



HOME SWEET HOME

Prepared by *Abdurahman Alrobaie*
as part of Coursera Data Science Capstone project



INTRODUCTION: BUSINESS PROBLEM

- According to a statistical study by the General Authority for Statistics in Saudi Arabia, about 38% of the population do not own a permanent residence (Aawsat, 2019).
- This project addresses this issue by performing an analysis of Khobar City, SA, and clustering the promising neighborhoods according to the following factors:
 - 1. Proximity to the city center
 - 2. Services and venues within the neighborhood
 - 3. Distance from factories and industrial areas
- Machine Learning (ML) clustering model is fitted to cluster the neighborhoods based on the venues nearby them.

DATA ACQUISITION

National Address API

- Obtain Khobar City's neighborhood data:
 - ❑ Names
 - ❑ Coordinates
 - ❑ City Center

GeoJson.io

- Create polygons with boundaries for Khobar City's neighborhoods
- Convert data into geodata for visualizations and calculations

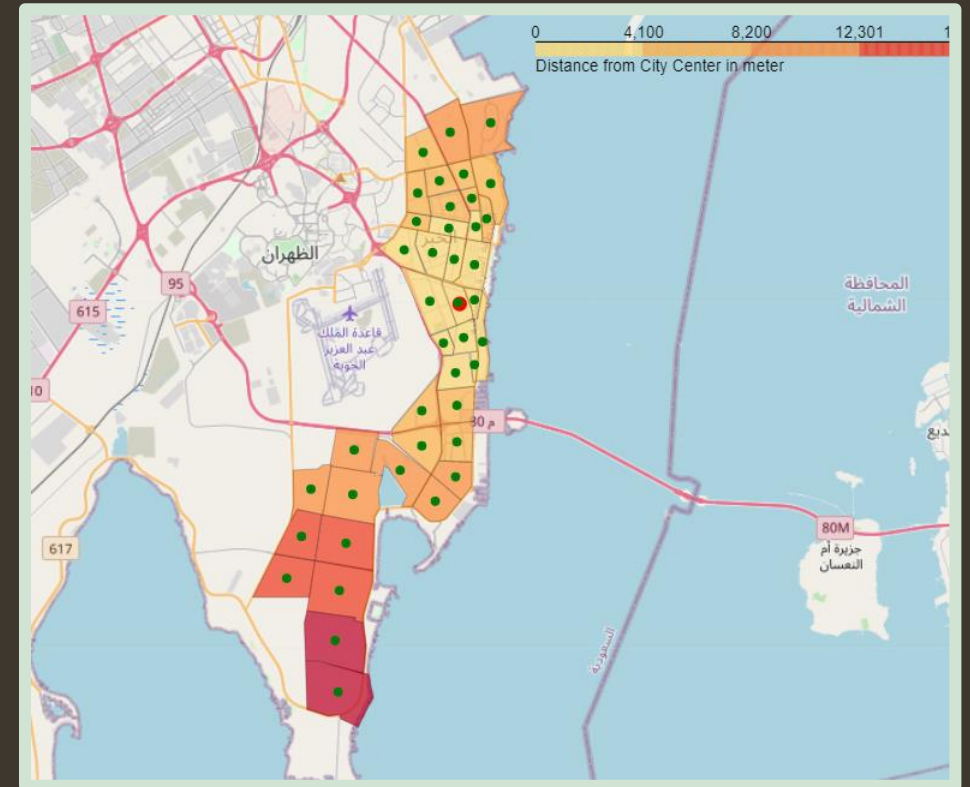
Foursquare API

- Retrieve venues including the following categories:
 - ❑ Restaurants
 - ❑ Schools
 - ❑ Clothing Shops
 - ❑ Supermarkets
 - ❑ Outdoor places

