

# **IBM Capstone Project - The Battle of Neighborhoods**

**Finding the Best Place for our Customer to Rent a House in Hamburg**

March 9, 2021

# Problem Description

- Find the best place for our customer to rent a house in Hamburg
- Conditions: Family-friendly and close to his new job location
- Hamburg has 104 quarters, 5.3 million inhabitants, is really diverse and is home to many companies and sports clubs
  - This leads to high rental prices and quarters that might be diverse
- Our aim: Cluster the relevant quarters of Hamburg, find a cluster which stands for family friendliness with parks and playgrounds and select the quarter which has the lowest rental prices in the family-friendly cluster.

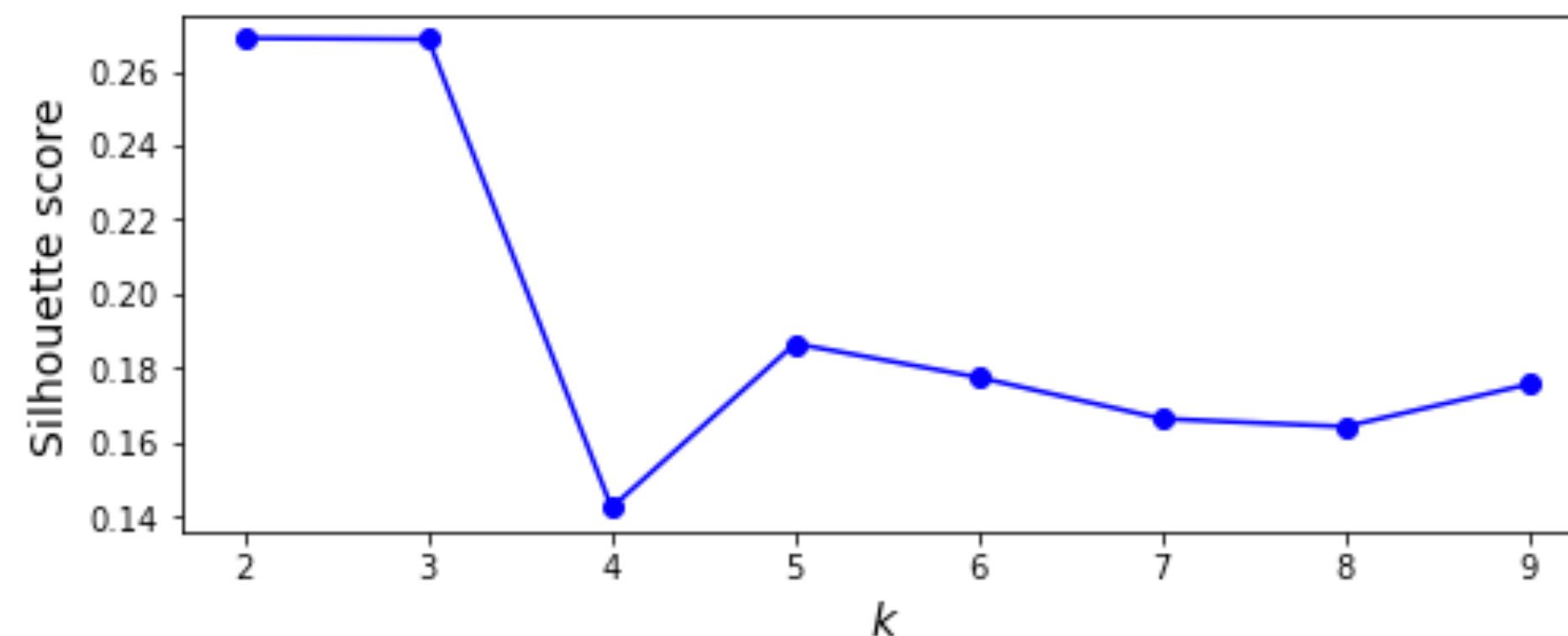
# Data

- Data set with the quarters scraped from Wikipedia:  
[https://de.wikipedia.org/wiki/Liste\\_der\\_Bezirke\\_und\\_Stadtteile\\_Hamburgs](https://de.wikipedia.org/wiki/Liste_der_Bezirke_und_Stadtteile_Hamburgs).
- Location (latitude and longitude coordinates) from GeoPy, a Python client for geocoding web services.
- Data set with rental prices of the quarters scraped from Hamburg Portal:  
<https://www.hamburgportal.de/immobilien/mietwohnungen/mietenspiegel/>

	Quarter	Borough	Latitude	Longitude	Price per m <sup>2</sup> in EURO
0	Neustadt	Hamburg-Mitte	53.549881	9.979048	10,69
1	Finkenwerder	Hamburg-Mitte	53.530882	9.858523	7,85
2	Altona-Altstadt	Altona	53.549660	9.945352	10,60
3	Sternschanze	Altona	53.561768	9.963282	11,73
4	Altona-Nord	Altona	53.561400	9.944720	10,61

