Exploring Dubai Neighborhood for a potential Expat

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Course – Capstone Data Science for IBM Data science Specialist

Introduction

The UAE is home to over 200 nationalities. Emiratis constitute roughly 20% of the total population, making UAE home to one of the world's highest percentage of immigrants. Indians and Pakistanis form the largest expatriate groups in the country, constituting 28% and 12% of the total population respectively 461,000 Westerners live in the United Arab Emirates, making up 5.1% of its total population. Most expatriates in the United Arab Emirates reside in Dubai and Abu Dhabi.

This project focuses on Dubai neighborhood. The purpose of this Project is to help people in exploring better facilities around their neighborhood. Apart from neighborhood facilities, Rent is also critical in deciding neighborhood. This project will also provide rent distribution across Dubai Neighborhoods. It will help people making smart and efficient decision on selecting great neighborhood out of numbers of other neighborhoods in Dubai, UAE. It will also help people in providing awareness of the area and neighborhood before moving to a new city, state, country or place for their work or to start a new fresh life.

Business Problem

This project address below problems.

a) Analyze all the available Neighborhoods in Dubai, UAE

b) Analyze Accommodation Prices in the Neighbor hoods based upon online data available

c) Group Neighborhoods based upon Similarities

d) Suggest Low rent Neighborhoods among similar neighborhoods to facilitate a wise decision

Target Audience

Dubai is most popular destination for new immigrants in whole MENA region. As a result, it is one of the most diverse and multicultural areas with around 200 Nationalities living together. Dubai has; headquarters of most of the business operating in MENA region. It is biggest Finance, Trading and Tourist Hub in the region. Although immigration has become a hot topic over the past few years with more governments seeking more restrictions on immigrants and refugees, the general trend of immigration into UAE has been on the rise.

The Target Audience for this project will be as follows:

- Any Person immigrating to Dubai

- Any UAE expat, who is planning to move to a different Neighborhood and wish to analyze Dubai neighborhoods and rent expenses
- Any body with interest in Data science, who is trying to learn key concepts of clustering methodology/ Unsupervised Learning with a Python based project

Data

Data Source

Wikipedia

Link: https://en.wikipedia.org/wiki/List_of_communities_in_Dubai

This Wikipedia page provides list of all the communities in Dubai. Apart from that, it also provides some significant details of each community, like population and Area. This will provide us insight in to population density of each area, which is also a critical information in deciding one's residence.

XML parsing will be done to get the required information.

List of communities in Dubai

From Wikipedia, the free encyclopedia

This is a **list of communities in Dubai**, United Arab Emirates. Dubai is mainly divided into 9 sectors which are then divided into communities. There are more than 130 communities in Dubai, which are listed below.[1]

Community Number ⬍	Community (English) ⬍	Community (Arabic) ⬍	Area(km²) ⬍	Population(2000) ⬍	Population density(/km²) ⬍
126	Abu Hail	أبو هيل	1.27 km²	21,414	16,861.4/km²
711	Al Awir First	العوير الأولى			
721	Al Awir Second	العوير الثانية			
333	Al Bada	البدع	0.82 km²	18,816	22946/km²
122	Al Baraha	البراحة	1.104 km²	7,823	7,086/km²
373	Al Barsha First	البرشاء الأولى	38.1 km²	1248	33/km²
376	Al Barsha Second	البرشاء الثانية	38.1 km²	1248	33/km²
671	Al Barsha South First	البرشاء جنوب الاولى	38.1 km²	1248	33/km²
672	Al Barsha South Second	البرشاء جنوب الثانية	38.1 km²	1248	33/km²
673	Al Barsha South Third	البرشاء جنوب الثالثة	38.1 km²	1248	33/km²

propertymonitor.ae
Link: https://www.propertymonitor.ae/research/uae-communities-index/dubai-rental-index.html

This site will be used for getting info about median rent in different Dubai communities.XML parsing will be done to get the required information. We will be using it for this project. However, Data collated from listing site like diazole will give better overview.

SALES   RENT   YIELD

Community	Community Type	Median Rent (AED/unit)	Last month
Al Furjan	Apartment	74,990	-2.96%
	Villa	134,421	0.44%
Al Habtoor City	Apartment	95,922	-1.48%
Al Khail Heights	Apartment	43,110	-1.47%
Arabian Ranches	Villa	105,651	-0.37%

Location Data

Location data in form of [Latitude, Longitude] will be required for all our analysis. We will use geocoder library of python to get location data.

Foursquare API Data

We will need data about different venues in different neighborhoods of Dubai. In order to gain that information, we will use "Foursquare" locational information. Four Square API is one of the most popular API for social exploration of any location. This can be used in getting venues around any location, exploring any venue, get details of any neighborhood facility with help of Tips, Rating etc.

After finding the list of neighborhoods, we will connect to the Foursquare API to gather information about venues inside each and every neighborhood. For each neighborhood, we have chosen the radius to be 1000 meters.

