Over-Tourism in Amsterdam

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1.Introduction

Amsterdam is a city with a population roughly 1,5 million. Meantime, the number of tourists that visit Amsterdam each year reaches to roughly ten times its population with 15.9 million daily visitors and 8.3 million overnight visitors [1]. As the volume of tourists that visit Amsterdam keep on growing, the possibilities for accommodation increases as well as number of other establishments targeting tourists.

With growing numbers of restaurants, bars and coffee-shops, there are concerns that Amsterdam is becoming a victim of over-tourism. Besides loosing authenticity of Amsterdam, there are concerns with regards to scarcity of living spaces for locals. Limited number of accommodation options lead to competition between regular and tourist accommodation while more and more essential shops leave their place to tourist shops.

In this investigation, we will look into different neighbourhoods of Amsterdam with regards to characteristics of their venues and availability for AirBnB offers. The insights generated will help Amsterdam's local government to form a more targeted strategy to lower the impact of over-tourism.

2. Data Description

We will use several sources of data for this analysis.

Data on Neighbourhoods of Amsterdam:

- GeoJson file containing different neighbourhoods [2].
- Neighbourhoods.csv: csv file containing latitude and longitude data for center point of each neighbourhood. The latitude and longitude data has been driven from Google Maps by selecting Ouder-en-Kind Stichting's office location for each neighbourhood [3].

Data on Venues:

- Foursquare API [4]

Data on AirBnB listings:

- Listings.csv : csv file containing names, prices, neighbourhood, lat&long data for each AirBnB listing in Amsterdam [2].

We will use the latitude and longitude values of each neighbourhood to query Foursquare API to get a list of venues that are in the neighbourhood of these points. We will also get the categories for these venues from Foursquare API.

Later on, geojson file containing polygons for each neighbourhood will be used to plot maps of Amsterdam. In addition we derive and use number of Airbnb listings, average price and reviews for each neighbourhood.

Insights into the type of venues and number of airbnbs will gives us a good impression on the characteristics of the neighbourhoods.

3.Methodology

The names of Amsterdam's neighbourhoods were driven from Airbnb's geojson file. I have connected the latitude and longitude values for each neighbourhood in a csv file as shown below (fig.1.). Let's call these center points for each neighbourhood.

	Neighbourhood	Latitude	Longitude
0	Bijlmer-Centrum	52.313293	4.954486
1	Bijlmer-Oost	52.320051	4.959330
2	Bos en Lommer	52.378944	4.844829
3	Buitenveldert - Zuidas	52.338396	4.869985
4	Centrum-Oost	52.375488	4.859004
5	Centrum-West	52.375493	4.885268
6	De Aker - Nieuw Sloten	52.346222	4.818332
7	De Baarsjes - Oud-West	52.364294	4.853836
8	De Pijp - Rivierenbuurt	52.354152	4.898587

Fig.1. Latitude and longitudes for Amsterdam's neighbourhoods

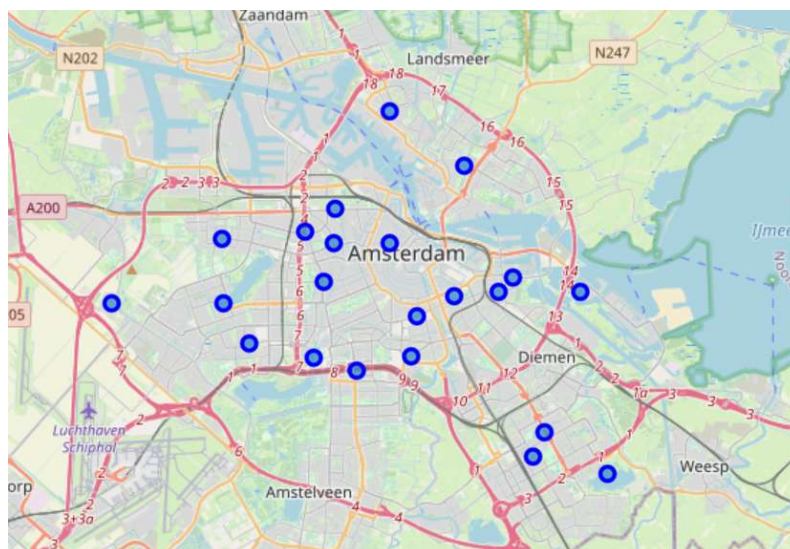By using **folium** library**,** I visualized each neighbourhood on map of Amsterdam.