DATA UNDERSTANDING

Neighborhoods Data

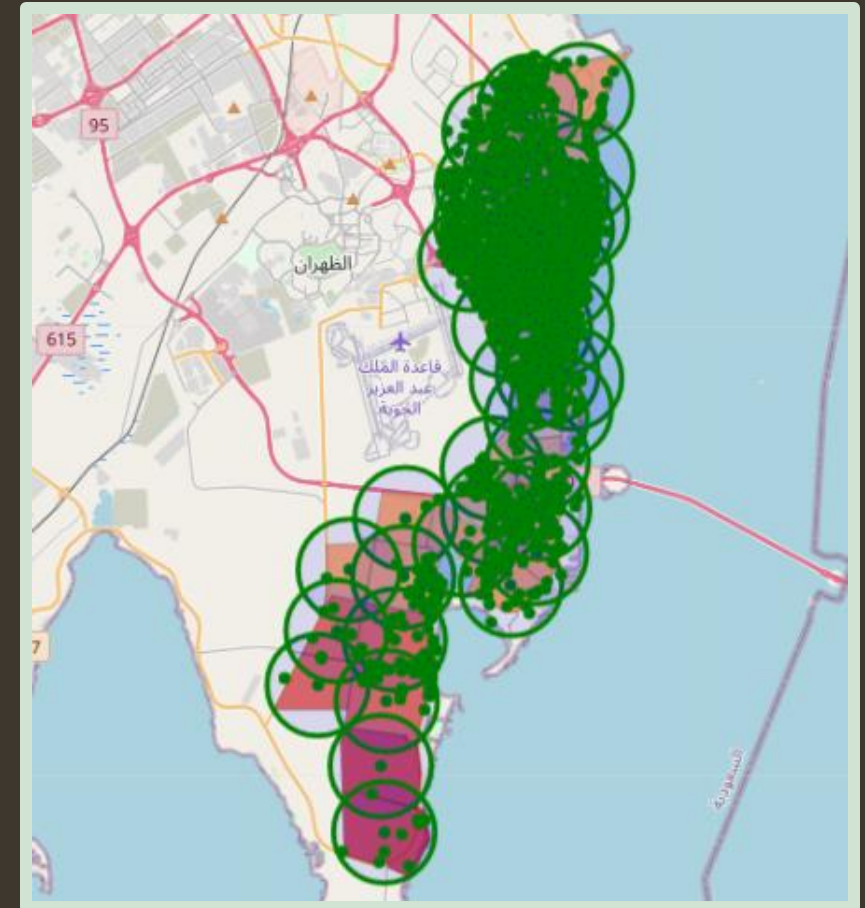
	Neighborhood	Latitude	Longitude	X	Y	Distance
0	THUQBAH	26.274439	50.191364	419260.957823	2.906329e+06	1466.819086
1	SOUTH THUQBAH	26.273737	50.205405	420662.446460	2.906243e+06	106.211710
2	ISKAN	26.257636	50.208391	420949.699536	2.904457e+06	1709.884239
3	HAMRA	26.226879	50.204523	420542.507086	2.901053e+06	5100.947741
4	TAAWIN	26.224262	50.186858	418776.065391	2.900774e+06	5716.547726
5	KHUZAMA	26.208595	50.186968	418776.199502	2.899039e+06	7372.194020
6	DUGHEITHER VILLAGE	26.274842	50.213668	421488.268917	2.906360e+06	798.957141
7	SAHIL	26.255873	50.217583	421866.439607	2.904257e+06	2216.201050
8	NORTH KHOBAR	26.290838	50.213636	421495.859179	2.908132e+06	2127.867270
9	MADINAT UMAL	26.293403	50.203582	420493.793127	2.908422e+06	2281.309626



