



# Prediction Potential Areas For Investment By Analyzing Venues Data And Sales Price Of Houses Sold Data


ONUR AKI

# İzmir

---

- 3th most populous city in Turkey.
- 4th most populous city in Mediterranean Sea.
- İzmir Alsancak Port
  - Primary port of Turkey for exports.
  - The biggest container port of Turkey
- The intersection of industry, agriculture, and tourism
- World's second fastest growing metropolitan economy
- House rents increase most recently:



An aerial photograph of Izmir, Turkey, showing a dense urban landscape with numerous multi-story buildings, green spaces, and a large harbor area with a bridge and ships. The city is situated along the coast, with mountains visible in the background.

## ❑ Izmir consist of 11 urban districts

- ❑ Balcova, Bayrakli, Bornova, Buca, Cigli, Gaziemir, Guzelbahce, Karabaglar, Karsiyaka, Konak, and Narlidere

## ❑ And additionally 19 rural districts

- ❑ Aliaga, Bayindir, Bergama, Beydag, Cesme, Dikili, Foca, Karaburun, Kemalpasaa, Kinik, Kiraz, Menderes, Menemen, Odemis, Seferihisar, Selcuk, Tire, Torbalı, Urla

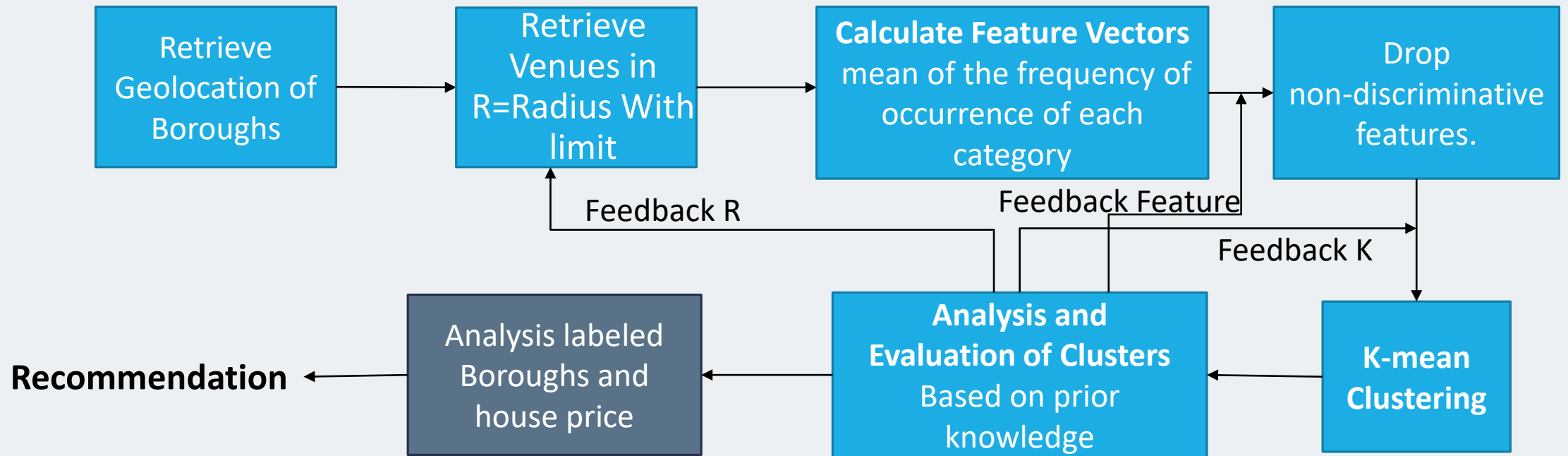


# Data

---

- ❑ Longitude and latitude coordinates of the center of boroughs.
  - ❑ An open-source API: <https://github.com/melihkorkmaz/il-ilce-mahalle-geolocation-rest-api>
  - ❑ Retrieved by URL queries
- ❑ The most common venues with their features in boroughs are retrieved from Foursquare API through URL query
  - ❑ <https://developer.foursquare.com/>
  - ❑ Retrieved by URL queries
- ❑ The average sales price of houses sold in Izmir are taken from Endeksa that is one of the most popular property price index companies in Turkey.
  - ❑ <https://www.endeksa.com/en/analiz/izmir/endeks/for-sale/house>
- ❑ The boundary of boroughs of Izmir are retrieved from Second-level Administrative Divisions of the Turkey from Spatial Data Repository of NYU.
  - ❑ The data of Izmir was parsed from all geojson files.
  - ❑ <https://geo.nyu.edu/catalog/stanford-nj696zj1674>

