

Applied Data Science with Python

Capstone Project

Istanbul helps Cairo Find a New Go Kart Location

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Introduction

Problem Statement

Cairo is a big city that is very rich in terms of population density, infrastructure, historical and cultural sites and number of universities. Such characteristics of a city makes it attractive for investors, but due to the age of the city, almost all business ideas and projects can be found around the city, which makes the odds of having an edge very low. Indeed the odds may be low, only if we are talking about conventional business ideas. Egypt is a developing country, and most of the conventional business ideas around the world are quite new for Egypt, which opens the door to more ideas, that may not be new to the world, but new for Egypt.

The problem with these projects is that they need data and effective market research, which Egypt lacks at the moment, but the situation is improving nevertheless.

One of these ideas is a Go Kart track in Cairo, it's nothing new to the city, but it's not explored as there are 3-4 tracks for the whole city! My job is to choose a location/s for a new track in Cairo based on the venues around the location. I will need to find a city that's similar to Cairo with already established Go Kart tracks, and try to use the data from this city and apply it to Cairo. I chose Istanbul because it's very similar to Cairo both in density and infrastructure with a good number of tracks +25.

Data

The data for this project will be divided into two parts: Cairo and Istanbul.

Cairo Data:

- Neighborhoods/regions. This data could be found using the :Second-level Administrative Divisions of the Egypt from Spatial Data Repository of NYU. The data is obtained as a Geojson file, it was parsed to only include the data for the Great Cairo region (Cairo+Giza). Because how crowded and old the city is, a clear and nice boundaries between the regions can't be modeled easily, so for some some work was done to get fix the location of the region and the final data is stored in an csv file.

	Neighborhood	lat	long
0	Ad-Duqi	30.041422	31.210375
1	Al-'Ajuzah	30.051100	31.212600
2	Al-'Umraniyah	29.993105	31.183427
3	Al-Ahram	29.977300	31.132500
4	Al-Badrashayn	29.817743	31.251240

- Venues found around the city's regions utilizing Foursquare API in a similar way to what we did during the course with NY and Toronto.

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Ad-Duqi	30.041422	31.210375	Bab Al Yemen (باب اليمن)	30.040153	31.211254	Yemeni Restaurant
1	Ad-Duqi	30.041422	31.210375	Vibe Studio	30.040646	31.208809	Recording Studio
2	Ad-Duqi	30.041422	31.210375	Shaheen Coffee Stores (ثني شاهين)	30.042630	31.211645	Organic Grocery
3	Ad-Duqi	30.041422	31.210375	World Gym	30.041050	31.207784	Gym / Fitness Center
4	Ad-Duqi	30.041422	31.210375	Hooka	30.043899	31.212416	Café

Istanbul Data :

- Go Kart tracks around the city, this data was obtained using the Foursquare API that matched with Google Maps.

	Name	lat	long
0	Olimpik Go-Kart	41.041878	28.854383
1	İstanbul park drift pisti	40.950922	29.408883
2	Fevpark Dragos	40.902245	29.146531
3	Tuzla Karting Park	40.858462	29.318287
4	İSTANBUL KARTİNG PARK	40.962524	29.204296

- Venues around the tracks again using the Foursquare API just like Cairo.

	name	lat	long	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Olimpik Go-Kart	41.041878	28.854383	Olimpik Go-Kart	41.041878	28.854383	Go Kart Track
1	Olimpik Go-Kart	41.041878	28.854383	Közde Eminönü Kahvecisi	41.040163	28.858011	Coffee Shop
2	Olimpik Go-Kart	41.041878	28.854383	Azerbaycan Dostluk Parkı	41.044146	28.856454	Park
3	Olimpik Go-Kart	41.041878	28.854383	KIRVEM ET LOKANTASI	41.044085	28.850430	Steakhouse
4	Olimpik Go-Kart	41.041878	28.854383	RAAY BALKON CAFE	41.043474	28.850453	Café
5	Olimpik Go-Kart	41.041878	28.854383	Black&Black PS3 Cafe	41.043616	28.850947	Arcade
6	Olimpik Go-Kart	41.041878	28.854383	Çakır Restaurant	41.038697	28.857686	Restaurant
7	Olimpik Go-Kart	41.041878	28.854383	Vendor Coffee	41.038303	28.857289	Coffee Shop
8	Olimpik Go-Kart	41.041878	28.854383	Olimpik Go Kart	41.042798	28.851030	Arcade