The data retrieved from Foursquare contains information of venues within the specified radius of longitude and latitude of the Neighborhood. The information obtained per venue as follows:

1. Neighborhood
2. Neighborhood Latitude
3. Neighborhood Longitude
4. Venue
5. Name of the venue e.g. the name of a store or restaurant
6. Venue Latitude
7. Venue Longitude
8. Venue Category

Data Cleaning

We must do Data cleaning or wrangling before any Data analysis. The main aim for Data cleaning is as follows.

a) Remove any NaN data which will be part of Analysis
b) Identify all unnecessary fields, outliers and eliminate them
c) Format the data in the form, most suitable for implementing any statistical Algorithm

Below are the details of Data wrangling performed in current project.

a) Eliminate non required field like Community Number and Arabic Name
b) For many rows, Population and Area are not available. We will not remove those rows, as they are mainly being used like additional information and not in Clustering Algorithm. Though, we need to handle them while calculating Population density.
c) property monitor.ae have median rent details for Apartment, Villa, Town House, Garden Homes. Since, we want to do a comparative analysis, we need to have data at similar level. To achieve this, we will keep median rent only for Apartments and filter out all other accommodation types.
d) we are getting List of Communities from Wikipedia and Rent details from propertymonitor.ae. Both data set can't be unified as community name will not be same. To address this problem, we will find nearest Community (using Location Data) in Property Monitor data against each Community in Wikipedia List and map them together.
e) In our Analysis, we find around 269 different Venue Types. Perform K-means clustering based upon 269 parameters will be both inefficient and Ineffective, as Most neighborhoods have limited venue types (below 20). To address this, we will sort 10 most common venues for each neighborhood and use them in segmentation. While sorting, we can notice that there are many neighborhoods with less than 10 venue types. We should ensure that only venue types with positive count are shown and if a neighborhood has less than 10 venue types, remaining values can be zero.

	Neighborhoods	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
0	Abu Hail	Indian Restaurant	Bakery	Market	Department Store	Fast Food Restaurant	Beach	Scenic Lookout	Gym	Asian Restaurant	Track
1	Al Awir First	Café	Cafeteria	0	0	0	0	0	0	0	0
2	Al Awir Second	Indian Restaurant	Coffee Shop	Burger Joint	Café	Clothing Store	0	0	0	0	0
3	Al Bada	Café	Coffee Shop	Gym / Fitness Center	Middle Eastern Restaurant	Comfort Food Restaurant	Beach	Boutique	Shopping Plaza	Seafood Restaurant	Restaurant
4	Al Baraha	Hotel	Spa	Asian Restaurant	Lounge	Fried Chicken Joint	Middle Eastern Restaurant	Convenience Store	Coffee Shop	Café	Smoke Shop

Technology Used

Foursquare API

Jupiter Notebook by Anaconda for Python 3

Python programming

Python Libraries:

- Pandas: For creating and manipulating data frames
- Folium: To create Map and provide Map based visualization for this project
- NumPy: To perform many mathematical and Statistical Functions on Data Frames, List and Series
- BeautifulSoup: For web scrapping and parsing XML and HTML Data
- Geocoder: To retrieve Location Data (latitude, longitude) for any address
- Requests: To make call request to Foursquare API
- JSON: Library to handle JSON files (output file type by Foursquare API, which contains all data)
- Scikit Learn: To perform advances statistical analysis like k-means clustering.
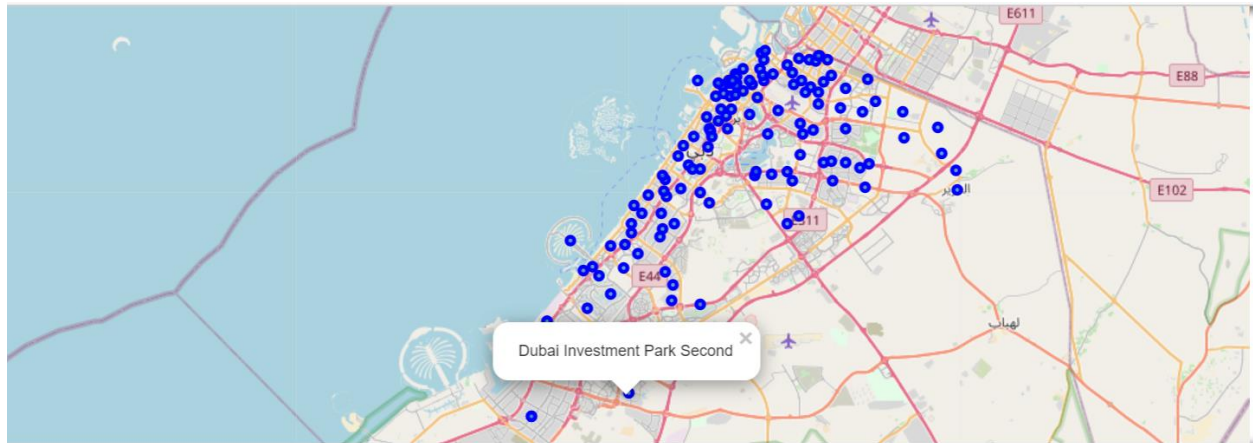- Matplotlib: Python Plotting Module for all kinds of charts and graphs

Methodology

a) Using the Data Source, we will generate a data frame as below.

Community	From Community List in Wikipedia
Area	Community Area
Population	Community Population
Latitude	Coordinates
Longitude	Coordinates
Nearby Community	Nearby Community from Property Monitor
Type	Residence Type
Median rent	Median Rent for Nearby Community
latitude_N, longitude_N	Co Ordinates of nearby Community

	Community	Area	Population	Latitude	Longitude	Nearby_Community	Type	Median Rent	latitude_N	longitude_N
0	Abu Hail	1.27 km²	21,414	25.28308	55.33435	Al Furjan	Apartment	74,990	25.27607	55.31087
1	Al Awir First	None	None	25.18605	55.54108	International City	Apartment	25,162	25.17685	55.41082
2	Al Awir Second	None	None	25.16792	55.54331	International City	Apartment	25,162	25.17685	55.41082
3	Al Bada	0.82 km²	18,816	25.21861	55.26406	City Walk	Apartment	151,369	25.20798	55.26185
4	Al Baraha	1.104 km²	7,823	25.28280	55.31678	Al Furjan	Apartment	74,990	25.27607	55.31087

b) Based upon this data a map is generated for all neighborhoods in Dubai with Circle Marker. Clicking on them will provide community name.

c) List of venues is collected for all neighborhoods by making Foursquare API call.