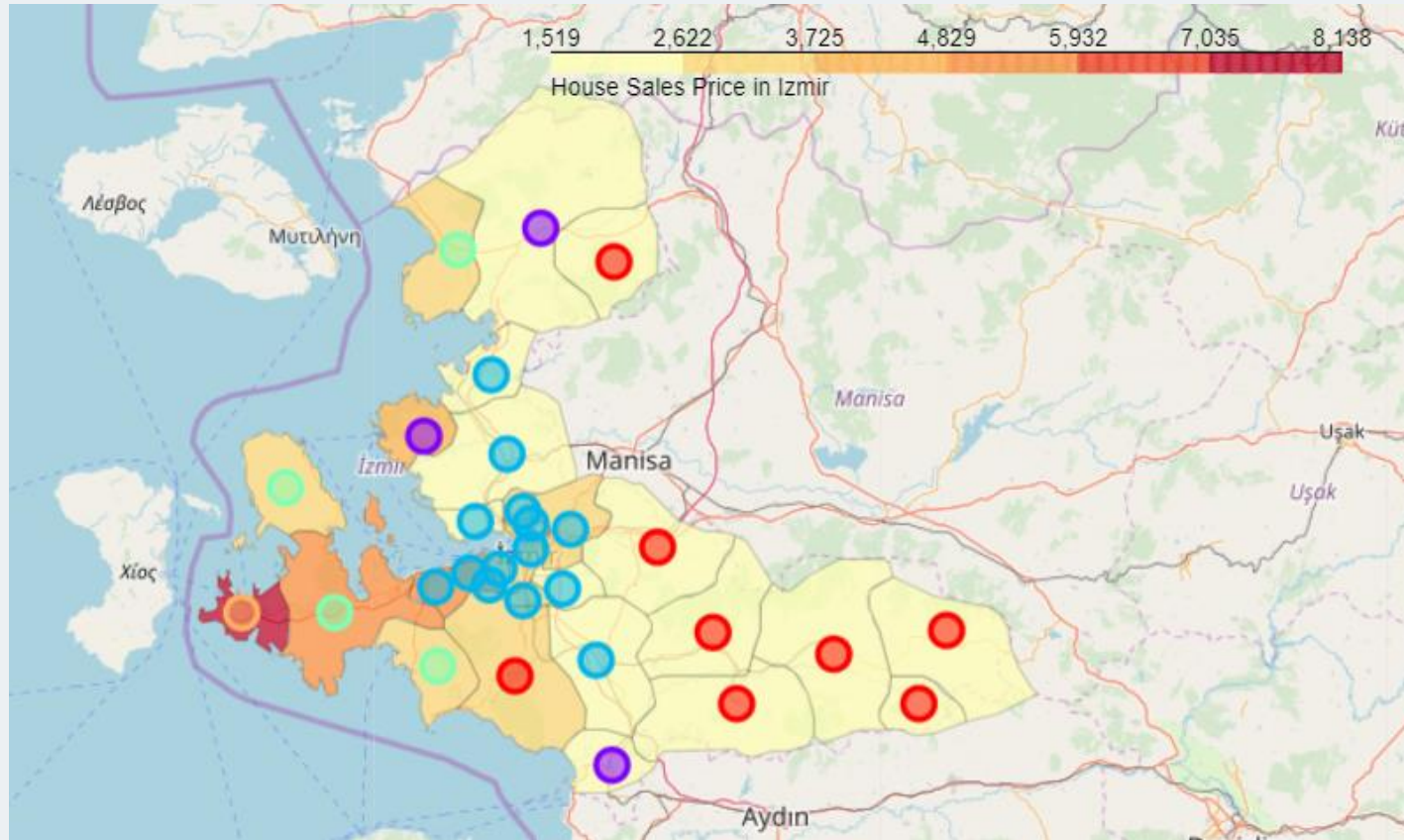
# Methodology



## Idea

- Cluster boroughs based on venues that they have.
- Compare clusters with the average sales price of houses sold.