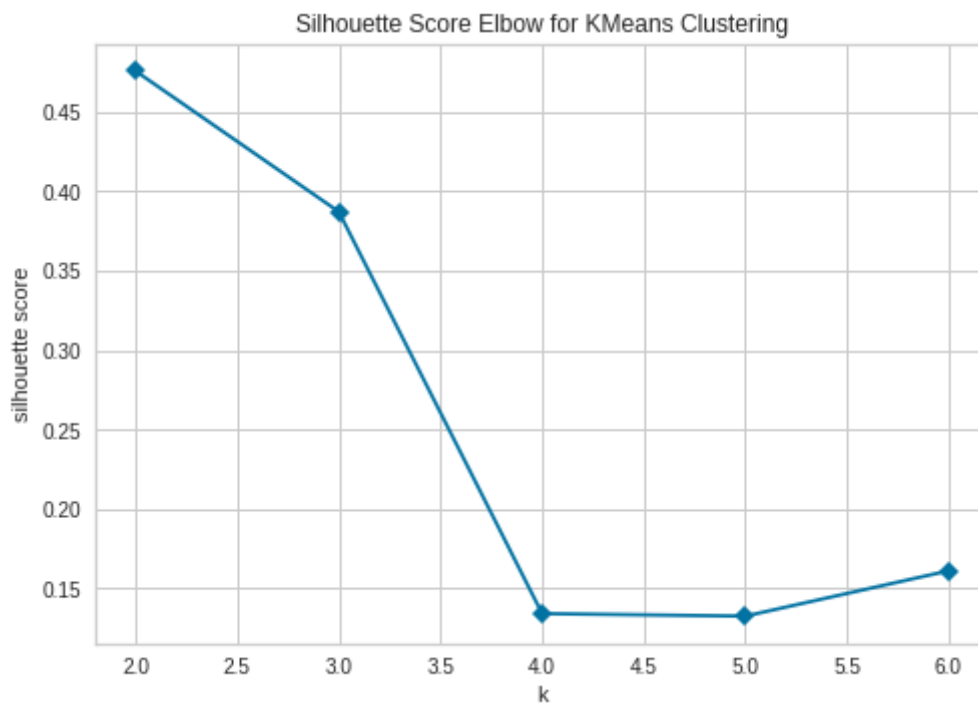
Methodology

For this project, it's necessary to find general characteristics of the locations in Istanbul and try to infer similar neighborhoods in Cairo. First after obtaining the venues around each location, the venues are then turned into features to cluster locations, this step is important to see if the locations have similarity between them or not. The values in the figure shows the frequency of each venue relative to the location:

	name	Accessories Store	Afghan Restaurant	American Restaurant	Arcade	Art Gallery	Arts & Crafts Store	Asian Restaurant	Astrologer	Athletics & Sports	Auto Dealership	Auto Garage	Auto Workshop
0	Almond Gokart Perlavista	0.0	0.000000	0.0	0.021053	0.010526	0.000000	0.0	0.0	0.010526	0.0	0.000000	0.010526
1	Beylerbeyi Go-Kart	0.0	0.016129	0.0	0.032258	0.000000	0.000000	0.0	0.0	0.016129	0.0	0.000000	0.000000
2	Cadde 26 ★ Tuning 2006	0.0	0.000000	0.0	0.021277	0.000000	0.021277	0.0	0.0	0.000000	0.0	0.021277	0.000000
3	Esatpaşa GARAGE	0.0	0.000000	0.0	0.064516	0.000000	0.032258	0.0	0.0	0.000000	0.0	0.000000	0.000000
4	Ferrari Racing Days - IstanbulPark	0.0	0.000000	0.0	0.000000	0.000000	0.000000	0.0	0.0	0.000000	0.0	0.000000	0.000000