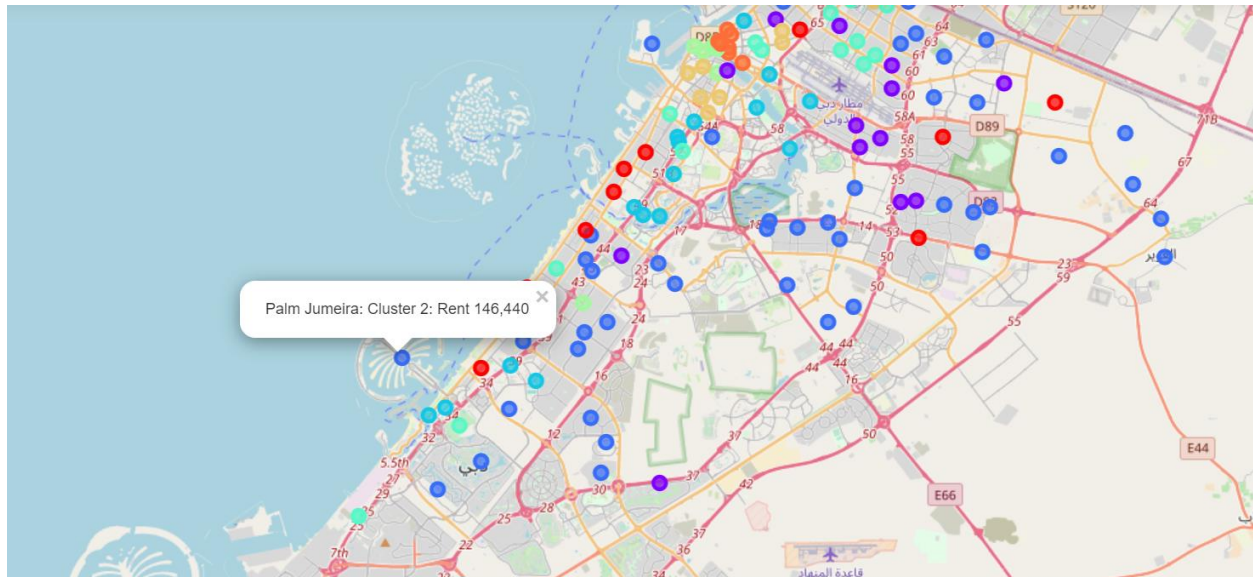|	Neighborhoods	Latitude	Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Abu Hail	25.28308	55.33435	Habib Bakery	25.281124	55.332774	Bakery
1	Abu Hail	25.28308	55.33435	Gold's Gym	25.282698	55.341019	Gym
2	Abu Hail	25.28308	55.33435	Al Douri Roastery	25.277057	55.328223	Bakery
3	Abu Hail	25.28308	55.33435	Union Co-Operative Society	25.282769	55.340896	Department Store
4	Abu Hail	25.28308	55.33435	McDonald's	25.282839	55.340780	Fast Food Restaurant

d) Top 10 venue types for each Neighborhood is identified

	Neighborhoods	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
0	Abu Hail	Indian Restaurant	Department Store	Park	Fast Food Restaurant	Market	Bakery	Asian Restaurant	Convenience Store	Dessert Shop	Clothing Store
1	Al Awir First	Café	Cafeteria	0	0	0	0	0	0	0	0
2	Al Awir Second	Indian Restaurant	Coffee Shop	Burger Joint	Clothing Store	Café	0	0	0	0	0
3	Al Bada	Café	Coffee Shop	Middle Eastern Restaurant	Gym / Fitness Center	Ice Cream Shop	Supermarket	Beach	Bakery	Gluten-free Restaurant	Chinese Restaurant
4	Al Baraha	Hotel	Indian Restaurant	American Restaurant	Bar	Lounge	Asian Restaurant	Coffee Shop	Turkish Restaurant	Women's Store	Fried Chicken Joint

e) All Neighborhoods are clustered by similarity in neighborhoods to generate below data frame. Cluster Label shows cluster to which the neighborhood belongs to.

	Neighborhoods	Area	Population	Latitude	Longitude	Median Rent	Cluster Labels	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
0	Abu Hail	1.27 km²	21,414	25.28308	55.33435	74,990	1	Indian Restaurant	Department Store	Park	Fast Food Restaurant	Market	Bakery	Asian Restaurant
1	Al Awir First	None	None	25.18605	55.54108	25,162	2	Café	Cafeteria	0	0	0	0	0
2	Al Awir Second	None	None	25.16792	55.54331	25,162	2	Indian Restaurant	Coffee Shop	Burger Joint	Clothing Store	Café	0	0
3	Al Bada	0.82 km²	18,816	25.21861	55.26406	151,369	0	Café	Coffee Shop	Middle Eastern Restaurant	Gym / Fitness Center	Ice Cream Shop	Supermarket	Beach
4	Al Baraha	1.104 km²	7,823	25.28280	55.31678	74,990	3	Hotel	Indian Restaurant	American Restaurant	Bar	Lounge	Asian Restaurant	Coffee Shop

f) Dubai Map is generated to show cluster, rent details for each neighborhood. All clusters are marked in different color.

Results

We get below clusters using K-Means Clustering.

