



IBM Data Science Professional Certificate

Applied Data Science Capstone

Capstone Project - The Battle of Neighborhoods

Selecting Best Location to open a new Sports Mall in Giza Governorate, Egypt



Submitted by: Ahmed Reda

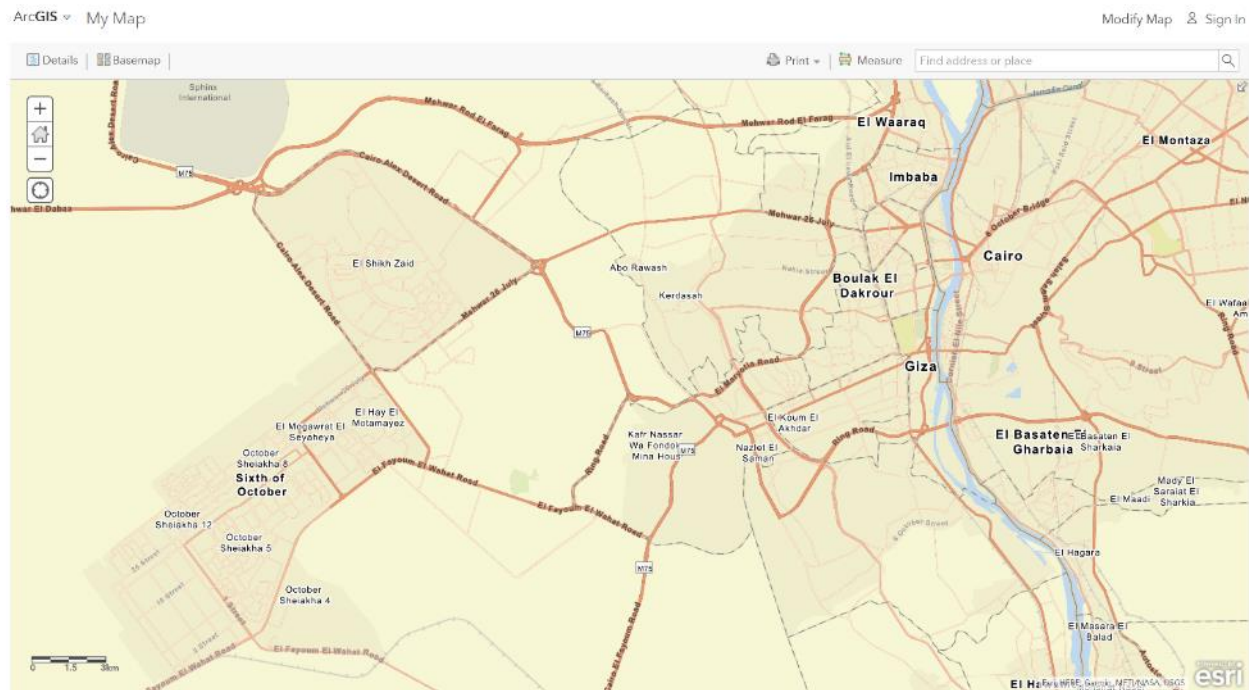
Date: July 2019

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1. Introduction

The aim of the this project is to utilize the use of Data Science & Location Data to select the optimum location for establishing Sports Mall in Giza Governorate, Egypt to serve the existing sporting facilities in the selected governorate.



2. Intended Audience

The intended audience are as follows;

- 1- Investors
- 2- Municipalities
- 3- Real Estate Developers

3. Business Understanding

The target is to select the best location for opening a Sports Mall.

4. Data Requirements

The required data to fulfil the above business requirements are as follows;

1. Municipal divisions of Giza Governorate
2. Longitude & Latitude coordinates for Municipal Divisions
3. Characteristics of each municipal division for existing venues and its categories

5. Data Collection

The data sources which will be used to fulfil the above requirements are as follows;

1. Municipal divisions of Giza Governorate https://en.wikipedia.org/wiki/Giza_Governorate, the image below shows brief about the governorate and Municipal Divisions data that will be used.