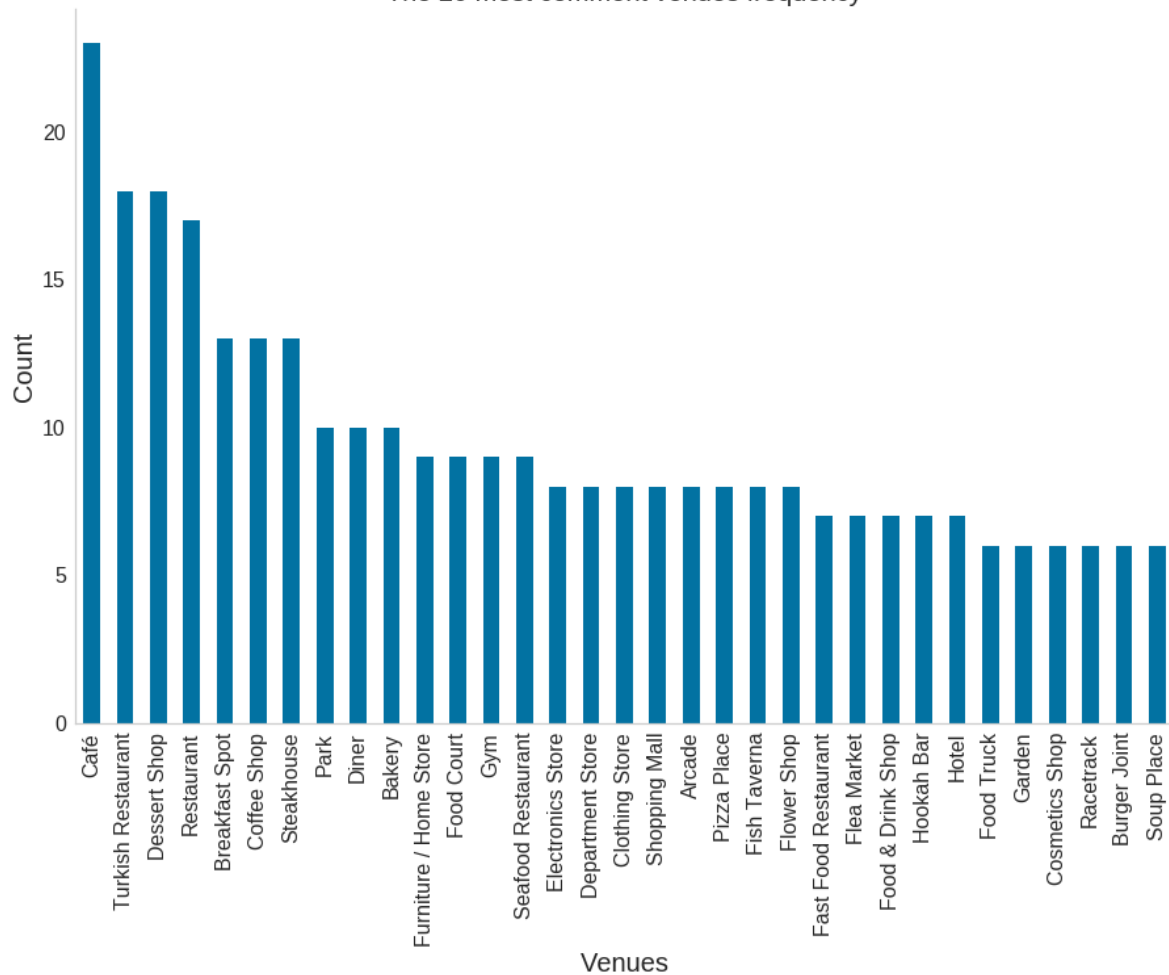
5 rows × 221 columns

Using the KMeans model, the Go Kart locations of Istanbul were clustered and the quality of clustering were assisted using elbow method. the following plot shows that only 2 clusters are giving the best clustering score, from these 2 clusters only 2 locations were found in one of them, which make us confidant that the locations are very close in the venues around them:



After that the most frequent venues of the top 20 venues are plotted in hope to give us insights about the the properties of the locations:

The 20 most common venues frequency



From the figure it can be seen that the characteristics of these locations are : cafe, fast/small/local food, shops, gyms, clubs/bars and outdoor/open places. It may be the case that these venues comes after the track is build, but because of the presence of shopping mall, I think that the track comes with these venues not the other way around. only 2 tracks are standalone tracks, most of these locations are around arcade and different shops, which indicates that the tracks are part of going-out with the family experience or a go-out to have fun while shopping or doing other activities. Hence, for Cairo we are interested in places where there are venues where families/friends could have fun driving the go karts, but also doing other activities like shopping or playing different games.

