



The battle of Neighborhoods

Amsterdam
02 April 2020



I. Problem

I work in Amsterdam as a manager for an international company. Once every while we have international assignments within our organization. I often get the question from the assignee what the best place would be to look for a house or apartment in Amsterdam.

Most of the time I propose to jointly discuss the possibilities, with the map of Amsterdam in front of us.

It is not easy to find a place to live in Amsterdam. In order to be able to focus on a specific area, it would be beneficial to understand the characteristics of all the areas. This will enable drilling down on the areas which suits most. As part of this project I explore different neighborhoods of Amsterdam and find the best area to look for a place to live for international assignees.

From the assignee perspective, a lot of factors come into play when finding the best accommodation. This study will focus on the following characteristics of the neighborhoods in Amsterdam:

- the safety
- the general atmosphere
- the house density
- the number of households with children in the neighborhood
- the population density in the neighborhood



2. Data

This project will use four different datasources:

- *Dataset of Amsterdam Neighborhood characteristics*
- *Dataset with safety index for Amsterdam Neighborhoods*
- *List of Neighborhoods in Amsterdam*
- *Foursquare data via the API*

Dataset of Amsterdam Neighborhood characteristics:

- Data from the city of Amsterdam, with different characteristics of the Neighborhood
- source: Amsterdam Datastore
- url: <https://api.data.amsterdam.nl/dcatd/datasets/G5JpqNbheXZSw/purls/NlralEidgfbWGw>
- Dimension: 805 columns x 19161 rows

niveau	aanam	SD	sdnaam	gebiedcode15	gebiedcodenaam	gebiednaam	GSD	jaar	BEVTOTAAL	BEV_PROG2015	...	SK017_KWETS34
niveau												
1	Amsterdam	S	Amsterdam	STAD	Amsterdam	Amsterdam	NaN	2040.0	NaN	NaN	...	NaN
2	Stadsdelen	A	A Centrum	A	A Centrum	Centrum	NaN	2040.0	NaN	NaN	...	NaN
2	Stadsdelen	B	B Westpoort	B	B Westpoort	Westpoort	NaN	2040.0	NaN	NaN	...	NaN
2	Stadsdelen	E	E West	E	E West	West	NaN	2040.0	NaN	NaN	...	NaN
2	Stadsdelen	F	F Nieuw-West	F	F Nieuw-West	Nieuw-West	NaN	2040.0	NaN	NaN	...	NaN



2. Data

List of neighborhoods in Amsterdam:

- From the formal datasets from the city of Amsterdam I was able to obtain a table with the different neighborhoods including the geographical data. This can be used to plot the data on maps as part of the analysis.

NeighbourhoodID	LNG	LAT
A00	4.896898	52.372560
A01	4.893655	52.374241
A02	4.887073	52.373251
A03	4.892358	52.365285
A04	4.904794	52.371762

Amsterdam safety data per neighborhood:

- The next piece of data used is the dataset containing the so-called safety index per neighborhood in Amsterdam. This data is also pulled from the formal data made available by the City of Amsterdam. The safety index is depicting the safety of a neighborhood based on for instance the amount of particular crimes. The lower the index, the more save the neighborhood is. A neighborhood with an index around 100 is considered to be relative save.

gebiedcode15	Wijken	2014	2015	2016	2017	2018
A00	A00 Burgwallen-Oude Zijde	76.0	50.0	82.0	112.0	74
A01	A01 Burgwallen-Nieuwe Zijde	77.0	78.0	70.0	67.0	85
A02	A02 Grachtengordel-West	35.0	56.0	38.0	42.0	70
A03	A03 Grachtengordel-Zuid	77.0	57.0	40.0	73.0	65
A04	A04 Nieuwmarkt/Lastage	64.0	71.0	75.0	68.0	68



2. Data

Foursquare data:

- Description: List of top 50 popular places in each borough. However, some suburban areas may have less than 50 places registered on Foursquare.
- Size: 2567 * 7
- Source: Foursquare API
- URL: <https://api.foursquare.com>

	Neighbourhood	Neighbourhood Latitude	Neighbourhood Longitude	Venue	venue Latitude	venue Longitude	venue Category
0	Burgwallen-Oude Zijde	52.37256	4.896898	Rosalia's Menagerie	52.371678	4.899174	Cocktail Bar
1	Burgwallen-Oude Zijde	52.37256	4.896898	De Koffieschenkerij	52.374043	4.898427	Coffee Shop
2	Burgwallen-Oude Zijde	52.37256	4.896898	Sofitel Legend The Grand Amsterdam	52.371093	4.895410	Hotel
3	Burgwallen-Oude Zijde	52.37256	4.896898	Wynand Fockink	52.372301	4.895253	Liquor Store
4	Burgwallen-Oude Zijde	52.37256	4.896898	Dam	52.372824	4.893702	Plaza



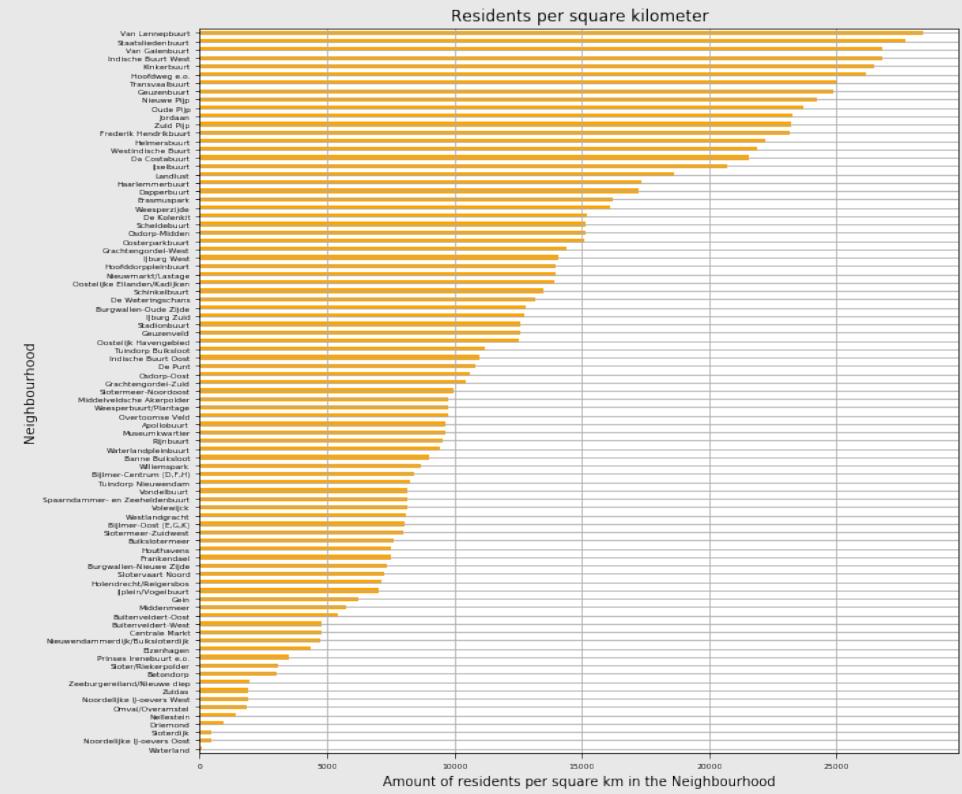
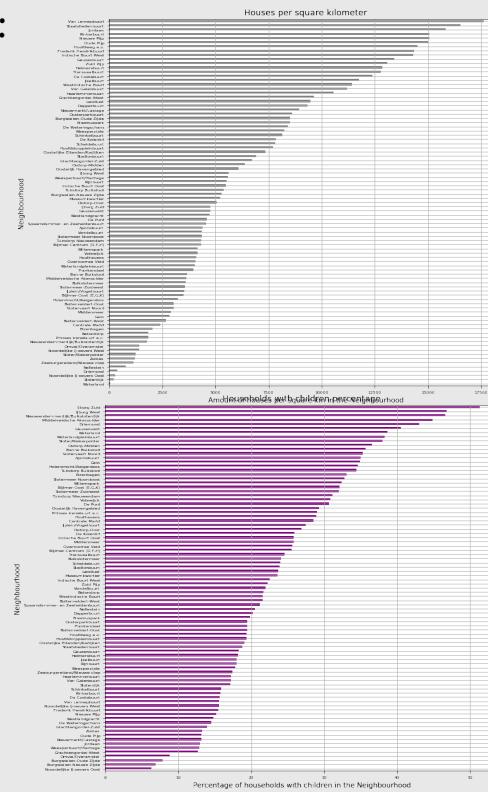
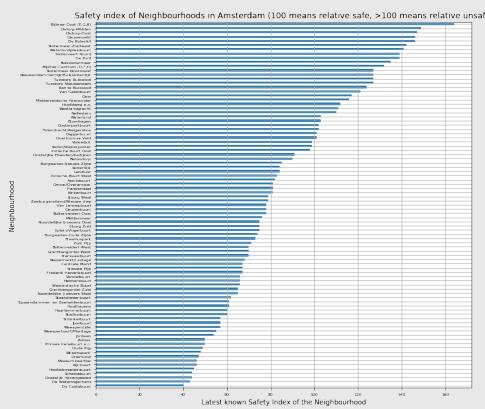
3. Methodology