Fig.2.Neighbourhoods plotted on map of Amsterdam

Afterwards, I have queried Foursquare API for venues near these center point of all neighbourhoods by using venues table of Foursquare. I have selected radius of a **1000 meter** for each center point since selection of center points are based on Google maps and do not necessarily represent the

activity/commercial center for the neighbourhoods. I have also limited the number of venues returned for each neighbourhood to **100** for sake of simplicity. As result I got a total of **1695** venues.

I have plotted these venues to get an initial insight of their distribution. I have also made a bar chart to see which neighborhoods have the highest numbers of venues. Please keep in mind that the limit is set to 100 venues/neighbourhood therefore we are overlooking some of the venues.
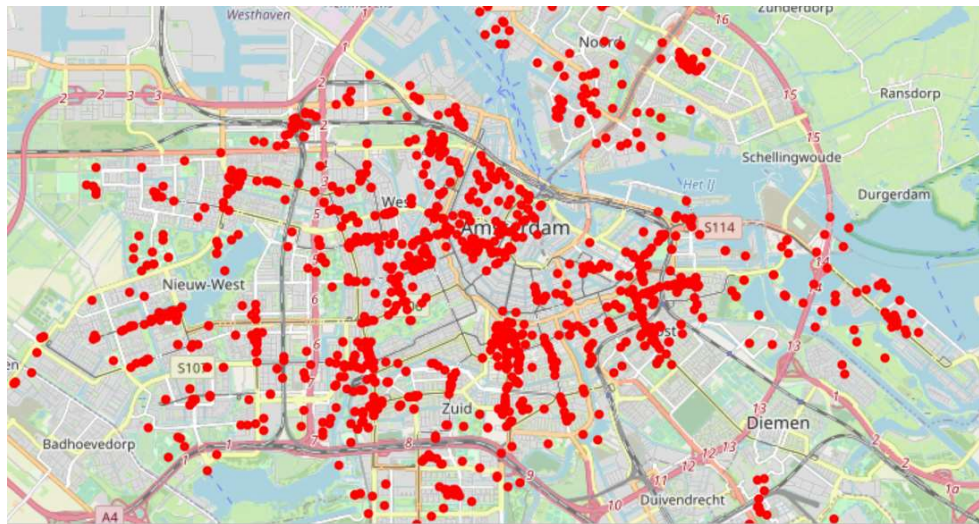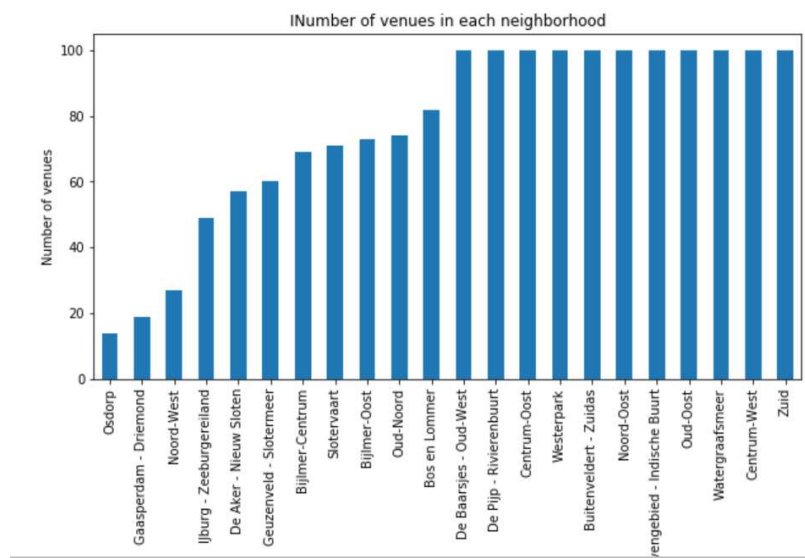