Municipal divisions [edit]

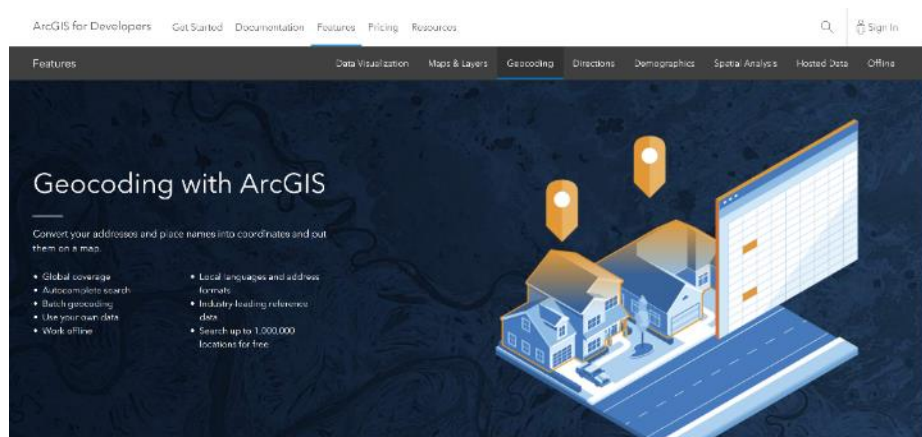
The governorate is divided into **municipal divisions**, with a total estimated population as of July 2017 of 8,886,090. In the case of Giza governorate, there are a number of **asqam** and **markaz**, with fully urban and rural parts. Sometimes a markaz and a kiam share a name.^[8]

Municipal Divisions

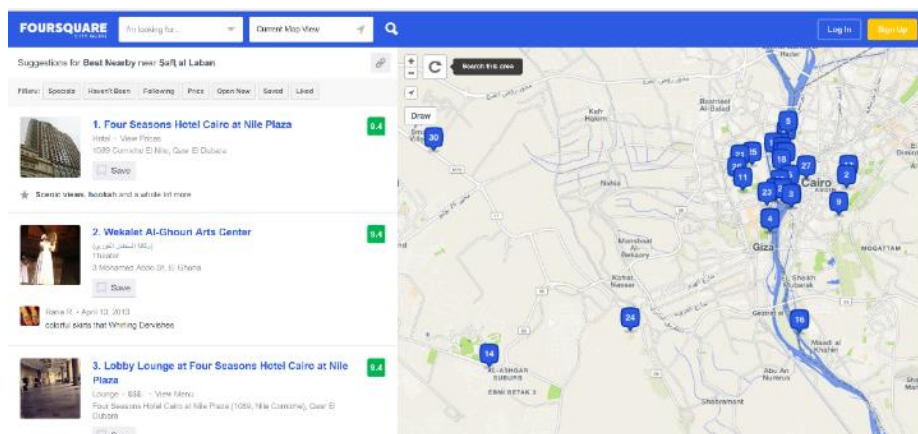
Anglicized name	Native name	Arabic transliteration	Population (July 2017 Est.)	Type
Dokki	دقي	Ad-Duqqi	71,161	Kiam (fully urban)
Pyramids	دقي الأهرام	Ad-Duqqi al-Ahram	681,478	Kiam (fully urban)
Agouza	دقي الجيزة	Ad-Duqqi al-Jizah	279,400	Kiam (fully urban)
El Ayyat	مرکز الشايطة	Al-Ayyat	494,548	Markaz

Giza Governorate on the map of Egypt Coordinates: 29°26′N 29°07′E﻿ / ﻿29.433°N 29.117°E﻿ / 29.433; 29.117	
Country	 Egypt
Seat	Giza (capital)
Government • Governor	Ahmed Rashad Mustafa Adil ^[5]
Area • Total	85,153 km ² (32,876 sq mi)
Population (January 2018) • Total	8,759,000 ^[7]
Time zone	UTC+2 (EET)
HDI (2017)	0.699 ^[6]
Website	http://www.giza.gov.eg

2. Geocoding Services of ArcGIS <https://geocode.arcgis.com/arcgis/> for getting the longitude & latitude coordinates for Municipal Divisions



3. FourSquare API to get the existing venues and its categories that will be used for classifying and clustering the different Municipal Divisions <https://foursquare.com/explore?mode=url&ne=30.111276%2C31.307774&sw=29.927267%2C31.020069>



The following section illustrates the methodology used to achieve the business requirements. The main factors that will be used for selection of the best location are:

- 1- Density of venues in the cluster, higher density means high potential
- 2- Density of Sports Facilities in each cluster, higher density means high potential
- 3- The existence of Sports Mall in cluster, lower density means high potential

This includes scraping the wiki page to get the municipal divisions, selecting subset from the data that represents the urban areas only. The below steps shows action taken for data preparation.