Finally, for each neighborhood in Cairo, the most 20 venues were found, also the neighborhoods were clustered into 7 groups based on their venue characteristics:

Label	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	11th most common venue	12th most common venue	13th most common venue	14th most common venue	15th most common venue	16th most common venue	17th most common venue	18th most common venue	19th most common venue	20th most common venue	
0	4	Abdin	Café	Egyptian Restaurant	Plaza	Theater	Coffee Shop	Dessert Shop	Middle Eastern Restaurant	Pastry Shop	Hotel Bar	Art Gallery	Falafel Restaurant	Italian Restaurant	Bookstore	Seafood Restaurant	Hotel	Beer Garden	Fast Food Restaurant	Casino	Clothing Store	Kebab Restaurant
1	6	'An Schams	Café	Seafood Restaurant	Egyptian Restaurant	Auto Garage	Mobile Phone Shop	Yoga Studio	Fast Food Restaurant	Falafel Restaurant	Fair	Eye Doctor	Event Service	Electronics Store	Eastern European Restaurant	Duty-free Shop	Donut Shop	Donor Restaurant	Distribution Center	Diner	Dessert Shop	Deli / Bodega
2	4	Ad-Darb al-Ahmar	Café	Historic Site	Kebab Restaurant	Plaza	Egyptian Restaurant	Dessert Shop	Music Venue	Jewelry Store	Market	Mosque	Middle Eastern Restaurant	Coffee Shop	Falafel Restaurant	Theater	Concert Hall	Souvenir Shop	Park	Pie Shop	Hookah Bar	Bookstore
3	4	Ad-Douj	Café	Restaurant	Fast Food Restaurant	Coffee Shop	Juice Bar	Gym / Fitness Center	Italian Restaurant	Mobile Phone Shop	Middle Eastern Restaurant	Plaza	Supermarket	Hotel	Electronics Store	Shawarma Place	Seafood Restaurant	Recording Studio	Organic Grocery	Hotel Bar	Yemeni Restaurant	Fried Chicken Joint
4	6	Al-'Ajzash	Café	Restaurant	Coffee Shop	Fast Food Restaurant	Kebab Restaurant	Nightclub	Seafood Restaurant	Supermarket	Middle Eastern Restaurant	Egyptian Restaurant	Italian Restaurant	Bakery	Burger Joint	Sushi Restaurant	Lebanese Restaurant	Mobile Phone Shop	Hotel	Plaza	Dessert Shop	
5	4	Al-'Umriyah	Electronics Store	Hotel	Food & Drink Shop	History Museum	Donor Restaurant	Falafel Restaurant	Fair	Eye Doctor	Event Service	Hookah Bar	Egyptian Restaurant	Eastern European Restaurant	Duty-free Shop	Donut Shop	Distribution Center	Historic Site	Diner	Dessert Shop	Deli / Bodega	Dairy Store
6	4	Al-Ahram	Historic Site	Hotel	Hostel	Lounge	Kebab Restaurant	Gift Shop	Garden	Resort	Café	Seafood Restaurant	Souvenir Shop	Bed & Breakfast	Stables	Fried Chicken Joint	Perfume Shop	Amphitheater	History Museum	Gaming Cafe	Electronics Store	Egyptian Restaurant
7	4	Al-Adabiyah	Café	Theater	Plaza	Movie Theater	Hotel	Falafel Restaurant	Clothing Store	Tunnel	Egyptian Restaurant	Pastry Shop	Bookstore	Market	Mobile Phone Shop	Distribution Center	Boulique	Middle Eastern Restaurant	Fast Food Restaurant	Juice Bar	Bakery	Italian Restaurant
8	4	Al-Bazatin	Bakery	Dessert Shop	Convenience Store	Middle Eastern Restaurant	Gym / Fitness Center	Breakfast Spot	Donut Shop	Flower Shop	Pharmacy	Juice Bar	Burger Joint	Sandwich Place	Café	Mobile Phone Shop	Grocery Store	Smoke Shop	Chinese Restaurant	Market	Sporting Goods Shop	Racetrack
9	2	Al-Hawamidiyah	Print Shop	Fair	Flea Market	Falafel Restaurant	Eye Doctor	Event Service	Electronics Store	Egyptian Restaurant	Eastern European Restaurant	Duty-free Shop	Donut Shop	Donor Restaurant	Distribution Center	Diner	Dessert Shop	Deli / Bodega	Dairy Store	Currency Exchange	Cupcake Shop	Cuban Restaurant
10	4	Al-Jamaliyah	Café	Historic Site	Mosque	Egyptian Restaurant	Sandwich Place	Pie Shop	Kebab Restaurant	Music Venue	Falafel Restaurant	Arts & Entertainment	Market	Souvenir Shop	Bus Station	Sports Club	Coffee Shop	Dessert Shop	Plaza	Theater	Women's Store	Hookah Bar
11	6	Al-Khalifa	Café	Dessert Shop	Juice Bar	Pizza Place	Boxing Gym	Egyptian Restaurant	Food Truck	Supermarket	Fast Food Restaurant	Gym / Fitness Center	Comfort Food Restaurant	Dairy Store	Eastern European Restaurant	Eye Doctor	Event Service	Crepes	Electronics Store	Cruise	Cuban Restaurant	Duty-free Shop
12	4	Al-Masri	Café	Coffee Shop	Ice Cream Shop	Restaurant	American Restaurant	Convenience Store	Lounge	Middle Eastern Restaurant	Bookstore	Dessert Shop	Fast Food Restaurant	Mobile Phone Shop	Pizza Place	Indian Restaurant	Italian Restaurant	Cupcake Shop	Supermarket	Lebanese Restaurant	Burger Joint	Eye Doctor
13	6	Al-Masri	Hot Dog Joint	Metro Station	Café	Cruise	Cuban Restaurant	Falafel Restaurant	Crepes	Fair	Eye Doctor	Event Service	Electronics Store	Egyptian Restaurant	Eastern European Restaurant	Duty-free Shop	Donut Shop	Donor Restaurant	Flea Market	Distribution Center	Diner	Dessert Shop
14	6	Al-Matariyah	Café	Hookah Bar	Smoke Shop	Ski Area	Dessert Shop	Donut Shop	Fair	Eye Doctor	Event Service	Electronics Store	Egyptian Restaurant	Eastern European Restaurant	Duty-free Shop	Distribution Center	Donor Restaurant	Fast Food Restaurant	Supermarket	Deli / Bodega	Dairy Store	Currency Exchange
15	4	Al-Muski	Café	Historic Site	Theater	Middle Eastern Restaurant	Falafel Restaurant	Market	Pie Shop	Egyptian Restaurant	Plaza	Tea Room	Italian Restaurant	Fried Chicken Joint	Clothing Store	Music Venue	Arts & Entertainment	Mobile Phone Shop	Art Museum	Bar	Antique Shop	Hotel