# Analyzing Data



- Cluster 0 → red label
- Cluster 1 → purple label
- Cluster 2 → blue label
- Cluster 3 → green label
- Cluster 4 → orange label

## NOTE:

Cluster 4 → Çeşme → Outlier:

- fifth most expensive district of Turkey.
- There are villas of the richest men of Turkey and ultra-luxury hotels.

# Cluster 0- Rural Boroughs

	Borough	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
3	Kiraz	Park	Seafood Restaurant	Mountain	Boarding House	Snack Place	Beach Bar	Fish & Chips Shop	Fast Food Restaurant	Pharmacy	Farmers Market
4	Kemalpasa	BBQ Joint	Park	Bakery	Forest	Pizza Place	Dessert Shop	Mountain	Kebab Restaurant	Steakhouse	Shopping Mall
5	Bayindir	Diner	Mountain	Tea Room	Flower Shop	Botanical Garden	Food Court	Garden	Turkish Coffeehouse	Pizza Place	Dive Bar
7	Odemis	Bakery	Dessert Shop	Kebab Restaurant	Sandwich Place	Gym / Fitness Center	Steakhouse	Clothing Store	Middle Eastern Restaurant	Tea Room	History Museum
11	Kinik	Botanical Garden	Plaza	Buffet	Forest	Bar	Pizza Place	Pide Place	Beach	Comfort Food Restaurant	Beer Garden
19	Menderes	Steakhouse	Arcade	Bakery	BBQ Joint	Forest	Trail	Athletics & Sports	Buffet	Farm	Diner
22	Beydag	Mountain	Steakhouse	Park	Convenience Store	Pharmacy	Tea Room	Farm	Lake	Turkish Coffeehouse	Plaza
23	Tire	Dessert Shop	Pizza Place	Snack Place	Historic Site	Clothing Store	Pub	Mountain	Sandwich Place	Arcade	Gym / Fitness Center

# Cluster 1

	Borough	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
13	Selcuk	Hotel	Historic Site	Coffee Shop	Bed & Breakfast	Steakhouse	Wine Shop	Fast Food Restaurant	Bar	Gym	Park
14	Bergama	Historic Site	Hotel	Bar	Lounge	Arcade	Turkish Home Cooking Restaurant	History Museum	Dessert Shop	Snack Place	Soccer Field
25	Foca	Hotel	Seafood Restaurant	Bed & Breakfast	Steakhouse	Bar	Beach	Historic Site	Pide Place	Harbor / Marina	Resort

- Dominated by Hotels and Historic sites.
- Many tourists come to Izmir to visit Selcuk and Bergama every year.
- Ephesus Ancient City, House of Virgin Mary, Pergamon Ancient City in Bergama, ...



