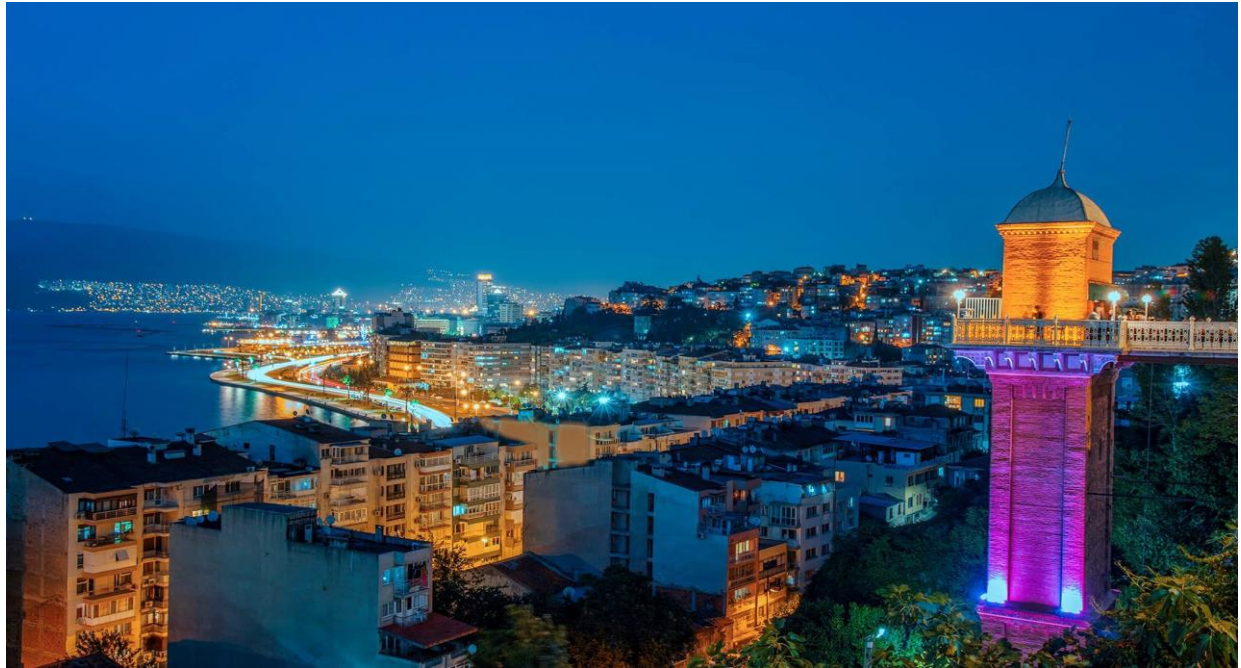


# Coursera Capstone Project

The Battle of Neighborhoods

Identifying a convenient place to Open a Shared Working place



## 1. Introduction

In our rapidly moving world, we all are busy with our jobs and striving to our goals. One thing that is widely believed to aid our productivity is a good workspace. Workspace refers to small premises provided, often by local authorities or economic development agencies, to help new businesses to establish themselves. These typically provide not only physical space and utilities but also administrative services and links to support and finance organizations, as well as peer support among the tenants. A continuum of sophistication ranges through categories such as 'managed workspaces', 'business incubators' and 'business and employment co-operatives'. In cities, they are often set up in buildings that are disused but which the local authority wishes to retain as a landmark. At the larger end of the spectrum are business parks, virtual offices, technology parks and science parks.

## 2. Business Problem

In this document we will go through the process in which Machine learning is used to identify a convenient place to set up a shared workspace rental service in the city of Izmir, Turkey. There will some requirements put up by our client which we have to take into consideration while identifying the required area. According to the client the new workspace should be located in an area which is surrounded by other complimentary services such cafes.

Based on the above requirements, 3 neighborhoods will be recommended for the client to set up a Shared Workspace rental service in the city of Izmir, Turkey.

### Target Audience

The target audience for this project is a client who wants to set up a shared workspace rental business in the city of Izmir, Turkey. Based on the analysis that will be done in this project the clients will be handed locations at which they can setup their business.

## 3. Data

Our first data source will be Atlasbig.com (<https://www.atlasbig.com/tr/izmirin-ilceleri>). From there we scrap data of Izmir's neighborhoods with **BeautifulSoup**. Now that we have acquire the neighborhoods, we will use the technique of Geocoding to get the coordinates of the neighborhoods. For this purpose, we make use of **Geopy's Nominatim**. After preparing the neighborhoods and their coordinates, next thing to do is get venues within each neighborhood with the use of the **Foursquare API**. We do this in order to choose a prefect and convenient surrounding for the business to be set up.

