

Izmir and Thessaloniki Similarity : A Data Approach

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1.Introduction

Many articles have emphasized the similarity of Izmir and Thessaloniki;

“Many cities in different European countries are remarkably similar. Thessaloniki and Izmir are such towns, closely linked by history and culture” [1],

“Thessaloniki known as Izmir's sibling” [2]

“İzmir is similar to Thessaloniki; Thessaloniki to Izmir” [3]

“The "brotherhood" between Karsiyaka and Kordelio, Menemen and Menemeni, bears the exchange.” [4]

However, most of these statements are based on limited observations or emotions. In this study, the similarity of the two cities was evaluated from the point of view of data analysis. The analysis could support their idea or reveal that the two cities are completely different.

2.Data Description

These study follows the steps below;

- Finding parts of the cities(municipalities) in Wikipedia.

- Finding coordinates of municipalities with API request via geopy.geocode Python library
- Finding the venues nearby the municipalities via Foursquare API.

3.Methodology

In this study, all of the necessary data collected from Wikipedia or API requests.

Firstly, builded a dataframe which includes the municipalities of the two cities and their coordinates. Totally, 44 municipalities were included in this study.

	Municipalities	Latitude	Longitude
0	Aliağa	38.807137	27.051375
1	Balçova	38.380478	27.055728
2	Bayındır	38.220605	27.647298
3	Bayraklı	38.486739	27.149265
4	Bergama	39.119154	27.177730

39	Panorama	40.586793	23.031612
40	Peraia	40.501659	22.925294
41	Thermi	40.547879	23.023600
42	Thessaloniki	40.640317	22.935272
43	Stavros	40.663952	23.700087

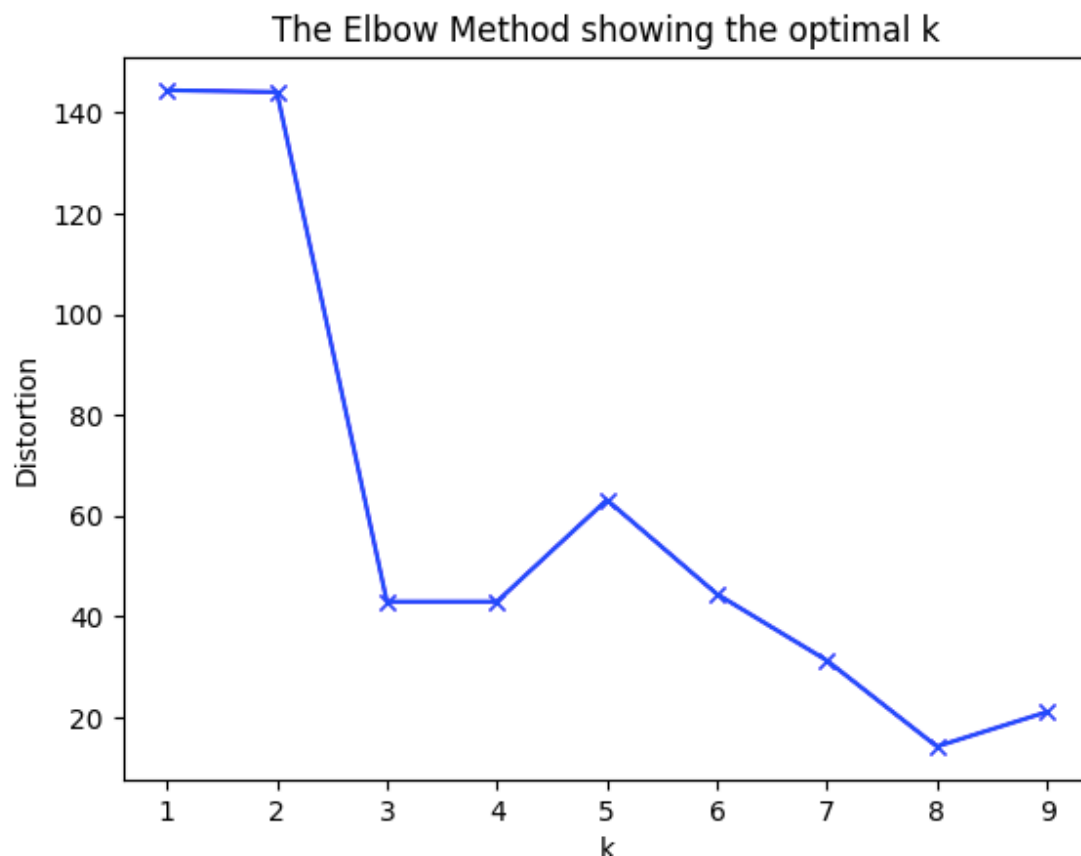
Secondly, found nearby 12 venues for each municipality. There are 147 different types of venues for 44 municipalities.