Exploratory Analysis: Main characteristics of neighborhoods?

In order to observe the datasets more in depth, the data is combined in a single dataset and the data of the following characteristics were ordered:

- Safety
- Population density
- House density
- Percentage children

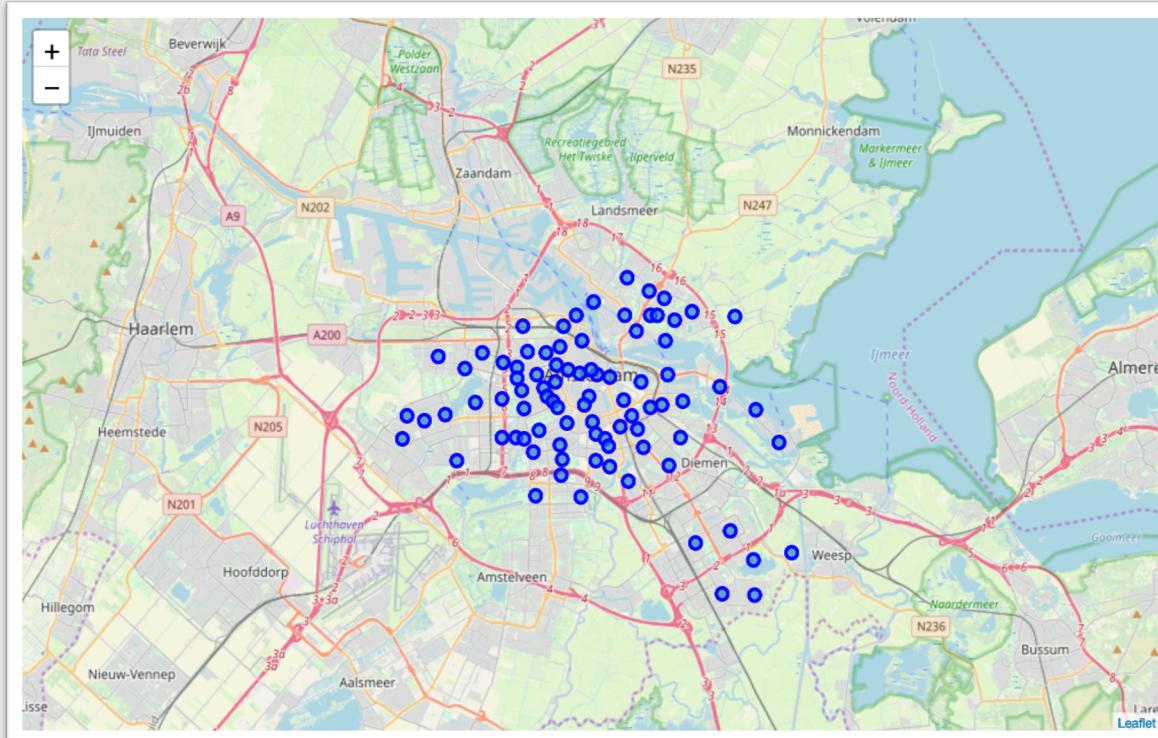
The data was visualised:



3. Methodology

Exploratory Analysis: Map of Amsterdam

With the coordinates of each borough from List of Amsterdam Neighbourhood data, the areas are plotted on the map of Amsterdam:



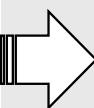
3. Methodology

Exploratory Analysis: Cluster analysis on Foursquare venue data

From the top 50 venue data acquired from Foursquare, hot encoding method was used to find out what venue categories are most popular. Venues from the same neighborhood were grouped and popular categories were discovered by frequency.

----Buitenveldert-Oost----		
	venue	freq
0	Park	0.11
1	Breakfast Spot	0.06
2	Flea Market	0.06
3	Cafeteria	0.06
4	French Restaurant	0.06

----Nieuwmarkt/Lastage----		
	venue	freq
0	Bar	0.16
1	Hotel	0.08
2	Marijuana Dispensary	0.06
3	Record Shop	0.04
4	Café	0.04



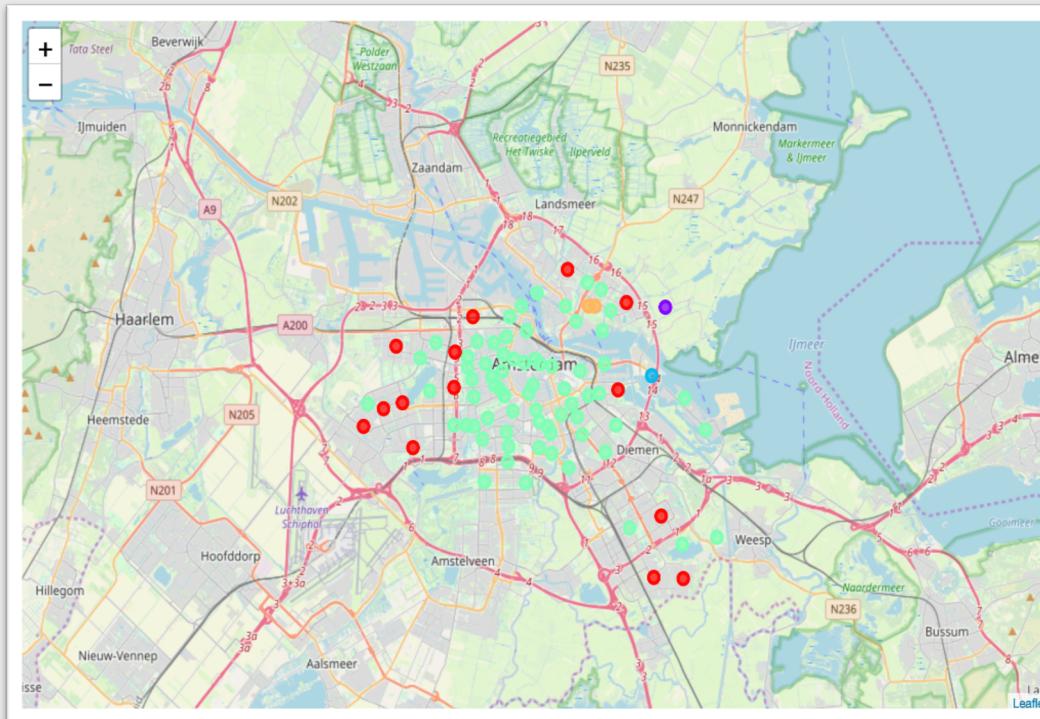
	Neighbourhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Apollobuurt	Hotel	Italian Restaurant	Comedy Club	French Restaurant	Café	Bistro	Baby Store	Juice Bar	Bus Stop	Park
1	Banne Buiksloot	Bus Stop	Park	Turkish Restaurant	Restaurant	Supermarket	Church	Shopping Mall	Bakery	Event Space	Ethiopian Restaurant
2	Betondorp	Market	Neighborhood	Bar	Bakery	Field	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant	Flower Shop
3	Bijlmer-Centrum (D,F,H)	Park	Clothing Store	Chinese Restaurant	Bakery	Fast Food Restaurant	Plaza	Italian Restaurant	Supermarket	Hostel	Mediterranean Restaurant
4	Bijlmer-Oost (E,G,K)	Supermarket	Bakery	Chinese Restaurant	Middle Eastern Restaurant	Metro Station	Fast Food Restaurant	Snack Place	Food & Drink Shop	Shopping Mall	Bus Stop