## 4. Methodology

To identify a convenient place to set up the required business, we will go through the steps of acquiring data, cleaning and preparing the data, building a model and clustering the neighborhoods. To acquire the required data about the neighborhoods in Izmir, Turkey, we use the technique of web scraping using the BeautifulSoup tool. After that we create a dataset and clean up the acquired data to prepare to build our model. Once our model is ready, we cluster the neighborhoods according to their convenience to the stated goal.

Since the clients want the workspace business to be opened in an area where cafes and restaurants are adequately abundant, we pick out neighborhoods which have renowned cafes and restaurants. With that, we construct a data set on which we do our clustering. Our clustering then results in different clusters according to prevalence of the desired venues in the neighborhoods. K-Means Clustering technique was used to do the clustering of the neighborhoods.

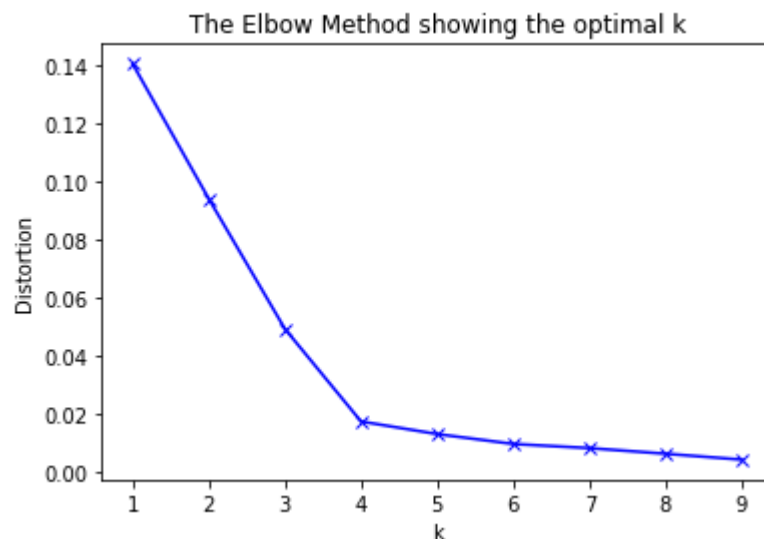
K-means clustering is a good place to start exploring an unlabeled dataset. The K in K-Means denotes the number of clusters. This algorithm is bound to converge to a solution after some iterations. It has 4 basic steps:

1. Initialize Cluster Centroids (Choose those 3 books to start with)
2. Assign datapoints to Clusters (Place remaining the books one by one)
3. Update Cluster centroids (Start over with 3 different books)
4. Repeat step 2–3 until the stopping condition is met.

After clustering the neighborhoods, we will have insights about which clusters contain various options of cafés and restaurants to setup the business in. To provide more specific insights, we use the technique of data visualization to display the magnitude of the occurrence of Cafes and Restaurants. To perform this task, Folium library was used.

## 5. Result

So, the first observation is the number of clusters that will result in. Using the Elbow method, we understand that 4 Clusters would be the optimal number of clusters.



Therefore, K-Means Clustering was run on the data set and the following result was acquired.



As we can observe from the map, there are 4 clusters that are segmented according to the extent to how much crucial venues such as cafes and restaurants they have. For better understanding we display the resulting clusters' data and go through it.