# Cluster 2 – Urban Boroughs

	Borough	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
1	Menemen	Coffee Shop	Gym	Gym / Fitness Center	Steakhouse	Kofte Place	Kokoreç Restaurant	Tea Room	Accessories Store	Bakery	Food Truck
2	Cigli	Gym / Fitness Center	Coffee Shop	Waterfront	Clothing Store	Scenic Lookout	Supermarket	Shopping Mall	Bakery	Bookstore	Basketball Stadium
6	Buca	Gym / Fitness Center	Bakery	Coffee Shop	Gym	Hookah Bar	Pub	Fast Food Restaurant	Kebab Restaurant	Turkish Home Cooking Restaurant	Bar
9	Karsiyaka	Coffee Shop	Gym / Fitness Center	Bookstore	Waterfront	Bar	Bakery	Scenic Lookout	Meyhane	Manti Place	Motorcycle Shop
10	Aliaga	Seafood Restaurant	Beach	Bakery	Fast Food Restaurant	Gym / Fitness Center	Beer Garden	Hotel	Waterfront	Steakhouse	Burger Joint
15	Bornova	Coffee Shop	Dessert Shop	Gym / Fitness Center	Clothing Store	Pastry Shop	Brewery	Bar	Salon / Barbershop	Bakery	Burger Joint
16	Torbalı	Coffee Shop	Steakhouse	Gym	Diner	Hookah Bar	Beer Garden	Bar	Clothing Store	Plaza	Art Gallery
17	Balcova	Coffee Shop	Theater	Hotel	Waterfront	Art Gallery	Seafood Restaurant	Chocolate Shop	Historic Site	Pastry Shop	Bakery
18	Gaziemir	Gym / Fitness Center	Coffee Shop	Hotel	Arcade	Bar	Kebab Restaurant	Bakery	Dessert Shop	Sandwich Place	Baby Store
21	Bayraklı	Coffee Shop	Meyhane	Gym / Fitness Center	Pastry Shop	Art Gallery	Chocolate Shop	Seafood Restaurant	Dessert Shop	Dance Studio	Performing Arts Venue
24	Guzelbahce	Seafood Restaurant	Coffee Shop	Bakery	Harbor / Marina	Hookah Bar	Beach	Burger Joint	Market	Pool	Supermarket
27	Konak	Theater	Dance Studio	Meyhane	Art Gallery	Pizza Place	Pastry Shop	Coffee Shop	Bakery	Turkish Home Cooking Restaurant	Chocolate Shop
28	Karabaglar	Coffee Shop	Waterfront	Seafood Restaurant	Gym	Bakery	Cosmetics Shop	Gym / Fitness Center	Hotel	Pizza Place	Concert Hall
29	Narlıdere	Seafood Restaurant	Waterfront	Gym	Gym / Fitness Center	Coffee Shop	Pizza Place	Steakhouse	Scenic Lookout	Art Gallery	Hotel

# Cluster 3

	Borough	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	Seferihisar	Beach	Bed & Breakfast	Seafood Restaurant	Hotel	Historic Site	Coffee Shop	Grocery Store	Furniture / Home Store	Lounge	Turkish Home Cooking Restaurant
8	Karaburun	Beach	Mountain	Other Great Outdoors	Scenic Lookout	Farm	Tea Room	Harbor / Marina	Bakery	Coffee Shop	Plaza
20	Dikili	Beach	Bar	Diner	Seafood Restaurant	Coffee Shop	Fast Food Restaurant	Pide Place	Music Venue	Farm	Plaza
26	Urla	Beach	Surf Spot	Hotel	Plaza	Farm	Campground	Tea Room	Pool	Scenic Lookout	Bar

- Popular coastal holiday towns of Izmir in this cluster.
- Intertwined with nature and sea
- Many number of bars, beaches, hotels as well as farms, mountains.

# Divide Price into price-levels, Merge Cluster Labels, Price And Price Level

Cluster Labels		Borough	Price	Price Levels
2	0	Bayindir	1795	level-1
5	0	Beydag	1519	level-1
17	0	Kemalpasa	2153	level-1
18	0	Kinik	1568	level-1
19	0	Kiraz	1707	level-1
21	0	Menderes	3021	level-2
24	0	Odemis	1666	level-1
27	0	Tire	2091	level-1

Cluster Labels		Borough	Price	Price Levels
10	3	Dikili	2995	level-2
15	3	Karaburun	3714	level-3
25	3	Seferihisar	2954	level-2
29	3	Urla	5033	level-4