3. Methodology

Cluster Analysis: K-Means Clustering

Based on the venue categories, K-means clustering was conducted to group the boroughs into 5 different clusters based on their similarity. The color dots below represent different clusters.



3. Methodology

Cluster Analysis: K-Means Clustering

Each cluster is then given a specific atmosphere category:

NeighbourhoodID	Borough	Households_with_Children_Percentage	House_Density	SAFETY_INDEX	LNG	LAT	Cluster Labels	Common Venue	Common Venue	C
E36	E West	17.1	204.0	84.0	4.853234	52.389607	0	Nightclub	Park	E
E39	E West	25.9	7853.0	146.0	4.841405	52.376981	0	Park	Restaurant	E
F78	F Nieuw-West	40.5	4746.0	146.0	4.802849	52.378967	0	Bus Stop	Supermarket	
F81	F Nieuw-West	26.9	5045.0	147.0	4.806869	52.356827	0	Clothing Store	Turkish Restaurant	
F82	F Nieuw-West	38.5	6379.0	149.0	4.794732	52.356743	0	Turkish Restaurant	Park	

Cluster 1: Healthy area:

NeighbourhoodID	Borough	Households_with_Children_Percentage	House_Density	SAFETY_INDEX	LNG	LAT	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue
N73	N Noord	38.7	37.0	103.0	4.979187	52.392644	1	Bike Trail	Athletics & Sports	Z Exhi

Cluster 2: Harbor area
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Cluster 2: Harbor area:

NeighbourhoodID	Borough	Households_with_Children_Percentage	House_Density	SAFETY_INDEX	LNG	LAT	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue
M34	M Oost	17.4	1141.0	79.0	4.969712	52.368609	2	Harbor / Marina	Gas Station	Cafe

Cluster 3: Lively area (Pubs, Bars, Hotels):

NeighbourhoodID	Borough	Households_with_Children_Percentage	House_Density	SAFETY_INDEX	LNG	LAT	Cluster Labels	1st Most Common Venue	2nd Most Common Venue
A00	A Centrum	7.9	8524.0	74.0	4.896898	52.372560	3	Bar	Hotel
A01	Centrum	6.9	5282.0	85.0	4.893655	52.374241	3	Bar	Coffee Shop
A02	Centrum	12.7	9621.0	70.0	4.887073	52.373251	3	Hotel	Café
A03	Centrum	14.0	6708.0	65.0	4.892358	52.365285	3	Italian Restaurant	Hotel
A04	Centrum	13.2	8952.0	68.0	4.904794	52.371762	3	Bar	Hotel