DATA UNDERSTANDING

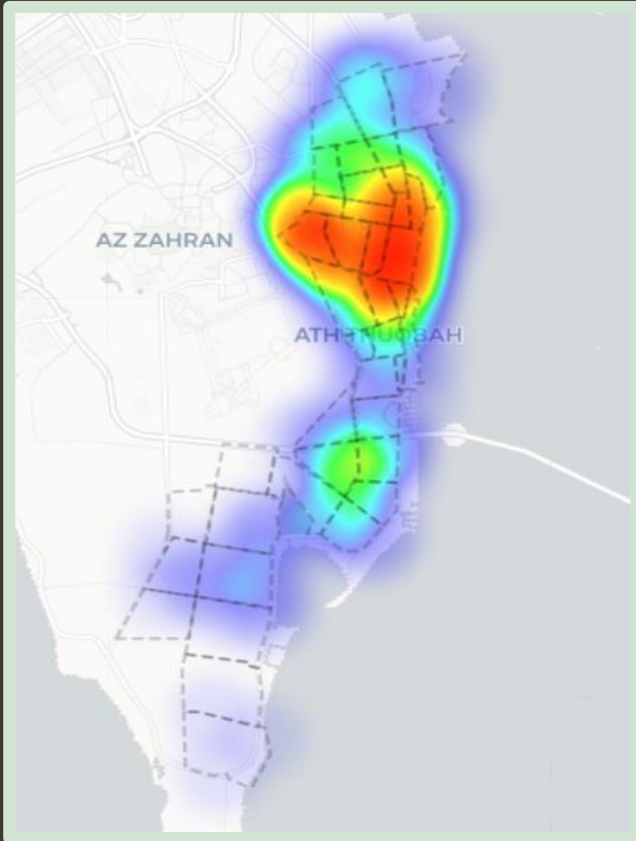
Foursquare API Data

	ID	name	lats	lons	cat	sub	Neighborhood
0	577e08ba498ee027e6fb1727	سوبرماركت القرنى	26.273430	50.186268	Supermarket	Supermarket	THUQBAH
1	4f413350e4b0740e7b8c7f02	Farm Supermarket (أسواق المزرعة)	26.289101	50.192048	Supermarket	Supermarket	AQRABIYAH
2	571623c8498e0d3bcf4d6465	Meed (ميد)	26.264993	50.192548	Supermarket	Supermarket	THUQBAH
3	57706fb0cd100106d4872c5c	بقالة ماجد	26.264034	50.191147	Supermarket	Grocery Store	THUQBAH
4	5cc7ff1c65211f002c271991	اسواق التلاجة العالمية	26.285603	50.193726	Supermarket	Supermarket	AQRABIYAH
...
2694	536b9b03498e1f325ba4336a	موحي	26.264544	50.191902	Food	Burrito Place	THUQBAH
2695	5cc8012416ef67002ca4cf44	مطعم رجل ألمع	26.267555	50.200341	Food	Asian Restaurant	THUQBAH
2696	52dae6a3498e8778e0e7a965	كافيتيريا السندباد	26.267265	50.195027	Food	Burrito Place	THUQBAH
2697	5db153f0fe7ae00008189b6d	بوفيه شواطئ الود	26.261724	50.190409	Food	Fast Food Restaurant	THUQBAH
2698	50a61760e4b0cd103aac5e2b	مطعم ومطبخ نور الحجاز	26.268066	50.197292	Food	Middle Eastern Restaurant	THUQBAH