Fig.3.Venues in Amsterdam

Fig.4. Number of venues in each neighbourhood

Afterwards I have grouped the number of venues by category to see what type venues are the most frequent in Amsterdam. As you can see from fig.5., the most common types of venues are (1st)restaurants, (2nd)hotels, (3rd) coffee shops, (4th)cafes and (5th)bars. Please notice that there are more categories referring to restaurants of a certain type of cousin (such as Turkish restaurant, Japanese restaurant etc.), these are not included in below categorization, however restaurants are still the leading category of venue. Therefore we are not going to dive deeper into this area.
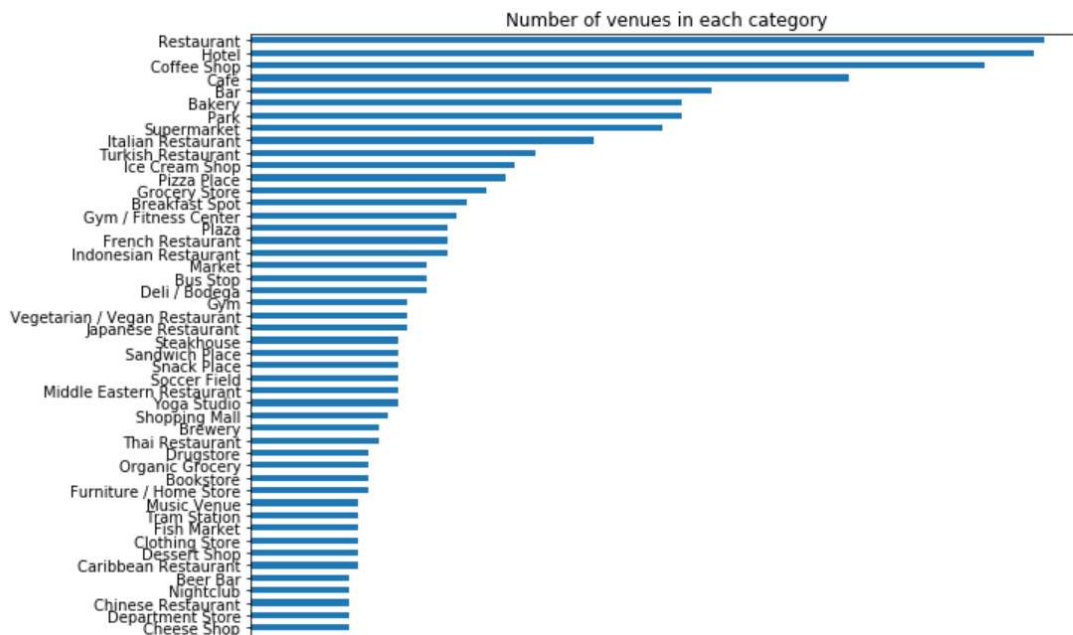
Fig.5. Most common categories of venues in Amsterdam

