033	11	6	82	14	42	68	36	43	6	2
7	Kartal	474514	12312	49443	1	0	5	0	1	5	0	4	2	2
8	Sancaktepe	456861	7319	31602	8	16	56	9	42	91	26	35	5	2
9	Sarıyer	335298	1912	87696	11	15	95	9	60	75	13	54	21	2
10	Sultangazi	537488	14807	26244	4	1	5	1	4	18	0	1	2	2
11	Şile	37904	48	29789	0	0	0	0	0	0	0	0	0	2
12	Tuzla	273608	2213	40884	8	4	16	10	5	7	1	6	2	2


Clusters of Boroughs
Cluster
0
1
2
pca2
pca1
3
2
1
0
−1
−2
−3
−4
−2
0
2
4
6

RESULTS

Cluster 0 : This group has higher number of venues and annual income. There are many Transportation ,Food Venues,Nightlife Spot in this group.If our menu is expensive. We can choose to start with this group.

Cluster 1 : Boroughs in this group has higher population compared to cluster 0. There are many food venue. Annual income of this group is average of entire boroughs.It is a middle segment group of our analysis.

Cluster 2 : This group has the lowest venue and people who live in these boroughs has average annual.Their population is also lower than others in general.

CONCLUSION

In this project , We used K-Means algorithm to cluster our dataset.K-Means clustering algorithm is moslty used algorithm amongst Unsupervised Learning.

After we explore our dataset with venues information. With this study , We can get important information based on Boroughs.

To get business decision to open a restaurant , We could also expand our dataset with venues name,population details etc. to target more specifically.

This project also can be used for people who have never been to Istanbul but want to know basic information about venues, type of boroughs.