This map illustrates the Greater Cairo Urban Region, centered on the Nile River. The city of Cairo is depicted with a dense network of roads and buildings. The Nile River flows through the center, with several bridges crossing it. The map includes labels for various districts and landmarks, such as 'مدينة النجش' (Nasr City), 'مدينة شبرا الخيمة' (Shubra el-Khayma), and 'مدينة الجيزة' (Giza). The Nile River is shown in blue, and the surrounding areas are in shades of green and brown. The map also shows the 'القاهرة الجديدة' (New Cairo) area to the north and the 'محافظة الجيزة' (Giza Governorate) to the west.

[illegible]

Neighborhood	ArName	ArTrans	Population	Category
0	Dokki	قصر شوقي	43,749	Rural (fully urban)
1	Pyramids	أبي حوريم	561,678	Rural (fully urban)
2	Agouza	أبي نجاشي	278,408	Rural (fully urban)
3	Giza	أبي جرش	286,668	Rural (fully urban)
4	El Densayah	أبي دنشايه	367,274	Rural (fully urban)
5	Sheikh Zaynab City	أبي زينب	90,907	Rural (fully urban)
6	Babou	بابي الجبل	963,201	Rural (fully urban)
7	Imbaba	إمبابة	534,686	Rural (fully urban)
8	Elh of October City (2)	مدينة أكتوبر 2	1,071,019	Rural (fully urban)
9	Elh of October City (1 & 3)	مدينة أكتوبر 1 & 3	1,021,999	Rural (fully urban)

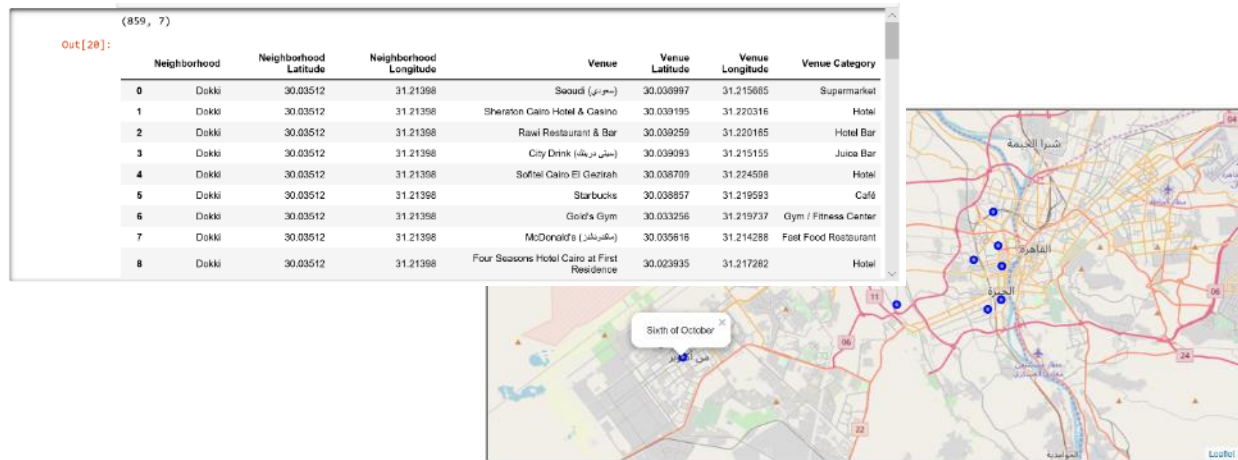
Out[11]:	Neighborhood	ArName	ArTrans	Population	Category
0	Dokki	قصر الدقي	Ad-Duqqi	71,161	Kism (fully urban)
1	Pyramids	قصر الأهرام	Al-Ahrām	681,478	Kism (fully urban)
2	Agouza	قصر الجيزة	Al-ʿAzzāh	278,400	Kism (fully urban)
3	Giza	قصر الجيزة	Al-ʿFizāh	286,668	Kism (fully urban)
4	El Omranly	قصر العمرانية	Al-Umrāniyah	367,274	Kism (fully urban)
5	Sheikh Zayed City	قصر الشيخ زايد	Madīnat El Saikh Zayid	90,997	Kism (fully urban)
6	Baḡa	قصر باغى الدكتور	Bāḡa al-Dakṭar	963,201	Kism (fully urban)
7	Imbaba	قصر إمبابة	Imbābbāh	634,686	Kism (fully urban)
8	Sixth of October	قصر 6 أكتوبر	Sixth of October	152,999	Kism (fully urban)