Results

Following the analysis in the previous section, cluster 4 stood out as most representative cluster, but few were truly representative, also some locations in other clusters showed similar results.

21	4	As-Salam	Hookah Bar	Flea Market	Kebab Restaurant	Café	Cuban Restaurant	Donut Shop	Falafel Restaurant	Fair	Eye Doctor	Event Service	Electronics Store	Egyptian Restaurant	Eastern European Restaurant	Duty-free Shop	Creperie	Cupcake Shop	Doner Restaurant	Cruise	Distribution Center	Diner
22	4	As-Saydah Zaynah	Café	Egyptian Restaurant	Falafel Restaurant	Kebab Restaurant	Historic Site	Plaza	Dessert Shop	Asian Restaurant	Performing Arts Venue	Seafood Restaurant	Metro Station	Italian Restaurant	Memorial Site	Pharmacy	Gym / Fitness Center	Hookah Bar	Diner	Eastern European Restaurant	Duty-free Shop	Harbor / Marina
25	4	Az-Zahir	Café	Plaza	Juice Bar	Pizza Place	Chinese Restaurant	Supermarket	Fried Chicken Joint	Kebab Restaurant	Metro Station	Fast Food Restaurant	Falafel Restaurant	Mosque	Coffee Shop	History Museum	Asian Restaurant	Currency Exchange	Flower Shop	Flea Market	Airport Terminal	American Restaurant
27	4	Bab ash-Shaykh	Historic Site	Café	Plaza	Sandwich Place	Mosque	Market	Arts & Entertainment	Music Venue	Kebab Restaurant	Pie Shop	German Restaurant	Diner	Eastern European Restaurant	Gym / Fitness Center	Duty-free Shop	Donut Shop	Harbor / Marina	Health & Beauty Service	Doner Restaurant	Distribution Center
28	4	Bulaq	Hotel	Bar	Café	Coffee Shop	Pub	Middle Eastern Restaurant	Lounge	Boat or Ferry	Burger Joint	Japanese Restaurant	Italian Restaurant	Steakhouse	Bookstore	Ice Cream Shop	Kebab Restaurant	Bus Station	Solid Place	Road	Lebanese Restaurant	Boutique
29	4	Bulaq al-Dakr	Gift Shop	Coffee Shop	Soccer Field	Egyptian Restaurant	Distribution Center	Fair	Eye Doctor	Event Service	Electronics Store	Eastern European Restaurant	Duty-free Shop	Donut Shop	Doner Restaurant	Yoga Studio	Fast Food Restaurant	Diner	Dessert Shop	Deli / Bodega	Dairy Store	Currency Exchange
30	4	Giza	Café	Middle Eastern Restaurant	Metro Station	Seafood Restaurant	Egyptian Restaurant	Dessert Shop	Restaurant	Electronics Store	Falafel Restaurant	Beer Garden	Sports Club	Lebanese Restaurant	Stationery Store	Kebab Restaurant	Mobile Phone Shop	Auto Workshop	Pharmacy	Gym	Construction & Landscaping	Tunnel
31	4	Hadra' al-Qishab	Creperie	Big Box Store	Shopping Mall	Fried Chicken Joint	Café	Sandwich Place	Yoga Studio	Donut Shop	Fair	Eye Doctor	Event Service	Electronics Store	Egyptian Restaurant	Eastern European Restaurant	Duty-free Shop	Doner Restaurant	Fast Food Restaurant	Distribution Center	Diner	Dessert Shop