As the purpose of this investigation is over-tourism, the preliminary insights are not surprising. However, we will need dive deeper. To start comparing different neighbourhoods, I have first modified my dataframe containing all venues by **one hot encoding** to get to a data frame containing frequency of each venue category for a neighbourhood. Afterwards, I applied **k-means clustering** to cluster Amsterdams neighbourhoods. Cluster number of **8** is selected after few iterations with higher and lower k values.
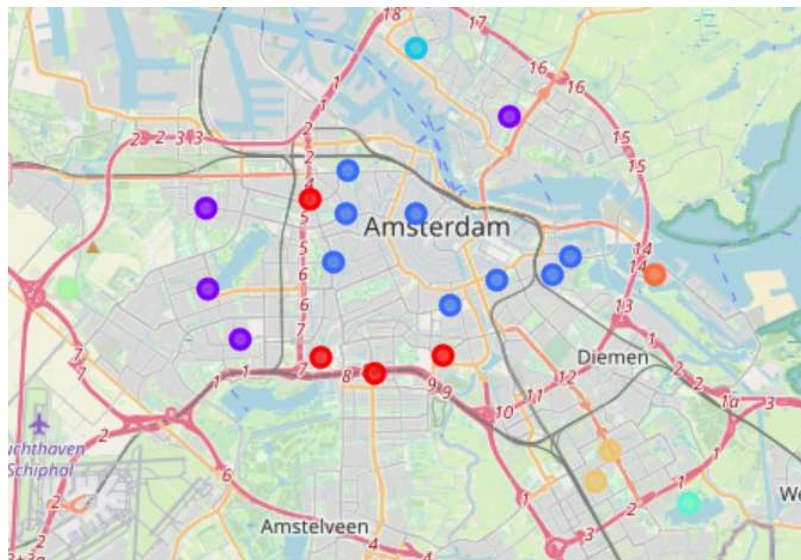

Fig.6. Neighborhood clusters

As you can see from fig.6., most neighbourhoods around the center of Amsterdam form a single cluster. Let's have a deeper look into this cluster and compare it with another one. While cluster 2 contains mostly coffee shops, restaurants, bars and hotels, cluster 1 has more venues such as supermarkets, soccer fields, Turkish restaurants and drugstores.

	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
4	Centrum-Oost	Coffee Shop	Café	Italian Restaurant	Bar	Pizza Place	Restaurant	Grocery Store	Yoga Studio	Park	Bakery
5	Centrum-West	Hotel	Bar	Coffee Shop	Restaurant	Café	Bakery	Cocktail Bar	Ice Cream Shop	Dessert Shop	Organic Grocery
7	De Baarsjes - Oud-West	Bar	Coffee Shop	Restaurant	Café	Grocery Store	Hotel	Park	Ethiopian Restaurant	Yoga Studio	Italian Restaurant
8	De Pijp - Rivierenbuurt	Bakery	French Restaurant	Restaurant	Pizza Place	Coffee Shop	Breakfast Spot	Middle Eastern Restaurant	Japanese Restaurant	Hotel	Mediterranean Restaurant
12	Noord-Oost	Coffee Shop	Bar	Restaurant	French Restaurant	Park	Café	Italian Restaurant	Ice Cream Shop	Hotel	Vegetarian / Vegan Restaurant
14	Oostelijk Havengebied - Indische Buurt	Coffee Shop	Restaurant	Café	Hotel	Bar	Bakery	Italian Restaurant	Market	Turkish Restaurant	Middle Eastern Restaurant
17	Oud-Oost	Hotel	Coffee Shop	Restaurant	Bar	Italian Restaurant	Breakfast Spot	Zoo Exhibit	Bakery	Yoga Studio	French Restaurant
20	Westerpark	Restaurant	Coffee Shop	Café	Music Venue	Pizza Place	Hotel	Turkish Restaurant	Bar	Italian Restaurant	Park

Fig.7. Most common venues in neighbourhoods in Cluster 2

	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
6	De Aker - Nieuw Sloten	Supermarket	Coffee Shop	Soccer Field	Hotel	Tram Station	Turkish Restaurant	Bus Stop	Chinese Restaurant	Drugstore	Gym / Fitness Center
10	Geuzenveld - Slotermeer	Soccer Field	Turkish Restaurant	Tram Station	Supermarket	Furniture / Home Store	Dessert Shop	Park	Baseball Field	Drugstore	Discount Store
16	Oud-Noord	Supermarket	Café	Turkish Restaurant	Market	Clothing Store	Park	Plaza	Gastropub	Bakery	Grocery Store
18	Slotervaart	Supermarket	Turkish Restaurant	Gym / Fitness Center	Park	Tram Station	Drugstore	Grocery Store	Chinese Restaurant	Snack Place	Hotel