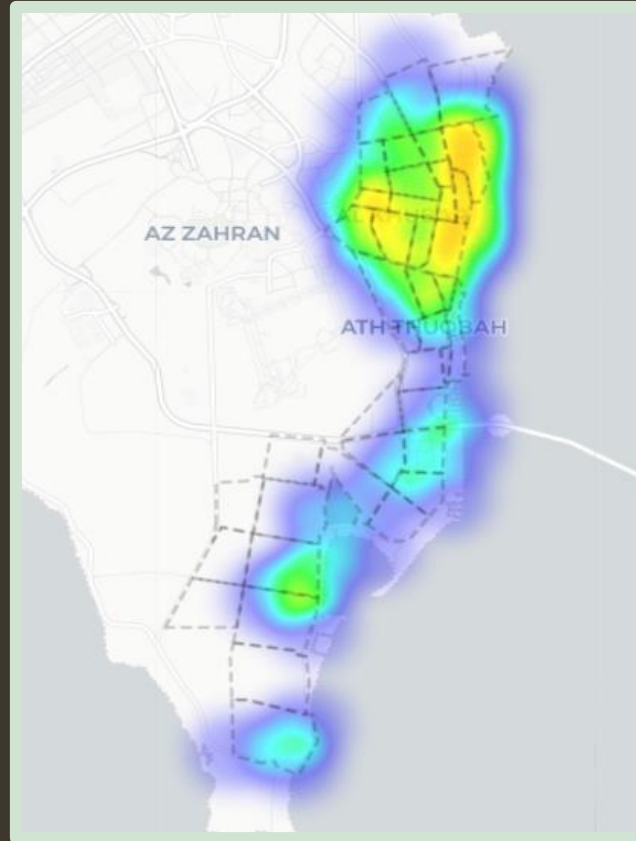


EXPLORATORY DATA ANALYSIS

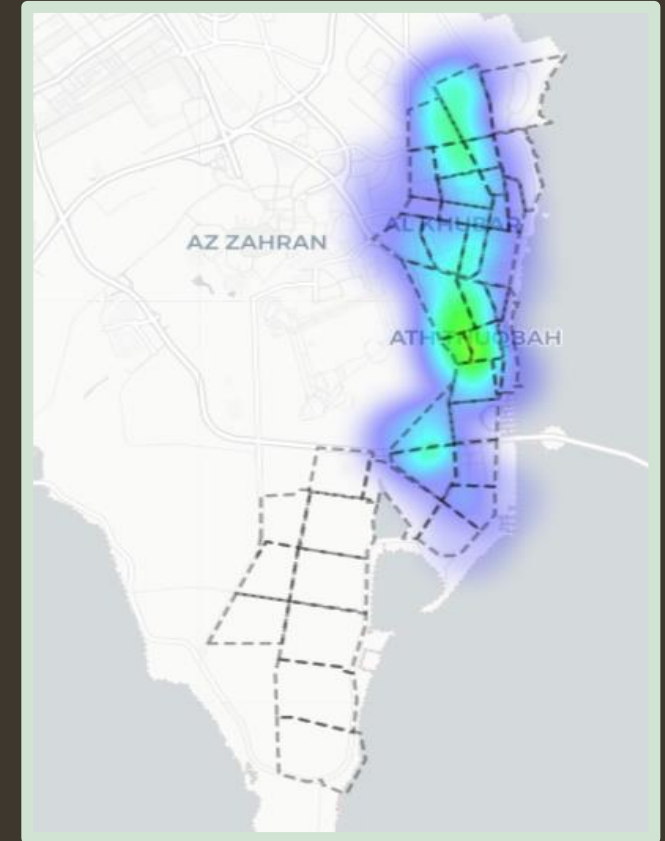
Venue Density Heat Maps



a



b



c

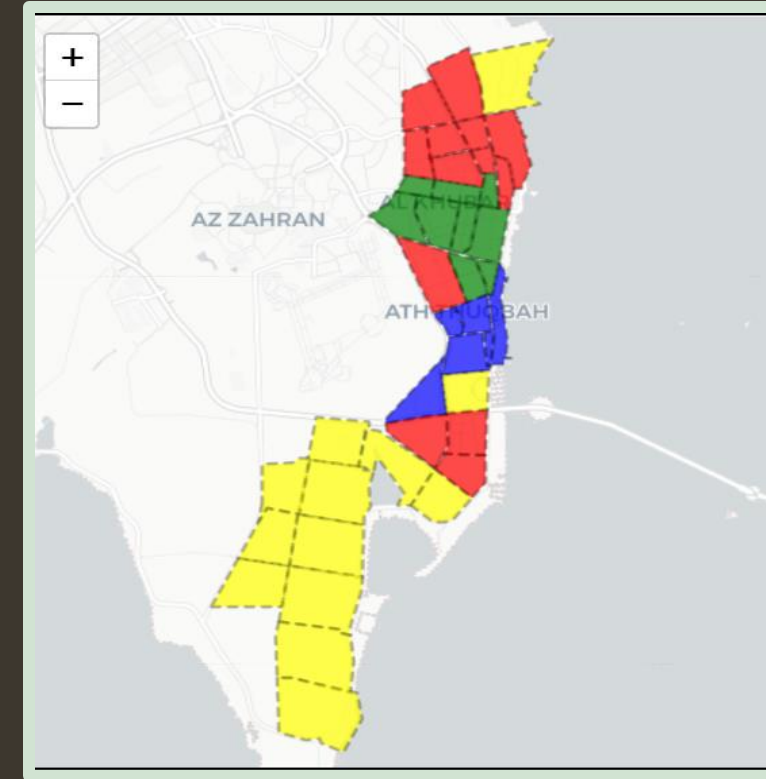