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Aliğa	38.807137	27.051375	İKA Menemen-Aliğa-Çandarlı Otoyolu Projesi Şa...	38.796922	27.008953	Construction & Landscaping
1	Aliğa	38.807137	27.051375	Çakırın Yeri	38.853298	27.033848	Breakfast Spot
2	Aliğa	38.807137	27.051375	Kyme Otel Restorant	38.824150	26.985690	Restaurant
3	Aliğa	38.807137	27.051375	Su İskelesi	38.822722	26.983722	Cocktail Bar
4	Aliğa	38.807137	27.051375	Bade	38.827273	26.982969	Beer Garden

Then top 10 venues of each municipality viewed.

	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	Aliğa	Restaurant	Bookstore	Breakfast Spot	Construction & Landscaping	Hotel	Gym / Fitness Center	Coffee Shop	Cocktail Bar	Beach	Steakhouse
1	Ampelokipoi	Café	Gym / Fitness Center	Pub	Snack Place	Bougatsa Shop	Fast Food Restaurant	Souvlaki Shop	Clothing Store	Pizza Place	Daycare
2	Bağcova	Café	Gym / Fitness Center	Kokoreç Restaurant	Gym	Park	Comfort Food Restaurant	Mountain	Motorcycle Shop	Food & Drink Shop	Boutique
3	Bayraklı	Turkish Restaurant	Doner Restaurant	Restaurant	Snack Place	Wings Joint	Park	Monument / Landmark	Café	Zoo	Diner
4	Bayındır	Cheese Shop	Train Station	Steakhouse	Restaurant	Café	Diner	Dessert Shop	Hotel	Smoke Shop	Turkish Coffeehouse
5	Bergama	Café	Public Art	Paper / Office Supplies Store	Mobile Phone Shop	Turkish Restaurant	Turkish Home Cooking Restaurant	Coffee Shop	Camera Store	Breakfast Spot	Jewelry Store
6	Beydağ	Park	Café	Tea Room	Diner	Mountain	Breakfast Spot	Turkish Restaurant	Turkish Coffeehouse	Bus Station	Electronics Store
7	Bornova	Park	Gym	Food Truck	Pool	Restaurant	Deli / Bodega	Breakfast Spot	Kebab Restaurant	Pastry Shop	Gym / Fitness Center
8	Buca	Breakfast Spot	Steakhouse	Rock Climbing Spot	Go Kart Track	Turkish Restaurant	Plaza	Garden	Electronics Store	Donut Shop	Doner Restaurant
9	Dikili	Diner	Food Court	Arcade	Pide Place	Auto Garage	Fast Food Restaurant	Coffee Shop	Cosmetics Shop	Botanical Garden	Steakhouse
10	Evosmos	Bar	Souvlaki Shop	Ouzeri	Gym	Cocktail Bar	Bakery	Plaza	Frozen Yogurt Shop	Café	Taverna

Clustering is suitable for this study due to this study is a descriptive analysis. In this case, it is appropriate to use the k-means method since all the data we are working on is numerical. At this point, determining the number of k clusters is a critical problem. Elbow and Silhouette methods showed that creating 3 clusters is an optimal solution.