Cluster 4: Quiet area:

NeighbourhoodID	Borough	Households_with_Children_Percentage	House_Density	SAFETY_INDEX	LNG	LAT	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue
N63	N Noord	34.4	5407.0	127.0	4.929079	52.393208	4	Campground	Ice Cream Shop	Pharm
N64	N Noord	46.6	1788.0	127.0	4.932702	52.393161	4	Bar	Tennis Court	

4. Results

In order to be able to validate a neighborhood against the wishes of the person looking for a place to live, the differentiating characteristics have been normalized. Every characteristic have been given an index by rating them against the results of the other neighborhoods. (We do this for all characteristics except for atmosphere which will be done in the next step).

Neighbourhood	SAFETY_INDEX	HouseHolds_with_Children_Percentage	House_Density	Population_Density	Cluster Labels	Safety	Children	Houses	Population
Burgwallen-Oude Zijde	74.0	7.9	8524.0	12814.0	3	0.725806	0.964444	0.517483	0.482517
Burgwallen-Nieuwe Zijde	85.0	6.9	5282.0	7374.0	3	0.637097	0.986667	0.701802	0.298198
Grachtengordel-West	70.0	12.7	9621.0	14382.0	3	0.758065	0.857778	0.455114	0.544886
Grachtengordel-Zuid	65.0	14.0	6708.0	10457.0	3	0.798387	0.828889	0.620729	0.379271
Nieuwmarkt/Lastage	68.0	13.2	8952.0	13969.0	3	0.774194	0.846667	0.493149	0.506851



5. Questionnaire

With all the data ordered, cleaned and indexed, the different characteristics can be weighted as a result of the wishes from the person looking for a place to live in Amsterdam. In order to get these wishes, a questionnaire is created. The answers for every item will be a rating between 0(agree) and 5(disagree). The form consists of the following questions:

Please rate the following questions between 0 and 5
Where 0 means the item does not influence your preferred area
and 5 means it does heavily influence your preferred area.

Do you like an area with many children:5
Do you like an area with a high safety index:5
Do you like an area with a lower house density:4
Do you like an area with a lower population density:4
Do you like an area with many health facilities like gyms:2
Do you like an area with many pubs and restaurants:0
Do you like an busy area with for instance many coffee shops and clothing stores:0
Do you like a quiet area with for instance many yoga facilities:0
Do you like to live in an area with traditional industries:0



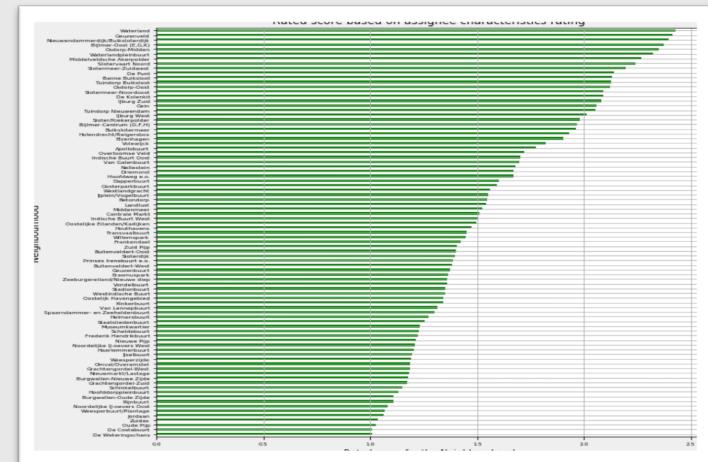
5. Questionnaire

Based on the outcome of the questionnaire personalised scores can be calculated for the individual characteristics of neighborhoods:

- Based on the input of the last 5 questions of the questionnaire (remember, these were the venue clusters), a simple rating for atmosphere is calculated per neighbourhood.
- For the other characteristics (percentage children, population density, house density, safety), the results per neighborhood are weighted with the answers from the questionnaire.