# Methodology

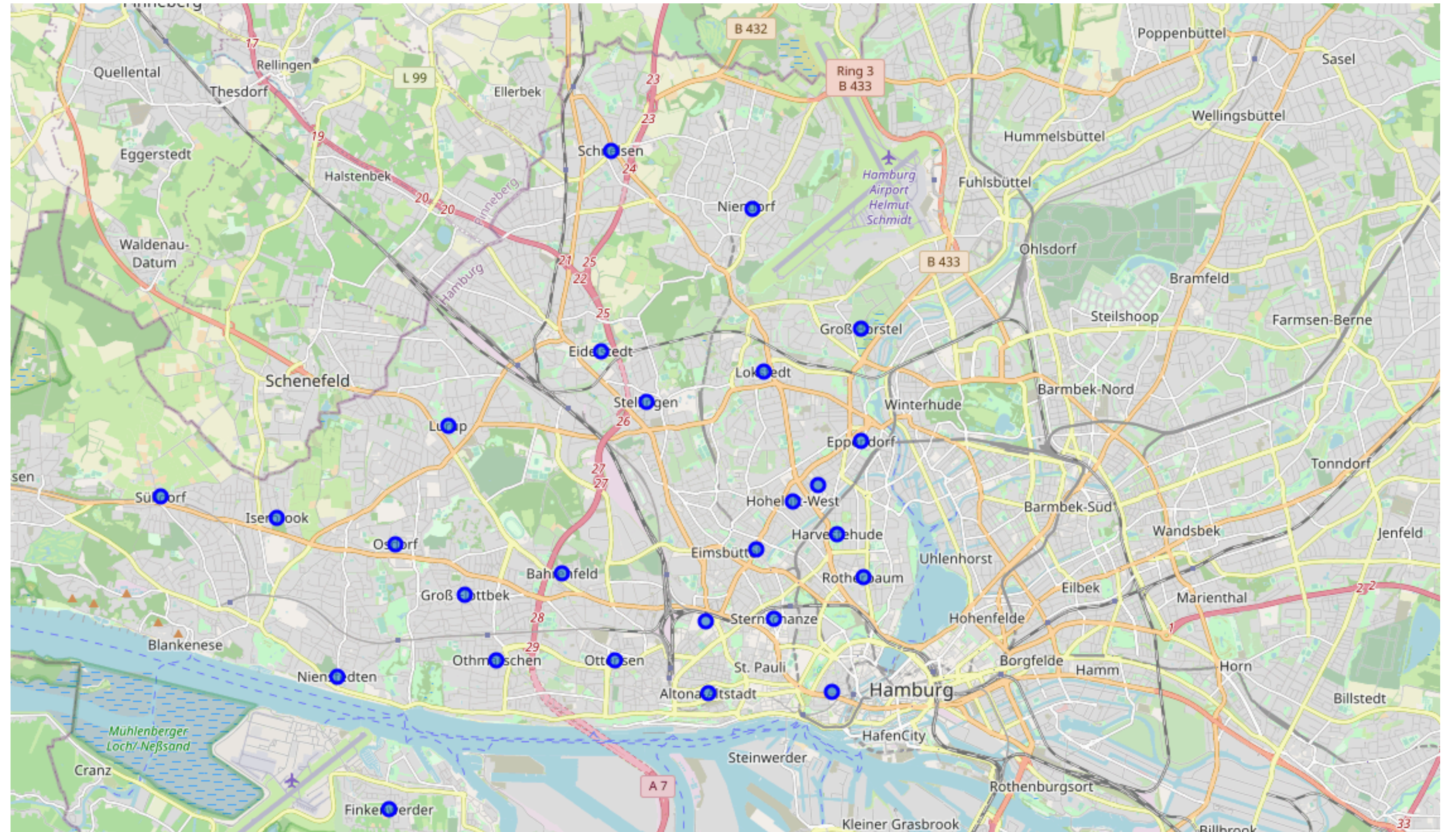
- In this project we have unlabeled data therefore need an algorithm from the unsupervised learning section of machine learning. We chose the kmeans algorithm due its reliability and ease of use.
- The silhouette scoring tells which which  $k$  (number of clusters) to pick for the algorithm. Result:  $k=2$  or  $k=3$ . We picked  $k=3$ , hoping to get 3 clusters that strongly differentiate from each other and to get one clean cluster with many family-friendly venues