(9, 7)

Out[13]:

	Neighborhood	ArName	ArTrans	Population	Category	Latitude	Longitude
0	Dokki	قصر قاي	Ad-Duqqī	71,161	Kism (fully urban)	30.03512	31.21358
1	Pyramids	قصر الأهرام	Al-Aḥrām	661,478	Kism (fully urban)	30.00636	31.12209
2	Agouza	قصر المحمودة	Al-Ajūzah	279,400	Kism (fully urban)	30.05061	31.21059
3	Giza	قصر الجيزة	Al-Jīzah	286,668	Kism (fully urban)	30.00956	31.21381
4	El Omraniya	قصر العمرية	Al-Umrāniyah	367,274	Kism (fully urban)	30.00243	31.20168
5	Sheikh Zayed City	قصر الشيخ زايد	Madīnat El Saikh Zaid	90,997	Kism (fully urban)	30.05339	31.00164
6	Bulaq	قصر بولاق الخمرور	Būlaq al-Dakrūr	963,201	Kism (fully urban)	30.03976	31.18943
7	Imbaba	قصر إمبابة	Imbābah	634,088	Kism (fully urban)	30.07625	31.20068
9	Sixth of October	قصر السادس أكتوبر / قمر شات 6 أكتوبر	Sixth of October	152,999	Kism (fully urban)	29.96630	30.93550

Exploring the existing venues in each municipal division. The parameters used are searching radius of 5000 meter and limit of 500. The below images shows venues table and map of municipal locations.



Exploring the sports facilities in each municipal division. The below images shows the list of sports facilities and map for sports facilities locations.



6.2 Analysis

The resulted data is grouped and taking the mean of the frequency of occurrence of each category. The top 10 most common venues are selected.

(9, 11)

Out[31]:

	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
0	Agouza	Café	Hotel	Italian Restaurant	Restaurant	Sports Club	Seafood Restaurant	Bakery	Middle Eastern Restaurant	Burger Joint	Sushi Restaurant
1	Bulaq	Café	Seafood Restaurant	Gym / Fitness Center	Dessert Shop	Hotel	Italian Restaurant	Middle Eastern Restaurant	Lebanese Restaurant	Sports Club	Juice Bar
2	Dokki	Café	Hotel	Restaurant	Italian Restaurant	Sports Club	Hotel Bar	Gym / Fitness Center	Lounge	Lebanese Restaurant	Nightclub
3	El Oreniya	Café	Hotel Bar	Italian Restaurant	Hotel	Restaurant	Gym / Fitness Center	Nightclub	Historic Site	Food Court	Dessert Shop
4	Giza	Café	Hotel	Hotel Bar	Dessert Shop	Italian Restaurant	Lounge	Food Court	Gym / Fitness Center	Historic Site	Nightclub
5	Imbaba	Café	Hotel	Italian Restaurant	Sushi Restaurant	Middle Eastern Restaurant	Lebanese Restaurant	Egyptian Restaurant	Dessert Shop	Coffee Shop	Bar
6	Pyramids	Café	Historic Site	Hotel	Falafel Restaurant	Convenience Store	Restaurant	Stables	History Museum	Scenic Lookout	Burger Joint
7	Sheikh Zayed City	Café	Shopping Mall	Coffee Shop	Food Court	Sports Club	Bakery	Burger Joint	Middle Eastern Restaurant	Gym / Fitness Center	Convenience Store
8	Sixth of October	Café	Syrian Restaurant	Middle Eastern Restaurant	Fast Food Restaurant	Sports Club	Coffee Shop	Shopping Mall	Supermarket	Kebab Restaurant	Restaurant

The data will be clustered into 3 clusters and examining the result of each cluster.