Cluster1:

Neighborhoods	Area	Population	Latitude	Longitude	Median Rent	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue
Al Bada	0.82 kmÂ²	18,816	25.21861	55.26406	151,369	0	CafÃ©	Coffee Shop	Middle Eastern Resta	Gym / Fitness Center	Ice Cream Shop	Supermarket
Al Khwaneej First			25.24282	55.4844	25,162	0	CafÃ©	Burger Joint	Coffee Shop	Comfort Food Restau	Juice Bar	Shopping Plaza
Al Manara	2.1 kmÂ²	2,147	25.14579	55.20958	128,948	0	Coffee Shop	CafÃ©	Farmers Market	Supermarket	Health & Beauty Servi	Middle Eastern Resta
Al Safouh First	7.6 kmÂ²	3,337	25.11369	55.17547	70,982	0	CafÃ©	Beach	College Gym	Gaming Cafe	Salon / Barbershop	BBQ Joint
Hor Al Anz East	4.18 kmÂ²	40,342	25.27819	55.3471	74,990	0	Middle Eastern Resta	CafÃ©	Smoke Shop	Department Store	Burrito Place	Burger Joint
Jumeira First	6.9 km	26,499	25.21043	55.2526	151,369	0	CafÃ©	Coffee Shop	Shopping Mall	Hotel	Burger Joint	Supermarket
Jumeira Second	6.9 km	26,499	25.19943	55.24683	95,922	0	CafÃ©	Coffee Shop	Ice Cream Shop	Plaza	Tea Room	Salad Place
Jumeira Third	6.9 km	26,499	25.18074	55.23161	95,922	0	CafÃ©	Beach	Middle Eastern Resta	Ice Cream Shop	Resort	Restaurant
Mirdif	9.2 kmÂ²	8,115	25.22614	55.42421	25,162	0	CafÃ©	Coffee Shop	Supermarket	Middle Eastern Resta	Cosmetics Shop	Gym
Umm Suqeim Seco	7.2 kmÂ²	16,459	25.15259	55.20044	70,982	0	CafÃ©	Coffee Shop	Burger Joint	Beach	Theme Restaurant	Italian Restaurant
Umm Suqeim Thir	7.2 kmÂ²	16,459	25.13508	55.19788	70,982	0	CafÃ©	Fast Food Restaurant	Turkish Restaurant	Middle Eastern Resta	Grocery Store	French Restaurant
Warsan First	17.1 kmÂ²	1,421	25.17685	55.41082	25,162	0	CafÃ©	Chinese Restaurant	Middle Eastern Resta	Coffee Shop	Mobile Phone Shop	Shopping Mall

Cluster 2:

Neighborhoods	Area	Population	Latitude	Longitude	Median Rent	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue
Abu Hail	1.27 kmÂ²	21,414	25.28308	55.33435	74,990	1	Indian Restaurant	Department Store	Park	Fast Food Restaurant	Market	Bakery
Al Mizhar Second	11.2 kmÂ²	4,326	25.25236	55.45677	25,162	1	Shopping Mall	Bakery	Indian Restaurant	Grocery Store	Coffee Shop	Park
Al Quoz First	27.1 kmÂ²	16,719	25.16852	55.25065	95,922	1	Coffee Shop	Furniture / Home Stor	Spa	Mediterranean Resta	Fast Food Restaurant	Gym / Fitness Center
Al Qusais First		15,502	25.28001	55.3686	74,990	1	Fast Food Restaurant	Indian Restaurant	Currency Exchange	Fried Chicken Joint	Pizza Place	Soccer Stadium
Al Qusais Third		7,506	25.26064	55.39643	124,464	1	Fast Food Restaurant	Park	Metro Station	Indian Restaurant	Burger Joint	Light Rail Station
Al Rashidiya	4.41 kmÂ²	22,326	25.22543	55.39009	124,464	1	Cafeteria	Convenience Store	Grocery Store	Middle Eastern Resta	Shopping Mall	Mediterranean Resta
Al Twar Third	6.8 kmÂ²	18,457	25.24986	55.39633	124,464	1	Fast Food Restaurant	Basketball Court	Tunnel	Indian Restaurant	Light Rail Station	Cafeteria
Al Warqa'a First	21.6 kmÂ²	5	25.19409	55.40157	25,162	1	Bookstore	Burger Joint	Dessert Shop	Tea Room	CafÃ©	Cafeteria
Al Warqa'a Second	21.6 kmÂ²	5	25.19511	55.40933	25,162	1	Bookstore	Burger Joint	Shopping Mall	Restaurant	Park	Cafeteria
Nad Shamma	1.36 kmÂ²	1,208	25.2211	55.37928	124,464	1	Middle Eastern Resta	Cafeteria	Fast Food Restaurant	Pizza Place	Burger Joint	Gym / Fitness Center
Arabian Ranches			25.05765	55.2714	45,518	1	Restaurant	Coffee Shop	Pharmacy	Bakery	ATM	Golf Course
Umm Hurair First	2.3 km	4,428	25.25812	55.30817	67,744	1	Hotel	Indian Restaurant	Lebanese Restaurant	Plaza	Coffee Shop	Burger Joint
Umm Ramool	3.61 kmÂ²	4,629	25.23159	55.37724	124,464	1	Shopping Mall	Coffee Shop	Pizza Place	Mediterranean Resta	Fast Food Restaurant	Restaurant

Cluster 3:

Neighborhoods	Area	Population	Latitude	Longitude	Median Rent	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue
Al Awir First			25.18605	55.54108	25,162	2	Café	Cafeteria	0	0	0	0
Al Awir Second			25.16792	55.54331	25,162	2	Indian Restaurant	Coffee Shop	Burger Joint	Clothing Store	Café	0
Al Barsha South Fir	38.1 km²	1248	25.08958	55.23424	61,118	2	Bakery	Fast Food Restaurant	Shopping Mall	Falafel Restaurant	Restaurant	Moving Target
Al Barsha South Se	38.1 km²	1248	25.07739	55.24267	61,118	2	Café	Supermarket	Hotel	Gym	Moving Target	Department Store
Al Barsha South Th	38.1 km²	1248	25.06229	55.23995	60,305	2	Botanical Garden	Coffee Shop	Theme Park	Fast Food Restaurant	Burger Joint	Supermarket
Al Barsha Third	38.1 km²	1248	25.09342	55.19044	70,982	2	Restaurant	Racetrack	Fast Food Restaurant	Tennis Court	Bakery	Lebanese Restaurant
Al Hamriya Port	0.89 km²	83	25.29871	55.33546	74,990	2	Tea Room	Harbor / Marina	Department Store	Steakhouse	Cafeteria	0
Al Khwaneej Second			25.22784	55.52232	25,162	2	Campground		0	0	0	0
Al Mamzar	3.35 km²	2,260	25.30094	55.34003	74,990	2	Beach	Cafeteria	Café	Middle Eastern Resta	Dessert Shop	Juice Bar
Al Merkad		139	25.15476	55.27988	85,671	2	Bike Trail	Athletics & Sports	Food Truck	Dog Run		0
Al Mina	3.10 km²	4,183	25.27166	55.26758	82,415	2	Boat or Ferry	Hotel Pool	Moving Target	Bookstore		0
Al Mizhar First	11.2 km²	4,326	25.24265	55.44234	25,162	2	Ice Cream Shop	Gym	Department Store	Dessert Shop	Recreation Center	Fast Food Restaurant
Al Quoz Industrial	27.1 km²	16,719	25.1227	55.22761	128,948	2	Soccer Field	Shopping Mall	Electronics Store	Kids Store	Gym	Arcade
Al Quoz Industrial	27.1 km²	16,719	25.13592	55.24313	128,948	2	Indian Restaurant	Soccer Field	Outlet Store	Auto Garage	Park	Italian Restaurant
Al Quoz Industrial	27.1 km²	16,719	25.13068	55.23132	128,948	2	Soccer Field	Shopping Mall	Antique Shop	Kids Store	Athletics & Sports	Coffee Shop
Al Quoz Second	27.1 km²	16,719	25.16478	55.2708	85,671	2	Coffee Shop	Spa	Park	Creperie	Pet Store	Canal
Al Quoz Third	27.1 km²	16,719	25.16091	55.23487	95,922	2	Gym / Fitness Center	Sporting Goods Shop	Furniture / Home Stor	Lebanese Restaurant	Sports Club	Bank
Al Qusais Industrial Fifth		1	25.2917	55.40556	124,464	2	Bakery	Café	Hotel	Moving Target	Pet Service	Middle Eastern Resta
Al Safa First	4.5 km²	6,291	25.17793	55.23422	95,922	2	Café	Ice Cream Shop	Mosque	Italian Restaurant	Tennis Court	Salon / Barbershop
Al Safa Second	4.5 km²	6,291	25.16633	55.23183	95,922	2	Furniture / Home Stor	Gym / Fitness Center	Indian Restaurant	Lebanese Restaurant	Deli / Bodega	Rental Car Location
Al Warqa'a Fifth	21.6 km²	5	25.19216	55.44937	25,162	2	Café	French Restaurant	Spa	Coffee Shop	Shopping Mall	0
Al Warqa'a Fourth	21.6 km²	5	25.18917	55.44016	25,162	2	Grocery Store	Scenic Lookout	0	0	0	0
Al Warqa'a Third	21.6 km²	5	25.19344	55.42457	25,162	2	Cafeteria	Park	Shopping Mall	Gas Station	0	0
Al Waheda	1.41 km²	9,856	25.29173	55.33822	74,990	2	Soccer Field	Cafeteria	Department Store	Park	Shopping Mall	Food Court
Aleyas			25.20292	55.52626	25,162	2	Stables	Kebab Restaurant	0	0	0	0
Bu Kadra	1.7 km²	195	25.18142	55.32889	43,110	2	Golf Course	Nature Preserve	Racetrack	Auto Workshop	0	0
Dubai Investment Park Second			24.97343	55.19563	83,530	2	Frame Store	Tennis Stadium	Sporting Goods Shop	Sports Club	Dive Shop	0
Emirates Hill First	12.3 km²		25.05435	55.15188	33,155	2	Spa	Restaurant	Vegetarian / Vegan Re	0	0	0
Emirates Hill Third	12.3 km²		25.06834	55.1754	49,400	2	Business Service	IT Services	Moving Target	Fast Food Restaurant	Flower Shop	Medical Supply Store
Hatta			24.80051	56.1164	32,560	2	Gym	Soccer Field	Lake	Scenic Lookout	Historic Site	0
Jebel Ali Industrial	47.1 km²	31,634	24.95078	55.09272	45,413	2	Restaurant	0	0	0	0	0
Jebel Ali Palm			24.95078	55.09272	45,413	2	Restaurant	0	0	0	0	0
Palm Jumeira			25.11859	55.1328898	146,440	2	Beach	Gym	Track	Mediterranean Resta	Hotel	Harbor / Marina
Muhaisanah Fourt	13 km²	90,870	25.2764	55.40964	124,464	2	Gym	Business Service	Fast Food Restaurant	Indian Restaurant	Hotel	Grocery Store
Muhaisanah Secor	13 km²	90,870	25.2651	55.42453	124,464	2	Music Venue	Athletics & Sports	Airport Terminal	Campground		0
Muhaisanah Third	13 km²	90,870	25.27131	55.40101	124,464	2	Cafeteria	Park	Rental Car Location	Burger Joint		0
Muhaisnah First	13 km²	90,870	25.24539	55.4189	25,162	2	Gym	Café	Bakery	Gym / Fitness Center	0	0
Nad Al Hammar	8.4 km²	2,563	25.20099	55.3764	124,464	2	Cafeteria	Sandwich Place	Grocery Store	Ice Cream Shop	Clothing Store	Café
Nadd Al Shiba Fou	8.4 km²	2,563	25.13575	55.36244	35,193	2	Burger Joint	Hotel	Pet Store	Park	Café	Shopping Plaza
Nadd Al Shiba Secc	8.4 km²	2,563	25.15411	55.34023	35,193	2	Gym	Pool	Cafeteria	Castle	Neighborhood	Grocery Store
Nadd Al Shiba Thir	60 km²	680	25.14331	55.37589	40,231	2	Pizza Place	Pet Store	Art Gallery	0	0	0
Oud Al Muteena Third			25.27326	55.44738	25,162	2	Auto Garage	Café	Gym Pool	0	0	0
Ras Al Khor			25.18519	55.33039	83,691	2	Furniture / Home Stor	Golf Course	Nature Preserve	Auto Workshop	0	0
Ras Al Khor Indust	13 km²		25.18224	55.34592	124,464	2	Indian Restaurant	Coffee Shop	Restaurant	Asian Restaurant	Gift Shop	Gym
Ras Al Khor Indust	13 km²		25.18465	55.36232	124,464	2	Automotive Shop	Photography Studio	Motorcycle Shop	Café	Warehouse Store	Coffee Shop
Ras Al Khor Indust	13 km²		25.17627	55.36839	25,162	2	Basketball Court	Hardware Store	Athletics & Sports	Food	Automotive Shop	0
Umm Al Sheif	1.87 km²	6,263	25.1983	55.1983	70,982	2	Movie Theater	Clothing Store	Restaurant	Cosmetics Shop	Hotel	Chinese Restaurant
Wadi Alamardi			25.21703	55.48636	25,162	2	Farm	Campground	0	0	0	0
Warsan Second	17.1 km²	1,421	25.17025	55.44499	25,162	2	Zoo Exhibit	Café	Bar	Fast Food Restaurant	Steakhouse	Coffee Shop
Za'abeel First	10 km²	5,283	25.22576	55.29937	82,415	2	Middle Eastern Resta	Theme Park	Public Art	Cricket Ground	Hotel	Snack Place