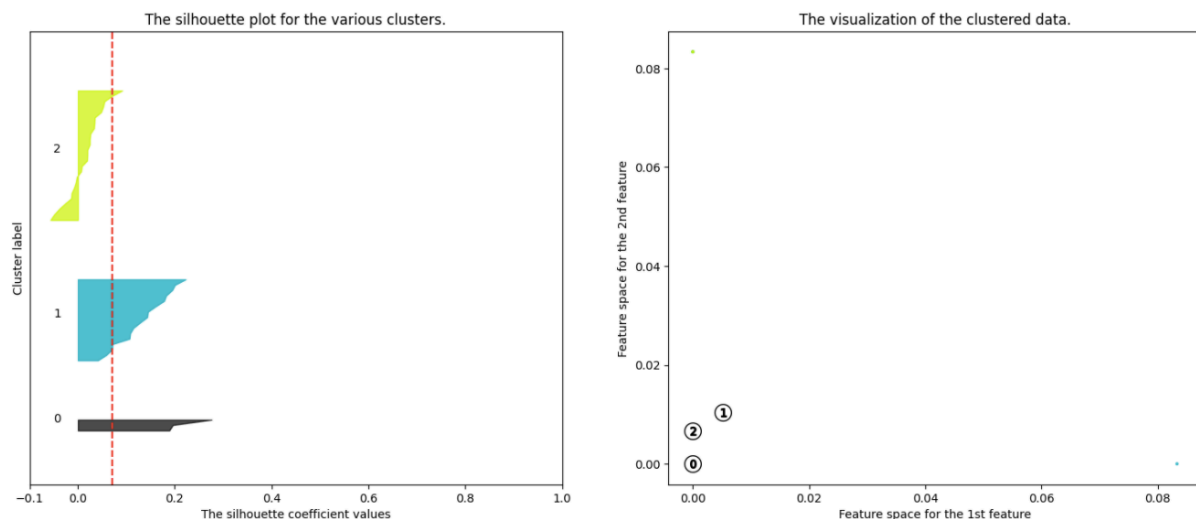


Automatically created module for IPython interactive environment

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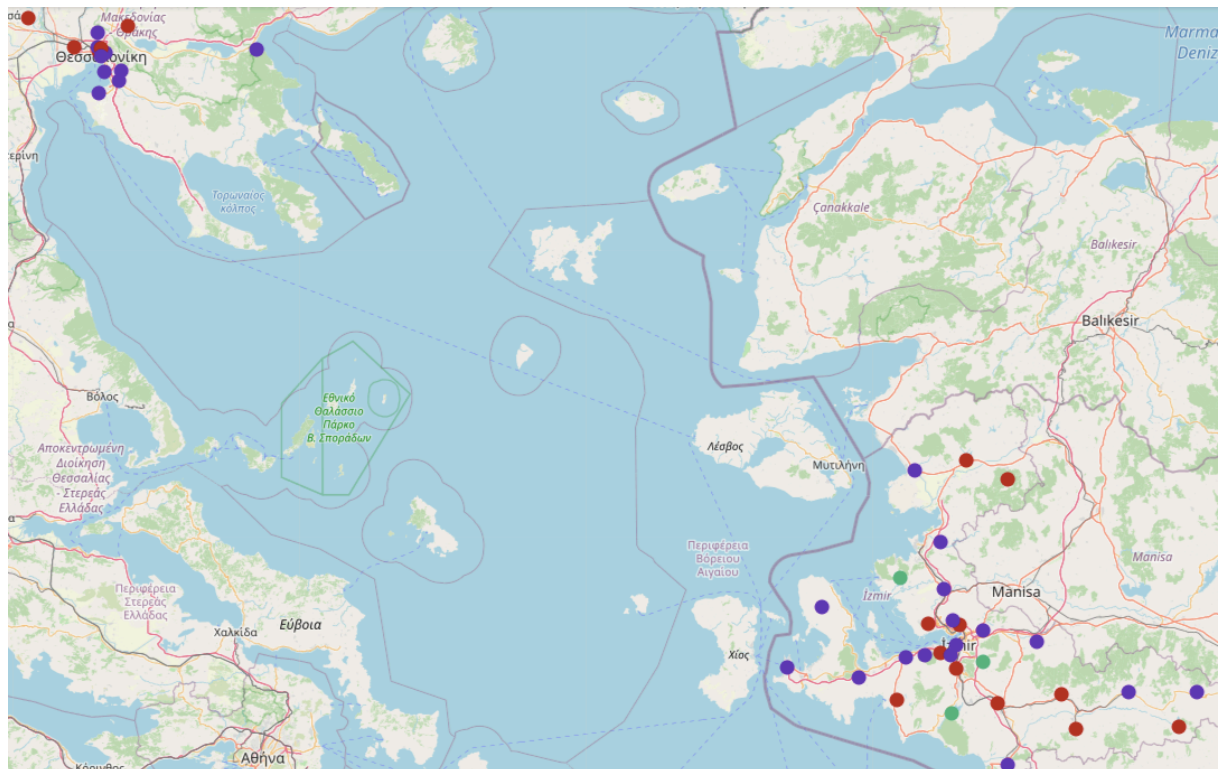
For n_clusters = 2 The average silhouette_score is : 0.05681855542631025
For n_clusters = 3 The average silhouette_score is : 0.0713225535444246
For n_clusters = 4 The average silhouette_score is : 0.0657125128584344
For n_clusters = 5 The average silhouette_score is : 0.06047416545871338
For n_clusters = 6 The average silhouette_score is : 0.05516778078102227
For n_clusters = 7 The average silhouette_score is : 0.04095650047489114
For n_clusters = 8 The average silhouette_score is : 0.04641864029249359
For n_clusters = 9 The average silhouette_score is : 0.05584052661265438
  