# Results

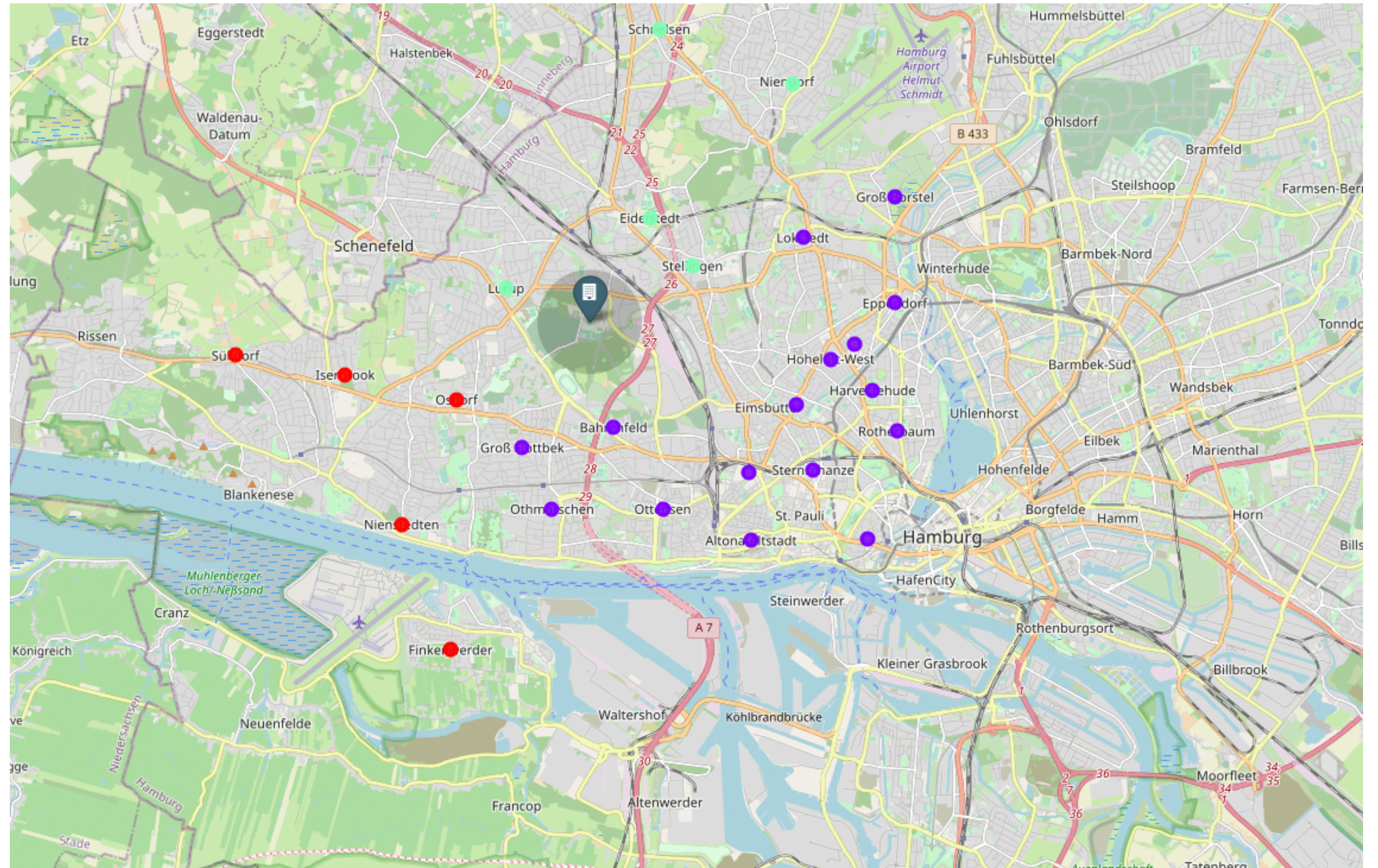
- The quarters which are within a 7 km radius from our clients job location.





# Results

- After the kmeans clustering we have 3 clusters (green, red and blue dots).





# Results

## Cluster 1

- Seems not to be the cluster we were looking for.
- It has one quarter which could be interesting (i.e. Osdorf) but the other quarters don't show a clear tendency towards parks and/or playgrounds.