Cluster 4:

Neighborhoods	Area	Population	Median Rent	Cluster Labels	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
Al Baraha	1.104 km²	7,823	74,990	3	Hotel	Indian Restaurant	American Restaurant	Bar	Lounge	Asian Restaurant	Coffee Shop	Turkish Restaurant	Women's Store	Fried Chicken Joint
Al Barsha First	38.1 km²	1248	70,982	3	Hotel	Middle Eastern Resta	Tapas Restaurant	Bed & Breakfast	Breakfast Spot	Korean Restaurant	Bakery	Steakhouse	Lebanese Restaurant	Russian Restaurant
Al Barsha Second	38.1 km²	1248	70,982	3	Hotel	Coffee Shop	Indian Restaurant	Bakery	Ice Cream Shop	Park	Egyptian Restaurant	Gym / Fitness Center	Candy Store	Restaurant
Al Garhoud	4 km²	4,466	83,691	3	Airport Lounge	Coffee Shop	Seafood Restaurant	Hotel	Lounge	Duty-free Shop	Smoke Shop	Burger Joint	Chinese Restaurant	Pub
Al Jaddaf	7.3 km²	2,990	83,691	3	Hotel	French Restaurant	Buffet	Bar	Italian Restaurant	American Restaurant	Lounge	Middle Eastern Resta	Molecular Gastronom	Seafood Restaurant
Al Jafiliya	1.63 km²	11,619	82,415	3	Hotel	Restaurant	Lounge	Coffee Shop	Café	Sushi Restaurant	Spa	Gourmet Shop	Greek Restaurant	Nightclub
Al Safouh Second	7.6 km²		94,596	3	Hotel	Italian Restaurant	Resort	Coffee Shop	Sandwich Place	Bistro	French Restaurant	Beach Bar
Al Satwa	2.87 km²	30,147	82,415	3	Hotel	Lounge	Café	Steakhouse	French Restaurant	Nightclub	Indian Restaurant	Restaurant	Bar	Residential Building (A
Al Wasl	4.76 km²	22,153	87,078	3	Hotel	Breakfast Spot	Lounge	Thai Restaurant	Gym / Fitness Center	Nightclub	Restaurant	Nightclub	Donut Shop	Canal
Business Bay	46 km²	191,000	87,078	3	Hotel	Lounge	Indian Restaurant	Gym / Fitness Center	Spa	Breakfast Spot	Restaurant	Steakhouse	South American Resta	Sandwich Place
Downtown Dubai	2.68	18,698	106,760	3	Hotel	Lounge	Lebanese Restaurant	Middle Eastern Resta	French Restaurant	Spa	Japanese Restaurant	Syrian Restaurant	Chinese Restaurant	Speakeasy
Dubai Investment park First			83,530	3	Hotel	Grocery Store	Coffee Shop	Café	Italian Restaurant	Thai Restaurant	Motorcycle Shop	Shopping Mall	Pet Store	Fast Food Restaurant
Marsa Dubai			94,596	3	Hotel	Beach	Restaurant	Café	Lounge	Indian Restaurant	Cocktail Bar	Spanish Restaurant	Seafood Restaurant	Resort
Port Saeed	1.84 km²	448	67,744	3	Hotel	Coffee Shop	Gym / Fitness Center	Café	Tex-Mex Restaurant	Record Shop	Bakery	Supermarket	Multiplex	Chinese Restaurant
Trade Centre 1	0.90 km²	4,358	82,415	3	Hotel	French Restaurant	Nightclub	Café	Greek Restaurant	Convenience Store	Pool	Coffee Shop	Residential Building (A	Fast Food Restaurant
Umm Hurair Secon	2.3 km	4,428	83,691	3	Coffee Shop	Lounge	Café	Hotel	Golf Course	BBQ Joint	Tapas Restaurant	Bar	Steakhouse	Spa
Za'abeel Second	10 km²	5,283	48,314	3	Hotel	Lounge	Indian Restaurant	Coffee Shop	Cocktail Bar	Italian Restaurant	Middle Eastern Resta	Greek Restaurant	Diner	Restaurant