Fig.8. Most common venues in neighbourhoods in Cluster 1

To have an understanding of the tourist accommodation distribution, I have filtered venues with categories 'Hotel' and 'Hostel' in a separate dataframe and plotted via folium. As seen from figure 9, hotels and hostels are relatively distributed across the city.
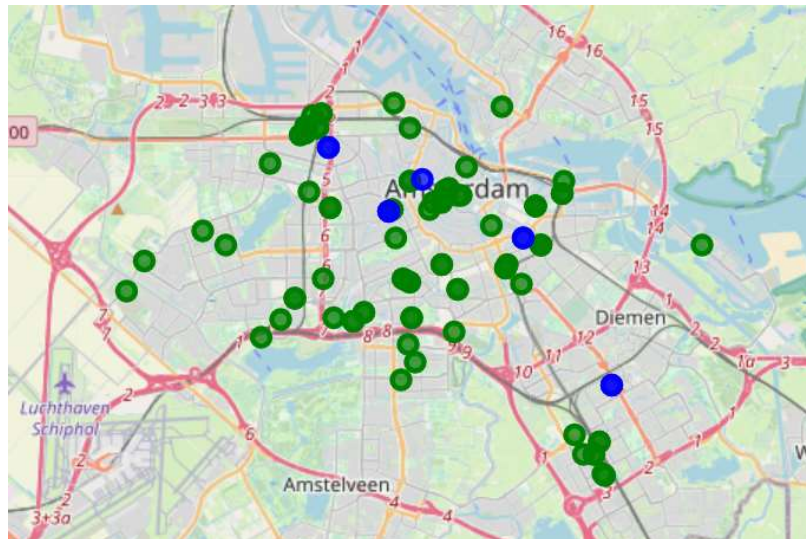

Fig.9. Hotels(in green) and hostels(in blue) found in Foursquare venues

In addition to Foursquare data, I made use of Airbnb data. I have load data from csv file containing Airbnb listings. **19362** Airbnb offerings were listed in this file. Since this is a large number for this analysis, I have grouped the listings by their neighbourhood and manipulated the data into a dataframe that contained, number of Airbnb listings, average price, average number of reviews per

neighbourhood. Afterwards I have merged this dataframe with the one that I had based on Foursquare queries.

By using **choropleth,** I have plotted a map of Amsterdam with color coding based on number of Airbnbs in a neighbourhood. De Baarsjes – Oud West neighbourhood stood out as the one with the highest number of Airbnbs which is 3268 airbnbs for one neighbourhood.
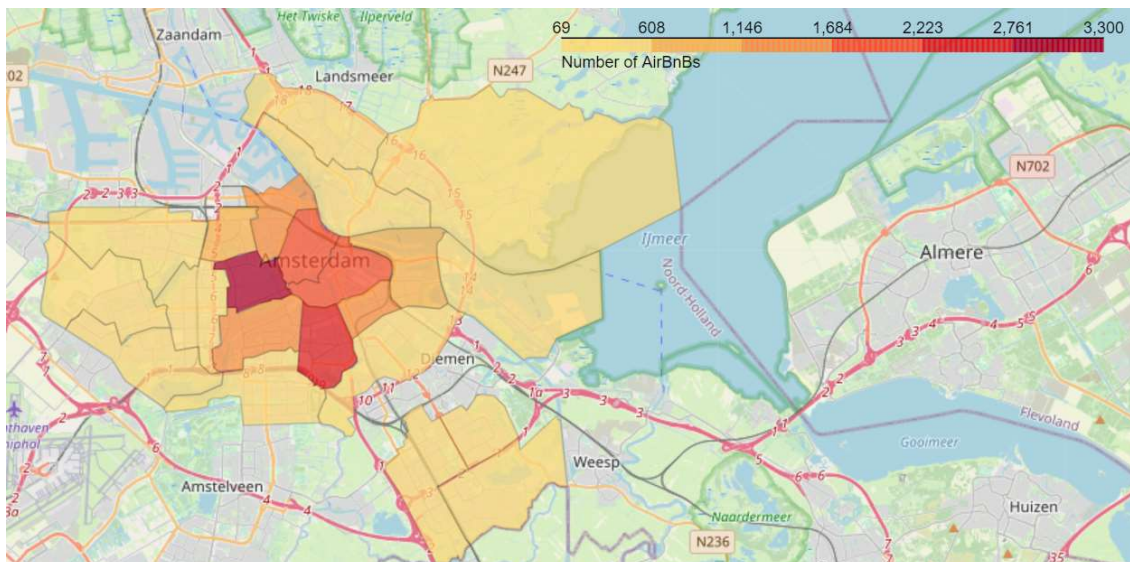