	Quarter	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue
0	Altona-Altstadt	Café	Park	Coffee Shop	Bakery	Seafood Restaurant	Pizza Place
1	Altona-Nord	Café	Bakery	Coffee Shop	Park	Seafood Restaurant	Pizza Place
2	Bahrenfeld	Café	Bakery	Park	Coffee Shop	Farmers Market	Ice Cream Shop
3	Eidelstedt	Café	Supermarket	Bakery	Zoo Exhibit	Park	Ice Cream Shop

# Results

## Cluster 2

- We almost have in every quarter a park either as the most common venue or as the 2nd most common.
- Playgrounds seem to be underrepresented across all clusters.
- Groß Borstel is the way to go due to the lowest rental price

	Quarter	Price per m^2 in EURO	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	Neustadt	10,69	1	Park	Café	Coffee Shop	Bakery	Seafood Restaurant	Plaza	Pizza Place	Ice Cream Shop	Pub	Nightclub
2	Altona-Altstadt	10,60	1	Café	Park	Coffee Shop	Bakery	Seafood Restaurant	Pizza Place	Ice Cream Shop	Hotel	Nightclub	Scenic Lookout
3	Sternschanze	11,73	1	Café	Bakery	Coffee Shop	Plaza	Seafood Restaurant	Pizza Place	Park	Wine Bar	Falafel Restaurant	Austrian Restaurant
4	Altona-Nord	10,61	1	Café	Bakery	Coffee Shop	Park	Seafood Restaurant	Pizza Place	Ice Cream Shop	Nightclub	Bistro	Supermarket
5	Ottensen	11,60	1	Café	Park	Bakery	Coffee Shop	Pizza Place	Ice Cream Shop	Seafood Restaurant	Supermarket	Beach Bar	Nightclub
6	Bahrenfeld	10,09	1	Café	Bakery	Park	Coffee Shop	Farmers Market	Ice Cream Shop	Seafood Restaurant	Supermarket	Pizza Place	German Restaurant
7	Groß Flottbek	11,38	1	Park	Bakery	Café	Seafood Restaurant	Ice Cream Shop	Supermarket	Falafel Restaurant	Restaurant	Harbor / Marina	Shopping Mall
8	Othmarschen	11,81	1	Park	Bakery	Café	Ice Cream Shop	Seafood Restaurant	Farmers Market	Wine Bar	Pizza Place	Supermarket	Bistro
14	Eimsbüttel	11,36	1	Bakery	Café	Coffee Shop	Park	Pizza Place	Wine Bar	Ice Cream Shop	French Restaurant	Plaza	Hotel
15	Rotherbaum	12,41	1	Coffee Shop	Café	Ice Cream Shop	Wine Bar	Restaurant	Park	Cocktail Bar	Plaza	Hotel	Farmers Market
16	Harvestehude	12,72	1	Café	Bakery	Coffee Shop	Park	Plaza	Ice Cream Shop	Restaurant	Wine Bar	Farmers Market	Seafood Restaurant
17	Hoheluft-West	11,68	1	Café	Bakery	Coffee Shop	Park	Wine Bar	Plaza	Ice Cream Shop	Farmers Market	German Restaurant	Supermarket
18	Lokstedt	10,28	1	Café	Park	Bakery	Supermarket	Zoo Exhibit	Coffee Shop	Wine Bar	Farmers Market	Hotel	Beer Store
23	Hoheluft-Ost	12,28	1	Café	Park	Bakery	Coffee Shop	Wine Bar	Farmers Market	Supermarket	Ice Cream Shop	French Restaurant	Falafel Restaurant
24	Eppendorf	11,83	1	Café	Park	Bakery	Coffee Shop	Wine Bar	Farmers Market	Supermarket	Ice Cream Shop	Tapas Restaurant	Bistro
25	Groß Borstel	9,59	1	Café	Park	Supermarket	Bakery	Coffee Shop	Italian Restaurant	Ice Cream Shop	Wine Bar	Hotel	Bistro



# Results

## Cluster 3

- Cluster 3 looks like cluster 1 with supermarkets on top of the ranking.

	Quarter	Price per m^2 in EURO	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
9	Lurup	8,40	2	Supermarket	Bakery	Zoo Exhibit	Gym / Fitness Center	Drugstore	Café	Hotel	Park	Clothing Store	Shopping Mall
19	Niendorf	9,55	2	Supermarket	Hotel	Bakery	Café	Greek Restaurant	Park	Zoo Exhibit	Airport Service	Ice Cream Shop	Pool
20	Schnelsen	8,88	2	Zoo Exhibit	Supermarket	Ice Cream Shop	Furniture / Home Store	Indoor Play Area	Bakery	German Restaurant	Italian Restaurant	Hotel	Greek Restaurant
21	Eidelstedt	8,92	2	Café	Supermarket	Bakery	Zoo Exhibit	Park	Ice Cream Shop	German Restaurant	Italian Restaurant	Gym / Fitness Center	Wine Bar
22	Stellingen	9,81	2	Café	Bakery	Zoo Exhibit	Supermarket	Italian Restaurant	Ice Cream Shop	German Restaurant	French Restaurant	Coffee Shop	Park

# Further Discussion

- Interesting to compare the results with other clustering algorithms. That is an idea for further analysis.
- Also the amount of categories (15) could be reduced in order to put the focus on e.g. 3 or 4 venue categories. That way, you could eventually make better distinctions and the algorithm would probably lead to even better results.