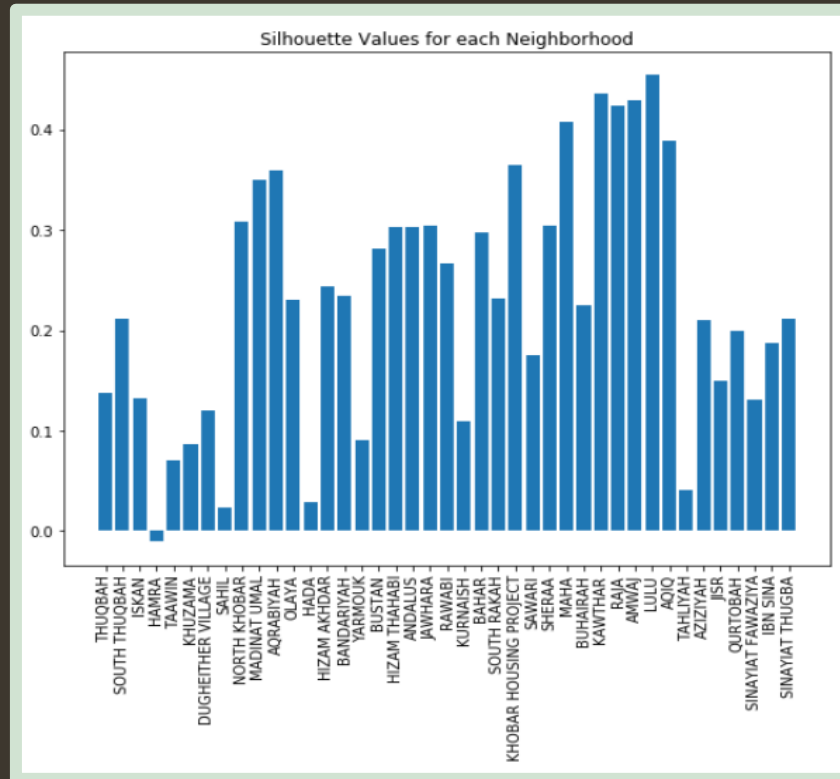
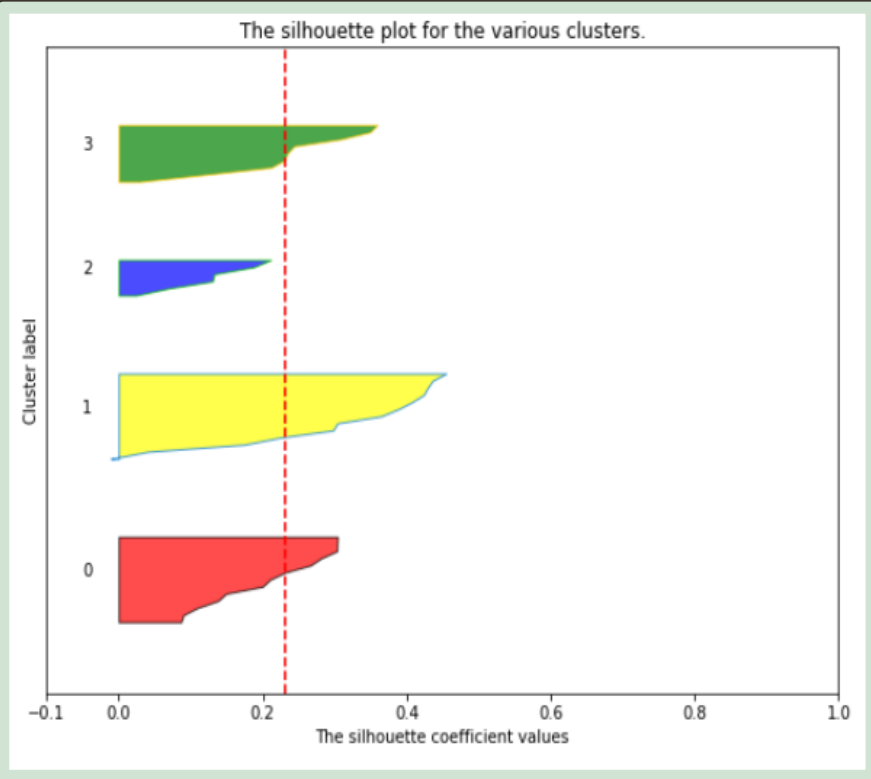
a): Commercial density, b): Outdoor places density, c): Industrial density