Out[37]:

	ArName	Latitude	Longitude	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
8	مركز الشيخ زايد	30.05339	31.00164	0	Cafe	Shopping Mall	Coffee Shop	Food Court	Sports Club	Bakery	Burger Joint	Middle Eastern Restaurant	Gym / Fitness Center	Convenience Store
9	مركز الشيخ زايد	29.96630	30.93950	0	Cafe	Syrian Restaurant	Middle Eastern Restaurant	Fast Food Restaurant	Sports Club	Coffee Shop	Shopping Mall	Supermarket	Kebab Restaurant	Restaurant

Out[39]:

	ArName	Latitude	Longitude	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
0	مركز الشيخ زايد	30.03512	31.21398	1	Cafe	Hotel	Restaurant	Italian Restaurant	Sports Club	Hotel Bar	Gym / Fitness Center	Lounge	Lebanese Restaurant	Nightclub
1	مركز الشيخ زايد	30.05081	31.21090	1	Cafe	Hotel	Italian Restaurant	Restaurant	Sports Club	Seafood Restaurant	Bakery	Middle Eastern Restaurant	Burger Joint	Sushi Restaurant
2	مركز الشيخ زايد	30.00956	31.21381	1	Cafe	Hotel	Hotel Bar	Dessert Shop	Italian Restaurant	Lounge	Food Court	Gym / Fitness Center	Historic Site	Nightclub
3	مركز الشيخ زايد	30.00243	31.20188	1	Cafe	Hotel Bar	Italian Restaurant	Hotel	Restaurant	Gym / Fitness Center	Nightclub	Historic Site	Food Court	Dessert Shop
4	مركز الشيخ زايد	30.03976	31.18043	1	Cafe	Seafood Restaurant	Gym / Fitness Center	Dessert Shop	Hotel	Italian Restaurant	Middle Eastern Restaurant	Lebanese Restaurant	Sports Club	Juice Bar
5	مركز الشيخ زايد	30.07825	31.20666	1	Cafe	Hotel	Italian Restaurant	Sushi Restaurant	Middle Eastern Restaurant	Lebanese Restaurant	Egyptian Restaurant	Dessert Shop	Coffee Shop	Bar

7. Results

The map shows 3 cluster as follows;

- Cluster (0) - Cyan; shows low number of venues
- Cluster (1) - Purple; show high number of venues
- Cluster (2) - Red; shows moderate number of venues

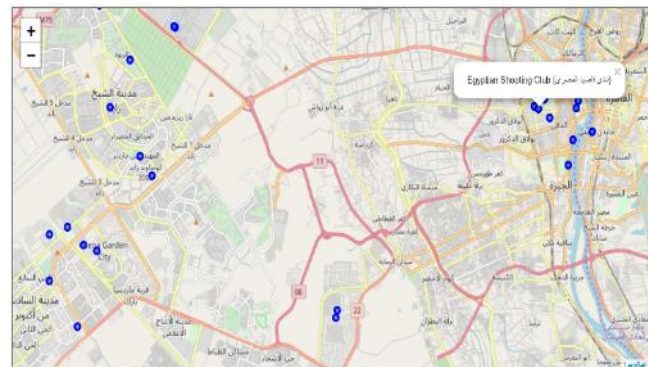


8. Discussion

As per the above and the results generated from the analysis, the map shows that Cluster (1) is showing higher density of venues which is considered high potential as per the main factors that will be used for selection of the best location **“Density of venues in the cluster, higher density means high potential”** while the other clusters show lower density.

In addition to, most of the sporting facilities are concentrated in Cluster (1).

The above 2 factors are considered traffic generator and potential for opening a new sports mall in Cluster (1).



9. Conclusion

Cluster 2 is the best location to establish a sports mall as it contains all potentials from existing sports facilities and other attractions as cafes & restaurants which will generate crowd in the cluster.

Observation

Cluster 2 :: is the selected Cluster for the existence of most of sports facilities and varaities of venues.

In [40]:

```
%%html
<iframe src="Giza_Clusters.html"width="475" height="350"></iframe><iframe src="Giza_SportsVenues.html"
width="475" height="350"></iframe>
```