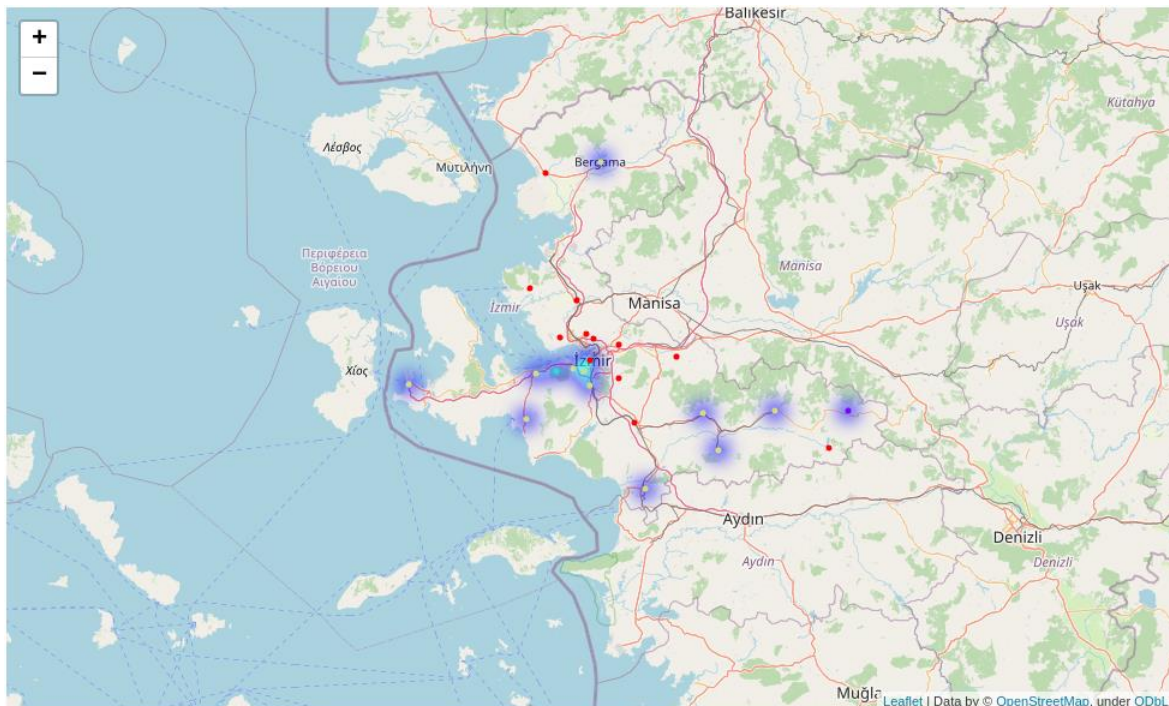
Now that we have clustered our neighborhoods in Izmir, Let's check how our clusters look like.

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In [119]: 1 oc[izmir_merged['Cluster Labels'] == 0, izmir_merged.columns[[1] + list(range(5, izmir_merged.shape[1]))]].head()
```

Out[119]:

|   | location   | altitude | 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 | (Buca, İzmir, Ege Bölgesi, Türkiye, (38.34446095, 27.262771990750778))     | 0.0      | 0.0            | Garden                | Farm                  | Concert Hall          | Wings Joint           | Electronics Store     | Fishing Spot          | Fish Market           | Fish & Chips Shop     | Fast Food Restaurant  | Farmers Market         |
| 2 | (Bornova, İzmir, Ege Bölgesi, Türkiye, (38.4678978, 27.260804924467173))   | 0.0      | 0.0            | Stadium               | Mountain              | Wings Joint           | Electronics Store     | Fish Market           | Fish & Chips Shop     | Fast Food Restaurant  | Farmers Market        | Farm                  | Factory                |
| 3 | (Konak, İzmir, Ege Bölgesi, Türkiye, (38.410958, 27.1294534))              | 0.0      | 0.0            | Bakery                | Borek Place           | Kokoreç Restaurant    | Flower Shop           | Turkish Restaurant    | Park                  | History Museum        | Plaza                 | Soccer Field          | Kofte Place            |
| 4 | (Karşıyaka, İzmir, Ege Bölgesi, Türkiye, (38.5034711, 27.113482575513878)) | 0.0      | 0.0            | Mountain              | Market                | Garden                | Farm                  | Wings Joint           | Factory               | Fish Market           | Fish & Chips Shop     | Fast Food Restaurant  | Farmers Market         |
| 5 | (Bayraklı, İzmir, Ege Bölgesi, Türkiye, (38.4867391, 27.149264834063008))  | 0.0      | 0.0            | Cosmetics Shop        | Pool Hall             | Bike Trail            | Fast Food Restaurant  | Gaming Cafe           | Factory               | Fishing Spot          | Fish Market           | Fish & Chips Shop     | Farmers Market         |

Based on the clustering that we conducted we have got the information that clusters 0 and Cluster 3 contain the type of neighborhoods that we are looking for. But since we are looking for better information to make our decision, we have constructed a Heat-Map.



One important addition for the potential neighborhood to have is being located at the heart of the city. That can be clearly seen from the heat map that we have constructed. On the Heat-Map we can see the Neighborhood 'Konak' which is under Cluster 0 has good amount of the desired venues as well as proximity to the center of the city. Furthermore, it is located closer to the Sea which will give customers fresh breath as well as amazing views.