32	4	Helwan	Café	Pizza Place	Fast Food Restaurant	Plaza	Juice Bar	Seafood Restaurant	Sports Club	Ice Cream Shop	Kebab Restaurant	Falafel Restaurant	Egyptian Restaurant	Smoke Shop	Gym / Fitness Center	Fried Chicken Joint	Pastry Shop	Track	Bookstore	Italian Restaurant	Pharmacy	Basketball Court
34	4	Imbabrah	Afghan Restaurant	Café	Park	Italian Restaurant	Cafeteria	Falafel Restaurant	Fair	Eye Doctor	Event Service	Electronics Store	Egyptian Restaurant	Duty-free Shop	Donut Shop	Doner Restaurant	Flea Market	Distribution Center	Diner	Dessert Shop	Deli / Bodega	
36	4	Near City 1	Café	Juice Bar	Indonesian Restaurant	Falafel Restaurant	Coffee Shop	Fried Chicken Joint	Supermarket	Baby Store	Syrian Restaurant	Pizza Place	Mobile Phone Shop	Gym	Creperie	Fair	Eye Doctor	Event Service	Electronics Store	Egyptian Restaurant	Eastern European Restaurant	Duty-free Shop
37	4	Near City 2	Café	Fast Food Restaurant	Coffee Shop	Juice Bar	Gym / Fitness Center	Creperie	Middle Eastern Restaurant	Italian Restaurant	Egyptian Restaurant	Restaurant	Burger Joint	Bakery	Pizza Place	Syrian Restaurant	Clothing Store	Pharmacy	Dessert Shop	Gaming Cafe	Sandwich Place	Gym
38	4	New Cairo 1	Coffee Shop	Café	Supermarket	Plaza	Ice Cream Shop	Falafel Restaurant	Pharmacy	Pizza Place	Park	Restaurant	Spa	Lebanese Restaurant	Candy Store	Shopping Mall	Bookstore	Kebab Restaurant	Sports Club	Fast Food Restaurant	Chinese Restaurant	Pool
40	4	New Cairo 3	Café	Fast Food Restaurant	Supermarket	Syrian Restaurant	Pizza Place	Restaurant	Convenience Store	Falafel Restaurant	Stationery Store	Kebab Restaurant	Lebanese Restaurant	Electronics Store	Egyptian Restaurant	Sandwich Place	Dessert Shop	Dairy Store	Pastry Shop	Juice Bar	Coffee Shop	
41	4	Qasr an-Nil	Café	Middle Eastern Restaurant	Lounge	Hotel	Egyptian Restaurant	Hotel Bar	Art Gallery	Restaurant	Coffee Shop	Theater	Italian Restaurant	Lebanese Restaurant	Plaza	Beer Garden	Performing Arts Venue	Dessert Shop	Mediterranean Restaurant	Bistro		
42	4	Rud al-Faraj	Café	Restaurant	Middle Eastern Restaurant	Speakeasy	Bakery	Pharmacy	Plaza	Distribution Center	Casino	Business Service	Mobile Phone Shop	Soccer Field	Metro Station	Supermarket	Creperie	German Restaurant	Italian Restaurant	Insurance Office	Fried Chicken Joint	Diner
47	4	Zamalek	Coffee Shop	Café	Middle Eastern Restaurant	Italian Restaurant	Pub	Bar	Hotel	Sushi Restaurant	Boat or Ferry	Bakery	Lounge	Burger Joint	Boutique	Performing Arts Venue	Dessert Shop	Steakhouse	Bookstore	Ice Cream Shop	Juice Bar	French Restaurant