DATA PREPARING

	Neighborhood	Distance from Center	Supermarket Average Distance	Supermarket Frequency	Elementary School Average Distance	Elementary School Frequency	Middle School Average Distance	Middle School Frequency	High School Average Distance	High School Frequency	...	Auto Workshop Average Distance
0	THUQBAH	1466.819086	1029.408236	4	791.430308	5	402.364304	1	851.421823	2	...	1147.817005
1	SOUTH THUQBAH	106.211710	1184.318876	7	672.761062	2	711.390339	2	1077.097359	4	...	962.801319
2	ISKAN	1709.884239	983.416303	3	590.450156	3	316.844829	1	592.979182	4	...	1022.764287
3	HAMRA	5100.947741	0.000000	0	638.814175	1	739.968224	1	0.000000	0	...	637.740252
4	TAAWIN	5716.547726	629.110848	1	0.000000	0	0.000000	0	0.000000	0	...	992.774912
5	KHUZAMA	7372.194020	1110.316188	5	132.557197	1	987.541636	3	413.681532	1	...	943.830309
6	DUGHEITHER VILLAGE	798.957141	623.373109	7	722.587404	1	604.910463	2	353.292399	1	...	1123.816092
7	SAHIL	2216.201050	999.981005	2	895.776229	2	246.341498	1	747.093206	3	...	1048.845419
8	NORTH KHOBAR	2127.867270	1090.853670	11	992.661004	5	1376.832495	5	1381.526813	5	...	1017.753156
9	MADINAT UMAL	2281.309626	905.666583	11	963.600881	7	1379.840574	8	1096.519383	8	...	1249.392836
10	AQRABIYAH	2926.142816	1196.124896	13	919.855511	8	620.351132	8	973.601705	11	...	888.898673
11	OLAYA	3900.760462	891.326634	11	955.131121	3	1083.238316	3	621.746471	5	...	936.887281
12	HADA	4683.326229	1294.790910	11	819.830277	4	633.224874	1	1151.732968	5	...	0.000000
13	HIZAM AKHDAR	3907.359596	1038.639868	9	1314.728669	5	768.208074	5	1262.010087	9	...	481.135444
14	BANDARIYAH	3993.892337	1337.926831	6	1062.084882	3	1275.604550	5	1145.253954	4	...	1220.930701
15	YARMOUK	4524.535883	715.377808	2	745.324436	1	0.000000	0	898.862459	3	...	728.893998
16	BUSTAN	5371.697446	661.844407	5	0.000000	0	0.000000	0	627.875924	2	...	257.115863
17	HIZAM THAHABI	4941.291149	721.789293	5	0.000000	0	0.000000	0	580.008213	5	...	697.049152
18	ANDALUS	5977.472548	965.243428	3	680.568442	1	0.000000	0	1006.713124	4	...	0.000000
19	JAWHARA	6307.257599	1005.320665	3	0.000000	0	0.000000	0	866.922876	4	...	1028.897749
20	RAWABI	6562.698142	807.841703	4	0.000000	0	0.000000	0	1266.571620	3	...	680.956015
21	KURNAISH	6306.033946	838.924512	3	0.000000	0	0.000000	0	0.000000	0	...	0.000000
22	BAHAR	9262.098061	0.000000	0	0.000000	0	0.000000	0	0.000000	0	...	0.000000
23	SOUTH RAKAH	8693.777436	1310.119863	6	421.036366	1	779.019993	2	881.616999	4	...	903.065587
24	KHOBAR HOUSING PROJECT	9064.195999	0.000000	0	0.000000	0	0.000000	0	0.000000	0	...	0.000000

NEIGHBORHOODS CLUSTERING

4 Clusters



RESULTS AND DISCUSSION

First Cluster

- 13 neighborhoods
- Commercially moderate in density
- Low in industrial Density
- Relatively Close to Khobar City's Center
- Best for choosing a neighborhood for your future home

	Neighborhood	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	10th Most Common Venue	Class
0	THUQBAH	Food	Medical Center	Clothing Store	Mosque	Gym & Fitness Center	Art & Entertainment	Grocery Store	Auto Workshop	Elementary School	Government Building	0
5	KHUZAMA	Food	Art & Entertainment	Gym & Fitness Center	Mosque	Medical Center	Factory	Government Building	Supermarket	Clothing Store	Auto Workshop	0
15	YARMOUK	Food	Clothing Store	Medical Center	Art & Entertainment	Gym & Fitness Center	Mosque	Parks	Shopping Mall	Government Building	Grocery Store	0
16	BUSTAN	Food	Medical Center	Gym & Fitness Center	Clothing Store	Mosque	Art & Entertainment	Parks	Shopping Mall	Government Building	Supermarket	0
17	HIZAM THAHABI	Food	Medical Center	Gym & Fitness Center	Art & Entertainment	Clothing Store	Mosque	Parks	Shopping Mall	Government Building	High School	0
18	ANDALUS	Food	Gym & Fitness Center	Art & Entertainment	Mosque	Medical Center	Clothing Store	Government Building	High School	Parks	Supermarket	0
19	JAWHARA	Gym & Fitness Center	Food	Art & Entertainment	Medical Center	Mosque	Clothing Store	Parks	Factory	Government Building	High School	0
20	RAWABI	Food	Gym & Fitness Center	Clothing Store	Medical Center	Art & Entertainment	Mosque	Government Building	Factory	Supermarket	Grocery Store	0
21	KURNAISH	Food	Medical Center	Art & Entertainment	Clothing Store	Gym & Fitness Center	Mosque	Beach	Parks	Government Building	Supermarket	0
23	SOUTH RAKAH	Food	Mosque	Medical Center	Auto Workshop	Art & Entertainment	Gym & Fitness Center	Government Building	Supermarket	Grocery Store	High School	0
35	AZIZIYAH	Food	Mosque	Medical Center	Art & Entertainment	Gym & Fitness Center	Clothing Store	Government Building	High School	Supermarket	Grocery Store	0
36	JISR	Food	Mosque	Medical Center	Gym & Fitness Center	Art & Entertainment	Government Building	Grocery Store	Clothing Store	Supermarket	High School	0
37	QURTOBAH	Food	Art & Entertainment	Gym & Fitness Center	Medical Center	Mosque	Auto Workshop	High School	Government Building	Supermarket	Factory	0