Fig.10. Number of AirBnbs in each neighborhood.

To look further into costs and popularity, I have used average price and average number of reviews and to plot choropleth maps.
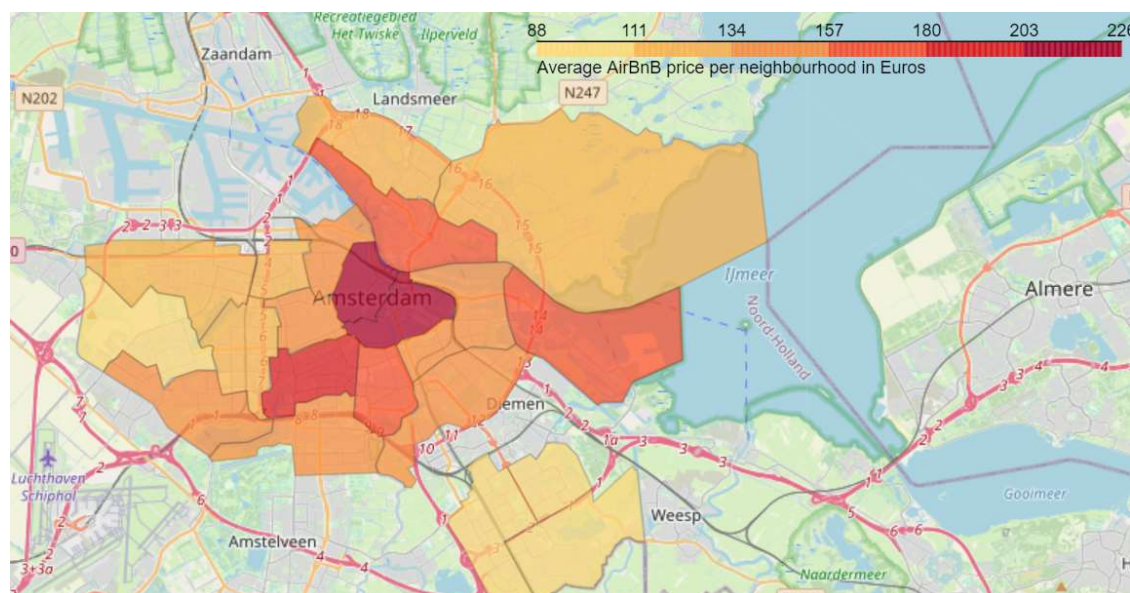