Cluster 5:

Neighborhoods	Area	Population	Median Rent	Cluster Labels	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
Al Hudaiba	0.84 kmÂ²	7,699	82,415	4	Coffee Shop	Asian Restaurant	CafÃ©	Convenience Store	Middle Eastern Resta	Indian Restaurant	Pizza Place	Seafood Restaurant	Cafeteria	Pakistani Restaurant
Al Muraqqabat	0.78 kmÂ²	32,395	74,990	4	Middle Eastern Restaurant	Hotel	Iraqi Restaurant	Gym / Fitness Center	Sandwich Place	Fried Chicken Joint	Spa	CafÃ©	Restaurant	Lounge
Al Mushrif			124,464	4	Indian Restaurant	Restaurant	Fried Chicken Joint	Hotel	Coffee Shop	CafÃ©	Asian Restaurant	Bakery	Department Store	Dessert Shop
Al Muteena	1.12 kmÂ²	18,094	74,990	4	Coffee Shop	Hotel	Middle Eastern Resta	CafÃ©	Lounge	Iraqi Restaurant	Grocery Store	Nightclub	Shopping Mall	Fried Chicken Joint
Al Nahda First	3.18 kmÂ²	600	74,990	4	Indian Restaurant	Department Store	Pakistani Restaurant	Middle Eastern Resta	Market	Beach	Residential Building (A	CafÃ©	Business Service	Sandwich Place
Al Nahda Second	3.18 kmÂ²	600	74,990	4	Coffee Shop	Italian Restaurant	Ice Cream Shop	American Restaurant	Pakistani Restaurant	Fast Food Restaurant	Residential Building (A	CafÃ©	Bakery	Furniture / Home Stor
Al Qusais Industrial Fourth	206		124,464	4	CafÃ©	Coffee Shop	Indian Restaurant	Fast Food Restaurant	Ice Cream Shop	Restaurant	Bakery	Gym / Fitness Center	Snack Place	Moving Target
Al Qusais Industrial Second	2,090		124,464	4	CafÃ©	Indian Restaurant	Fast Food Restaurant	Restaurant	Ice Cream Shop	Coffee Shop	Asian Restaurant	Middle Eastern Resta	Sporting Goods Shop	Sandwich Place
Al Qusais Industrial Third	162		124,464	4	Ice Cream Shop	CafÃ©	Coffee Shop	Indian Restaurant	Fast Food Restaurant	Restaurant	Bakery	Asian Restaurant	Flower Shop	Sporting Goods Shop
Al Qusais Second	7,657		124,464	4	Coffee Shop	Indian Restaurant	Bakery	Convenience Store	Park	Diner	Post Office	Restaurant	CafÃ©	Cafeteria
Al Twar First	6.8 kmÂ²	18,457	124,464	4	Athletics & Sports	Coffee Shop	Fast Food Restaurant	CafÃ©	Indian Restaurant	Bus Station	Fried Chicken Joint	Bookstore	Mobile Phone Shop	Breakfast Spot
Al Twar Second	6.8kmÂ²	18,457	124,464	4	Coffee Shop	CafÃ©	Park	Indian Restaurant	Dessert Shop	Convenience Store	Post Office	Chinese Restaurant	Bakery	Sandwich Place
Emirates Hill Secor	12.3 kmÂ²		70,982	4	Coffee Shop	Restaurant	Middle Eastern Resta	Diner	Gym	Nightclub	Residential Building (A	Fried Chicken Joint	French Restaurant	Gastropub
Jebel Ali 1	47.1 kmÂ²	31,634	33,155	4	Middle Eastern Resta	Sandwich Place	Supermarket	Coffee Shop	Indian Restaurant	CafÃ©	Clothing Store	Donut Shop	Bakery	Liquor Store
Jebel Ali 2	47.1 kmÂ²	31,634	33,155	4	Middle Eastern Resta	Sandwich Place	Supermarket	Coffee Shop	Indian Restaurant	CafÃ©	Clothing Store	Donut Shop	Bakery	Liquor Store
Trade Centre 2	1.91 kmÂ²	3,353	151,369	4	Coffee Shop	French Restaurant	Spa	Restaurant	CafÃ©	Japanese Restaurant	Gym / Fitness Center	Gym	Greek Restaurant	Latin American Restau
Umm Suqeim First	7.2 kmÂ²	16,459	95,922	4	Coffee Shop	Beach	Restaurant	Indian Restaurant	Juice Bar	Burger Joint	Bakery	Middle Eastern Resta	Water Park	Lebanese Restaurant

Cluster 6:

Neighborhoods	Area	Population	Median Rent	Cluster Labels	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
Al Buteen	0.07 kmÂ²	2,364	67,744	5	CafÃ©	Hotel	Market	Electronics Store	Historic Site	Art Gallery	Indian Restaurant	Asian Restaurant	Tea Room	Fast Food Restaurant
Al Dhagaya	0.125 kmÂ²	10,896	67,744	5	Hotel	Historic Site	Restaurant	Electronics Store	Art Gallery	Flower Shop	Shopping Mall	CafÃ©	Museum	Fast Food Restaurant
Al Hamriya, Dubai	0.72 kmÂ²	15,104	67,744	5	Indian Restaurant	Tea Room	CafÃ©	Coffee Shop	Supermarket	Historic Site	Ice Cream Shop	Greek Restaurant	French Restaurant	Fast Food Restaurant
Al Quoz Industrial	16,719		128,948	5	Coffee Shop	CafÃ©	Gym / Fitness Center	Art Gallery	Cultural Center	Juice Bar	Soccer Field	Boutique	Middle Eastern Resta	Furniture / Home Stor
Al Ras	0.20 kmÂ²	6,812	67,744	5	Indian Restaurant	CafÃ©	Historic Site	Coffee Shop	Museum	Art Gallery	Middle Eastern Resta	History Museum	Tea Room	Shopping Mall
Al Sabkha	0.13 kmÂ²	2,627	67,744	5	Hotel	Middle Eastern Resta	CafÃ©	Historic Site	Electronics Store	Art Gallery	Asian Restaurant	Jewelry Store	Flower Shop	Shopping Mall
Al Shindagha	0.26 kmÂ²	16	67,744	5	Indian Restaurant	Middle Eastern Resta	Shopping Mall	Market	Coffee Shop	Juice Bar	Movie Theater	Fast Food Restaurant	Museum	Bed & Breakfast

Cluster 7:

Neighborhoods	Area	Population	Median Rent	Cluster Labels	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
Al Karama	1.509 km	45,674	67,744	6	Indian Restaurant	Ice Cream Shop	North Indian Restaura	Pakistani Restaurant	Filipino Restaurant	Fast Food Restaurant	Seafood Restaurant	Supermarket	Bakery	Restaurant
Al Khabisi	1.255 kmÂ²	6,737	74,990	6	Indian Restaurant	Hotel	CafÃ©	Chinese Restaurant	Market	Gym / Fitness Center	Convenience Store	Department Store	Pool Hall	Coffee Shop
Al Kifaf	0.8 kmÂ²	35	67,744	6	Indian Restaurant	Hotel	Seafood Restaurant	CafÃ©	Park	Middle Eastern Resta	Pizza Place	Japanese Restaurant	Fast Food Restaurant	Tea Room
Al Mankhool	1 km	16,013	67,744	6	Indian Restaurant	Fast Food Restaurant	Supermarket	Chinese Restaurant	Restaurant	Hotel	Greek Restaurant	Dim Sum Restaurant	Seafood Restaurant	Burger Joint
Al Qusais Industrial First	2,099		124,464	6	Indian Restaurant	Ice Cream Shop	CafÃ©	Convenience Store	Restaurant	Office	Spa	Flower Shop	Fast Food Restaurant	Pakistani Restaurant
Al Raffa	1.24 kmÂ²	15,344	67,744	6	Indian Restaurant	Coffee Shop	Chinese Restaurant	Asian Restaurant	Roof Deck	Pizza Place	Fast Food Restaurant	Gastropub	Supermarket	Nightclub
Al Souq Al Kabeer		26,405	67,744	6	Indian Restaurant	Ice Cream Shop	CafÃ©	Historic Site	Electronics Store	Coffee Shop	Middle Eastern Resta	Museum	Camera Store	Beach
Hor Al Anz	4.18 kmÂ²	40,342	74,990	6	Indian Restaurant	Market	CafÃ©	Fast Food Restaurant	Bakery	Department Store	Pharmacy	Burrito Place	Scenic Lookout	Restaurant

Cluster 8:

Neighborhoods	Area	Population	Median Rent	Cluster Labels	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
Al Guoz Fourth			67,744	7	Hotel	Asian Restaurant	Middle Eastern Resta	Chinese Restaurant	Snack Place	Japanese Restaurant	Korean Restaurant	Lounge	Fried Chicken Joint	Fish Market
Al Murar	0.41 kmÂ²	19,831	74,990	7	Hotel	Indian Restaurant	Asian Restaurant	Middle Eastern Resta	Women's Store	Restaurant	Mobile Phone Shop	Fried Chicken Joint	CafÃ©	Skating Rink
Al Nasr, Dubai	1.5 kmÂ²	2,469	74,990	7	Hotel	Asian Restaurant	Women's Store	Restaurant	Indian Restaurant	Japanese Restaurant	Middle Eastern Resta	Mobile Phone Shop	Skating Rink	Fast Food Restaurant
Al Rigga	0.89 kmÂ²	5,684	67,744	7	Hotel	Persian Restaurant	Restaurant	Middle Eastern Resta	Chinese Restaurant	Asian Restaurant	Korean Restaurant	Dim Sum Restaurant	Electronics Store	Snack Place
Ayal Nasir	0.17 kmÂ²	13,077	67,744	7	Hotel	Asian Restaurant	Art Gallery	Restaurant	Middle Eastern Resta	Japanese Restaurant	Jewelry Store	Gym	Fried Chicken Joint	Snack Place
Naif	0.561 kmÂ²	28,571	67,744	7	Hotel	Asian Restaurant	Japanese Restaurant	Middle Eastern Resta	Restaurant	Italian Restaurant	Jewelry Store	Gym	Snack Place	Historic Site
Rigga Al Buteen	0.684 kmÂ²	1,394	67,744	7	Hotel	Coffee Shop	Ice Cream Shop	Restaurant	Fast Food Restaurant	Middle Eastern Resta	Shopping Mall	CafÃ©	Lounge	Bank

Conclusion

We can have few key conclusions as follows.

a) All clusters have high similarity within it.

E.g. If somebody is coming new to Dubai and looking for hotel accommodation, he will try to look into Cluster 4 neighborhoods. Somebody wanting a relatively calm

neighborhood with less venues, may look into cluster 3. Somebody liking multicuisine foods, may consider cluster 7 as it has all different type of Restaurants.

b) Within the cluster based upon venues, an expat can choose neighborhood based upon rent viability.

c) We can also see population density by considering Area and Neighborhood and decide based upon our liking.