This leads to a final score per neighborhood in Amsterdam based on its characteristics and preferences of the person looking for a place to live:

	Neighbourhood	Population	Rating_Atmosphere	Rating_Safety	Rating_Children	Rating_Houses	Rating_Population	Score
79	Waterland	-0.000000	0.4	0.508065	0.720000	0.800000	-0.000000	2.428065
30	Geuzenveld	0.267724	0.0	0.854839	0.760000	0.585821	0.214179	2.414839
73	Nieuwendammerdijk/Buiksloterdijk	0.099551	0.0	0.701613	0.895556	0.720359	0.079641	2.397168
82	Bijlmer-Oost (E,G,K)	0.197567	0.0	1.000000	0.573333	0.641947	0.158053	2.373333
32	Osdorp-Midden	0.360566	0.0	0.879032	0.671111	0.511547	0.288453	2.350143



5. Conclusion

With the analysis we are able to identify neighborhoods with a good fit with the wishes from the international assignee who wants to find a place to live in Amsterdam. For the purpose of this analysis, input is collected from a random assignee. The ratings of importance this assignee gave to the different characteristics of a neighborhood are reported below. The final overview is based on these ratings.

The random assignee gave the following ratings of importance (on a scale of 5):

Question	Rating
Importance to live in a busy area:	0
Importance to live in an area with health facilities	2
Importance to live in an area nearby the harbour	0
Importance to live in a lively(shops etc) area	0
Importance to live in a quiet area	0
Importance to live in a safe area	5
Importance to live in an area with a lot of children	5
Importance to live in an area with a low population density	4
Importance to live in an area with a low house density	4

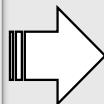
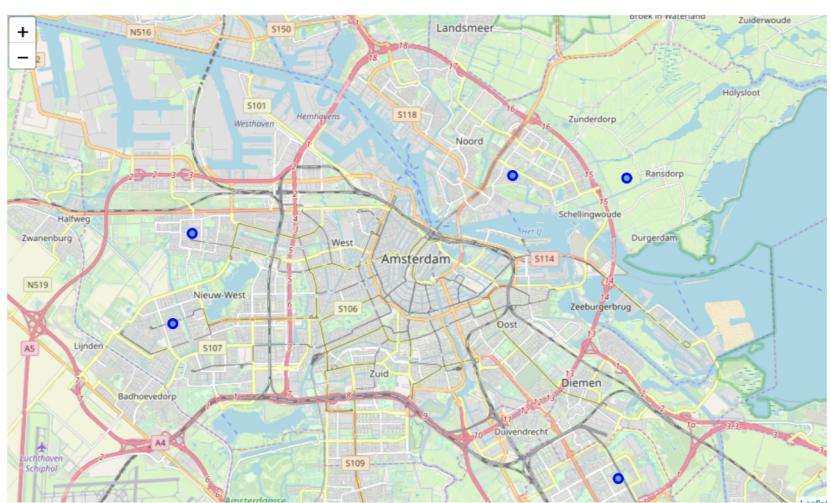


5. Conclusion

Based on the output of the questionnaire the top-5 best fit neighborhoods are calculated:

NeighbourhoodID	Borough	Neighbourhood
N73	N Noord	Waterland
F78	F Nieuw-West	Geuzenveld
N64	N Noord	Nieuwendammerdijk/Buiksloterdijk
T94	T Zuidoost	Bijlmer-Oost (E,G,K)
F82	F Nieuw-West	Osdorp-Midden

These neighbourhoods can be shown on the map of Amsterdam as per below view:



As can be seen on the map, the neighborhoods with the best fit given the input from our random assignee are particularly outside the Amsterdam center area.

This seems to be a perfect fit with the importance this assignee gave to the different characteristics. This random assignee was looking for a safe and quiet neighborhood with a high percentage of children and a low density of houses and population. This are typically the areas outside the center, which is indeed depicted on the map.