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Silhouette analysis for KMeans clustering on sample data with n_clusters = 3



4.Results

Clustered municipalities figured out with a folium map. The map shows that there are no separated two cities. Only the first cluster has municipalities from Izmir but the other two clusters include municipalities from the two cities.



The municipalities of the first cluster are Buca, Foça and Menderes from Izmir. Breakfast spot, Farm and Steakhouse are very popular in these regions. Basketball Court, Butcher, Fishing Spot, Go Kart Track, Gozleme Place, Lake, Rock Climbing Spot venues are identifiers for these regions.

	Municipalities	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	Buca	38.344461	27.262772	0	Breakfast Spot	Steakhouse	Rock Climbing Spot	Go Kart Track	Turkish Restaurant	Plaza	Garden	Electronics Store	Donut Shop	Doner Restaurant
1	Foça	38.670049	26.858567	0	Breakfast Spot	Steakhouse	Farm	Pide Place	Gozleme Place	Butcher	Basketball Court	Supermarket	Cheese Shop	Fishing Spot
2	Menderes	38.149147	27.106591	0	Restaurant	Steakhouse	Farm	Breakfast Spot	Lake	Scenic Lookout	Forest	BBQ Joint	Cosmetics Shop	Factory

The second cluster contains 10 regions from Izmir such as Balçova, Bergama, Seferihisar and contains 5 regions from Thessaloniki such as Sindos and Lagkadas. Cafe, Bar and Gym center are very popular in these regions. Airport, Brewery, Bus Station, Camera Store, Dance Studio, Jewelry Store, Kids Store, Military Base, Monument / Landmark, Museum, Paper / Office Supplies Store, Pet Store, Pizza Place, Public Art, Rental Car Location, Shop & Service, Snack Place, Spa, Train Station, Turkish Coffeehouse, Wings Joint, Zoo venues are identifiers for these regions.

	Municipalities	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	Balçova	38.380478	27.055728	1	Café	Gym / Fitness Center	Kokoreç Restaurant	Gym	Park	Comfort Food Restaurant	Mountain	Motorcycle Shop	Food & Drink Shop	Boutique
1	Bayındır	38.220605	27.647298	1	Cheese Shop	Train Station	Steakhouse	Restaurant	Café	Diner	Dessert Shop	Hotel	Smoke Shop	Turkish Coffeehouse
2	Bayraklı	38.486739	27.149265	1	Turkish Restaurant	Doner Restaurant	Restaurant	Snack Place	Wings Joint	Park	Monument / Landmark	Café	Zoo	Diner
3	Bergama	39.119154	27.177730	1	Café	Public Art	Paper / Office Supplies Store	Mobile Phone Shop	Turkish Restaurant	Turkish Home Cooking Restaurant	Coffee Shop	Camera Store	Breakfast Spot	Jewelry Store
4	Beydağ	38.095113	28.224275	1	Park	Café	Tea Room	Diner	Mountain	Breakfast Spot	Turkish Restaurant	Turkish Coffeehouse	Bus Station	Electronics Store
5	Çiğli	38.492077	26.994095	1	Café	Zoo	Steakhouse	Coffee Shop	Garden	Kids Store	Military Base	Restaurant	Airport	Turkish Coffeehouse