RESULTS AND DISCUSSION

Second Cluster

- 13 neighborhoods
- Commercially low in density
- Low in industrial Density
- Located remotely from Khobar City's Center

	Neighborhood	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	10th Most Common Venue	Class
3	HAMRA	Food	Grocery Store	Mosque	Auto Workshop	Medical Center	Gym & Fitness Center	Clothing Store	Elementary School	Middle School	Factory	1
22	BAHAR	Food	Medical Center	Art & Entertainment	Beach	Grocery Store	Gym & Fitness Center	Mosque	Elementary School	Middle School	High School	1
24	KHOBAR HOUSING PROJECT	Medical Center	Shopping Plaza	Gym & Fitness Center	Elementary School	Middle School	High School	University	Food	Parks	Mosque	1
25	SAWARI	Food	University	Gym & Fitness Center	Art & Entertainment	Beach	Mosque	Supermarket	Government Building	Factory	Library	1
26	SHERAA	Food	Art & Entertainment	Mosque	Gym & Fitness Center	Beach	Government Building	Parks	Supermarket	Medical Center	Factory	1
27	MAHA	University	Shopping Plaza	Shopping Mall	Elementary School	Middle School	High School	Food	Parks	Mosque	Gym & Fitness Center	1
28	BUHAIRAH	Food	Art & Entertainment	Mosque	Auto Workshop	Medical Center	Beach	Elementary School	Middle School	High School	University	1
29	KAWTHAR	Food	University	Shopping Plaza	Shopping Mall	Elementary School	Middle School	High School	Parks	Mosque	Gym & Fitness Center	1
30	RAJA	Food	Art & Entertainment	Medical Center	University	Gym & Fitness Center	Elementary School	Middle School	High School	Parks	Mosque	1
31	AMWAJ	Food	Supermarket	Elementary School	Beach	Gym & Fitness Center	Middle School	High School	University	Parks	Mosque	1
32	LULU	Food	Shopping Plaza	Shopping Mall	Elementary School	Middle School	High School	University	Parks	Mosque	Gym & Fitness Center	1
33	AQIQ	Beach	Food	Shopping Plaza	Gym & Fitness Center	Elementary School	Middle School	High School	University	Parks	Mosque	1
34	TAHLIYAH	Food	Medical Center	Mosque	Supermarket	Grocery Store	Government Building	Gym & Fitness Center	Elementary School	High School	Art & Entertainment	1

RESULTS AND DISCUSSION

Third Cluster

- 6 neighborhoods
- Commercially low in density
- High in industrial Density
- Relatively Close to Khobar City's Center

	Neighborhood	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	10th Most Common Venue	Class
2	ISKAN	Food	Auto Workshop	Factory	Medical Center	Mosque	Art & Entertainment	High School	Elementary School	Supermarket	Clothing Store	2
4	TAAWIN	Food	Factory	Auto Workshop	Mosque	Art & Entertainment	Gym & Fitness Center	Supermarket	Clothing Store	Grocery Store	Government Building	2
7	SAHIL	Food	Auto Workshop	Factory	Mosque	Art & Entertainment	Clothing Store	Medical Center	High School	Elementary School	Parks	2
38	SINAYIAT FAWAZIYA	Food	Auto Workshop	Factory	Art & Entertainment	Elementary School	Medical Center	Beach	Mosque	Middle School	High School	2
39	IBN SINA	Auto Workshop	Food	Factory	Art & Entertainment	Mosque	Elementary School	Middle School	Gym & Fitness Center	Shopping Plaza	Medical Center	2
40	SINAYIAT THUGBA	Food	Auto Workshop	Factory	Mosque	Medical Center	Elementary School	Supermarket	Grocery Store	High School	Beach	2