The best candidates are shown below, most of these locations contain a metro station or active public transportation, also they are very active and contain different venues and shopping center.

	Label	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	11th most common venue	12th most common venue	13th most common venue
3	4	Ad-Duqi	Café	Restaurant	Fast Food Restaurant	Coffee Shop	Juice Bar	Gym / Fitness Center	Italian Restaurant	Mobile Phone Shop	Middle Eastern Restaurant	Plaza	Supermarket	Hotel	Electronics Store
8	4	Al-Basatin	Bakery	Dessert Shop	Convenience Store	Middle Eastern Restaurant	Gym / Fitness Center	Breakfast Spot	Donut Shop	Flower Shop	Pharmacy	Juice Bar	Burger Joint	Sandwich Place	Coffee Shop
12	4	Al-Ma'adi	Café	Coffee Shop	Ice Cream Shop	Restaurant	American Restaurant	Convenience Store	Lounge	Middle Eastern Restaurant	Bookstore	Dessert Shop	Fast Food Restaurant	Mobile Phone Shop	Pizzeria
25	4	Az-Zahir	Café	Plaza	Juice Bar	Pizza Place	Chinese Restaurant	Supermarket	Fried Chicken Joint	Kebab Restaurant	Metro Station	Fast Food Restaurant	Falafel Restaurant	Mosque	Coffee Shop
28	4	Bulaq	Hotel	Bar	Café	Coffee Shop	Pub	Middle Eastern Restaurant	Lounge	Boat or Ferry	Burger Joint	Japanese Restaurant	Italian Restaurant	Steakhouse	Bookstore
36	4	Nasr City 1	Café	Juice Bar	Indonesian Restaurant	Falafel Restaurant	Coffee Shop	Fried Chicken Joint	Supermarket	Baby Store	Syrian Restaurant	Pizza Place	Mobile Phone Shop	Gym	Creperie
38	4	New Cairo 1	Coffee Shop	Café	Supermarket	Plaza	Ice Cream Shop	Falafel Restaurant	Pharmacy	Pizza Place	Park	Restaurant	Spa	Lebanese Restaurant	Café
40	4	New Cairo 3	Café	Fast Food Restaurant	Supermarket	Syrian Restaurant	Pizza Place	Restaurant	Convenience Store	Falafel Restaurant	Stationery Store	Kebab Restaurant	Lebanese Restaurant	Seafood Restaurant	Electronics Store

Discussion

This is a preliminary analysis and rather a simple one, but for more serious analysis I think features found from Istanbul could be localized so it matches the nature of Cairo, for example the features from Istanbul contained a lot of Turkish restaurant variations, these same features could not be applied to Egypt, but mapping these kind of venues to it's Egyptian equivalent is much better. Or these features could be abstracted between the two so that we may cluster the two groups together and find the cluster that contains the Go Kart Tracks and the neighborhoods.

Conclusion

All in all this was an interesting and project in terms of idea or steps and methods used, I think that this kind of "borrowing" of other cities and entities around the world that are similar to what we have here in Egypt is a shortcut towards achieving faster development and greater expansion in business and other other fields that data science could help, whether this help is by saving efforts or discovering hidden patterns that can only be found in data.