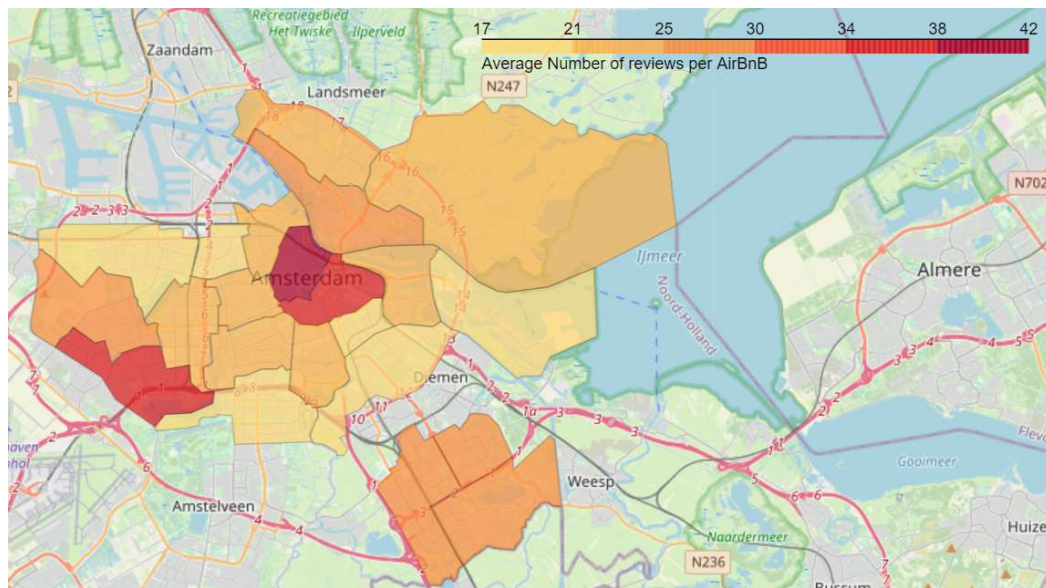Fig.11. Average aribnb price in each neighbourhood

Fig.12. Average number of reviews per Airbnb

4. Results

Based on the analysis described above, there are a few observations that we can draw;

- There is a large number of venues that are aimed at tourists in Amsterdam. This shows itself clearly in fig.5.
- By clustering neighbourhoods, we see that the neighbourhoods in Central Amsterdam form a cluster. Compared to different clusters this cluster has a higher concentration of coffee shops, hotels and bars.
- From figures 11 and 12 that Central Amsterdam remains attractive for visitors even though average Airbnb prices are higher compared to other neighbourhoods.
- Meanwhile De Baarsjes – Oud West has the highest numbers of airbnb listings while average price and number reviews remain lower.

5.Discussion

Results indicate that Central Amsterdam is mostly aimed at tourism rather than living areas for locals. We can claim that neighbourhoods that are listed in Cluster 2 are aiming at tourists by seeing the frequency of categories of venues and how they differ from venue category distribution in other clusters.

For municipality of Amsterdam there could be different strategies to limit over-tourism. One of them could be limiting licenses for Airbnb listings in each neighborhood. Another could be creating a tourist designated area where a few neighbourhoods are kept as a tourist destination while others offer limited tourist-venues or accommodation.

The neighborhood, De Baarsjes – Oud West has the most number of airbnbs while still being cheaper and less popular than its neighbour Centrum-West. Therefore it could be a critical test case for applying strategies to overcome over-tourism.

6. Conclusions

Within this report we have investigated over-tourism in Amsterdam for supporting decision making process of Municipality of Amsterdam. The analysis is based on opensource data that is collected from Foursquare and Airbnb. Suggestions for implementation have been elaborated in discussion session.

This analysis remains interesting not only for local authorities but also individuals who are planning on participating in tourism industry.

7. Further analysis

For sake of simplicity, Airbnb listings are grouped based on mean values for each neighbourhood. It could be interesting to also use medians and investigate variation in different neighbourhoods. In addition, deeper dives into each neighbourhood could give us new insights.

8.References

[1] https://www.amsterdam.info/basics/figures/

[2] http://insideairbnb.com/get-the-data.html

[3] https://maps.google.com

[4] https://developer.foursquare.com/docs/api-reference/venues/details/