RESULTS AND DISCUSSION

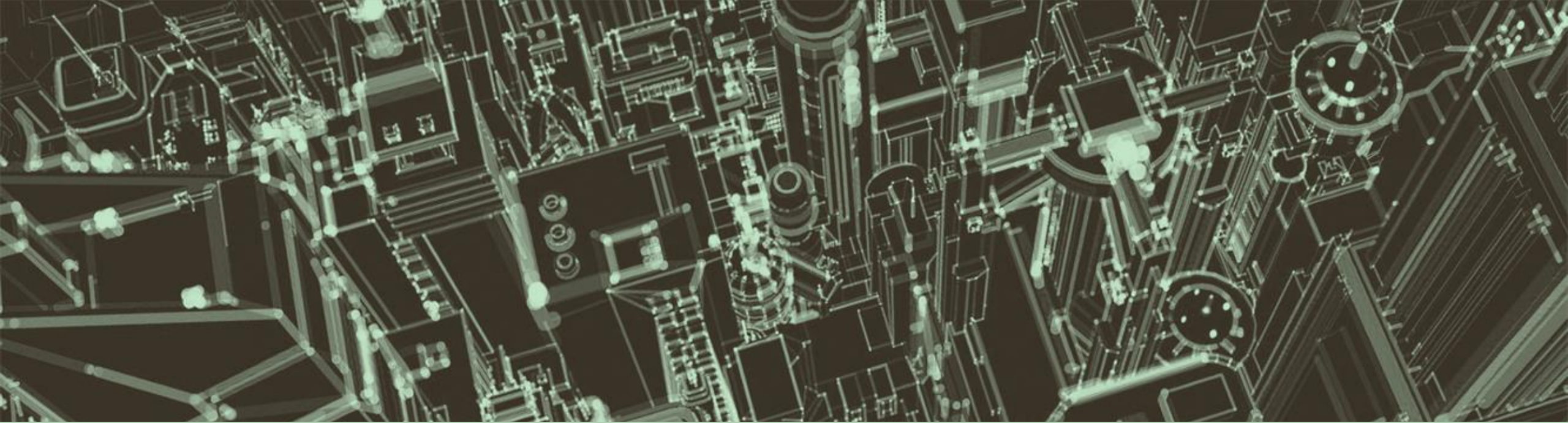
Fourth Cluster

- 9 neighborhoods
- Commercially high in density
- Low in industrial Density
- Very Close to Khobar City's Center

	Neighborhood	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	10th Most Common Venue	Class
1	SOUTH THUQBAH	Food	Medical Center	Clothing Store	Gym & Fitness Center	Art & Entertainment	Mosque	Government Building	Shopping Mall	Grocery Store	Supermarket	3
6	DUGHEITHER VILLAGE	Food	Medical Center	Clothing Store	Art & Entertainment	Gym & Fitness Center	Mosque	Government Building	Shopping Mall	Supermarket	Grocery Store	3
8	NORTH KHOBAR	Clothing Store	Food	Medical Center	Art & Entertainment	Government Building	Mosque	Gym & Fitness Center	Shopping Mall	Grocery Store	Supermarket	3
9	MADINAT UMAL	Medical Center	Clothing Store	Food	Art & Entertainment	Mosque	Gym & Fitness Center	Grocery Store	Government Building	Supermarket	Shopping Mall	3
10	AQRABIYAH	Medical Center	Clothing Store	Food	Art & Entertainment	Gym & Fitness Center	Mosque	Grocery Store	Shopping Mall	Supermarket	Government Building	3
11	OLAYA	Clothing Store	Food	Medical Center	Art & Entertainment	Gym & Fitness Center	Shopping Mall	Mosque	Supermarket	Government Building	Parks	3
12	HADA	Food	Medical Center	Clothing Store	Gym & Fitness Center	Art & Entertainment	Mosque	Supermarket	Shopping Mall	Government Building	Parks	3
13	HIZAM AKHDAR	Medical Center	Food	Clothing Store	Gym & Fitness Center	Art & Entertainment	Mosque	Grocery Store	Parks	High School	Supermarket	3
14	BANDARIYAH	Food	Medical Center	Clothing Store	Art & Entertainment	Gym & Fitness Center	Mosque	Parks	Shopping Mall	Grocery Store	Government Building	3

REMARKS & CONCLUSION

- Based on the previous clustering result, the first cluster makes a group of the most promising neighborhoods for your future house.
- Although there are numerous factors for selecting that location, whether personal or financial, the first to consider are included in the first cluster.
- Consequently, a more in-depth analysis takes place where you can select from different parts of the neighborhood.
- Overall, this can be a good kick-off for the first step into the pursuit of having your dream house.



Thank you and I hope you liked
my project😊