The third cluster contains 15 regions from Izmir such as Çeşme and Konak and it contains 9 regions from Thessaloniki such as Kalamaria and Thermi. Restaurant and Hotel are very popular in these regions. Auto Garage, Bakery, Bay, Beach, Beach Bar, Bed & Breakfast, Bistro, Boarding House, Bookstore, Borek Place, Botanical Garden, Burger Joint, Campground, Castle, Church, College Quad, Construction & Landscaping, Convenience Store, Country Dance Club, Cupcake Shop, Daycare, Deli / Bodega, Dive Bar, Donut Shop, Electronics Store, Fair, Flower Shop, Food Court, Food Truck, Frozen Yogurt Shop, Gastropub, Gym Pool, Health Food Store, Italian Restaurant, Kebab Restaurant, Lounge, Market, Mediterranean Restaurant, Mens Store, Meyhane, Meze Restaurant, Modern Greek Restaurant, Music Store, Other Great Outdoors, Paintball Field, Pastry Shop, Pedestrian Plaza, Pharmacy, Seafood Restaurant, Soccer Field, Stadium, Surf Spot, Sushi Restaurant, Söğüş Place, Tennis Court, Theater, Theme Restaurant, Vineyard, Waterfront, Wine Bar venues are identifiers for these regions.

	Municipalities	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	Aliağa	38.807137	27.051375	2	Restaurant	Bookstore	Breakfast Spot	Construction & Landscaping	Hotel	Gym / Fitness Center	Coffee Shop	Cocktail Bar	Beach	Steakhouse
1	Bornova	38.467898	27.260805	2	Park	Gym	Food Truck	Pool	Restaurant	Deli / Bodega	Breakfast Spot	Kebab Restaurant	Pastry Shop	Gym / Fitness Center
2	Çeşme	38.324418	26.302856	2	Seafood Restaurant	Hotel	Meyhane	Waterfront	Turkish Restaurant	Historic Site	History Museum	Ice Cream Shop	Söğüş Place	Bed & Breakfast
3	Dikili	39.078833	26.929873	2	Diner	Food Court	Arcade	Pide Place	Auto Garage	Fast Food Restaurant	Coffee Shop	Cosmetics Shop	Botanical Garden	Steakhouse
4	Güzelbahçe	38.362744	26.886187	2	Kebab Restaurant	Theme Restaurant	Factory	Market	Steakhouse	Supermarket	Lounge	Breakfast Spot	Restaurant	Fair
5	Karabağlar	38.369771	27.104592	2	Bakery	Gym	Kebab Restaurant	Plaza	Music Store	Sandwich Place	Scenic Lookout	Seafood Restaurant	Doner Restaurant	Steakhouse
6	Karaburun	38.558789	26.470023	2	Beach	Other Great Outdoors	Waterfront	Coffee Shop	Plaza	Hotel	Café	Scenic Lookout	Bed & Breakfast	Diner

5. Discussion

This study shows that there are no completely separate two cities. Many municipalities are similar. It shows that the two cities still have similar culture and lifestyle.

Only the municipalities of the first cluster completely belong to Izmir. These municipalities far away the Aegean sea, maybe their culture and lifestyle effected by this issue.

On the other hand, Menemen from Izmir and Menemeni(Ampelokipoi) from Thessaloniki are located in different clusters.

6. Conclusion

This approach can be usefull for considering the similarity of the different locations.

On the other hand, Foursquare API can provide the data with venue count limit and/or radius.

Foursquare can provide very few venue data for small places such as Karaburun and Stavros.

If the scope is expanded, more detailed results can be obtained, but this study was not expanded enough to investigate the best result, as it aimed to present only one approach.

7.Referances

- [1] <https://www.etranslation.gr/commonalities-across-borders-observations-thessaloniki-greece-izmir-turkey/>
- [2] <https://eksisozluk.com/selanik-vs-izmir--4345888>
- [3] <https://www.hurriyet.com.tr/yazarlar/deniz-sipahi/izmir-selanik-e-benzer-selanik-de-izmir-e-28146202>
- [4] <https://m.bianet.org/biamag/kent/216180-kentlerin-kardesligi-ve-selanik-izmir>