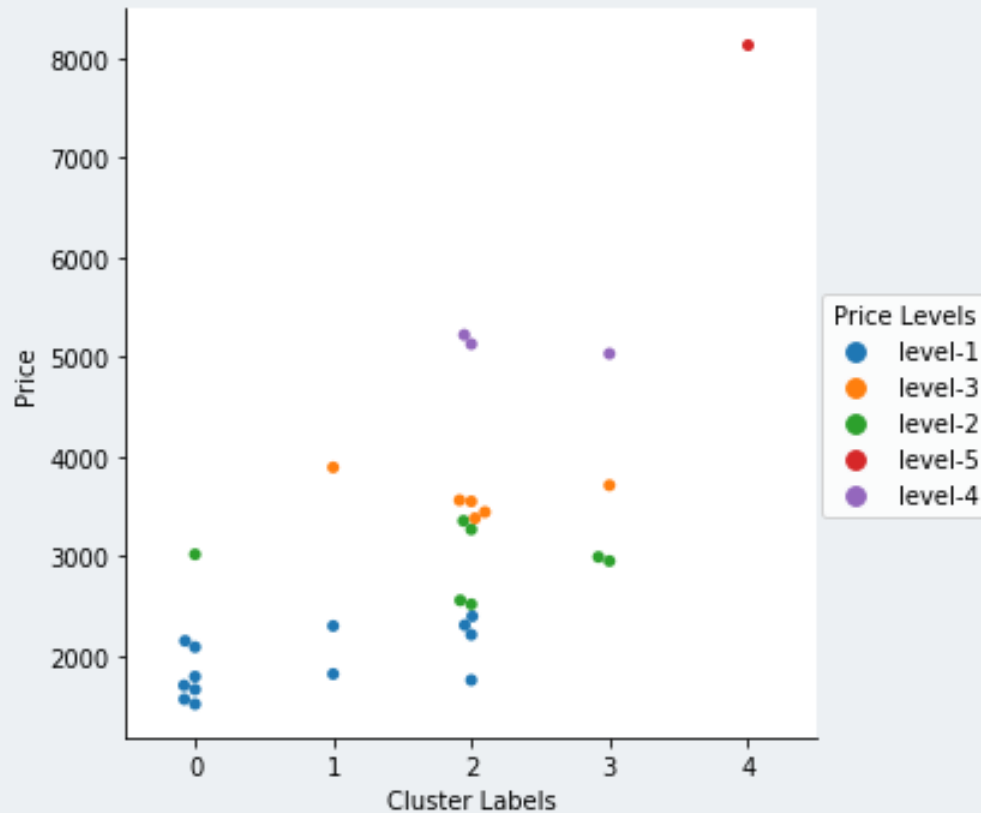
Cluster Labels		Borough	Price	Price Levels
0	2	Aliaga	2311	level-1
1	2	Balcova	3383	level-3
3	2	Bayrakli	3445	level-3
6	2	Bornova	3564	level-3
7	2	Buca	2560	level-2
9	2	Cigli	2520	level-2
12	2	Gaziemir	3357	level-2
13	2	Guzelbahce	5222	level-4
14	2	Karabaglar	2400	level-1
16	2	Karsiyaka	3552	level-3
20	2	Konak	3271	level-2
22	2	Menemen	2215	level-1
23	2	Narlidere	5130	level-4
28	2	Torbali	1760	level-1

	Cluster Labels	Borough	Price	Price Levels
4	1	Bergama	1821	level-1
11	1	Foca	3893	level-3
26	1	Selcuk	2303	level-1

Cluster Labels	Borough	Price	Price Levels	
8	4	Cesme	8138	level-5



# Results and Discussion



- Cesme (Cluster 4) is outlier
- Cluster 1: Selcuk and Bergama can be a great opportunity for investment.
  - similar to Foca
  - far cheaper than Foca.
  - two boroughs have beach although not as popular as Foca.
- Cluster-2: Aliaga, Cigli, Buca may be a profitable investment
- Cluster 3: Urla is one of the most valuable boroughs not only of Izmir but in Turkey.
  - Karaburun, Dikili, and Seferhisar are affordable despite their similarity to Urla.

# Conclusion

---

In this project, I demonstrated a method to predict the best areas for investors or for those who think to buy a new home. In this method, boroughs were clustered by k-means algorithm based on venues that they have. Then, cluster labels were compared to house-prices. By analyzing both data, one can recommend the areas may have the potential to invest. This method can be developed by contributing other data sets into venues. Because many factors can affect boroughs similarity. Especially, urban boroughs need more features to be distinguished. Thereby, more accurate results can be obtained.