

Neighborhood analysis of Frankfurt (GER)

Capstone Project
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Background and introduction into the research problem

Description of the problem and a discussion of the background

Frankfurt am Main is the fifth largest city in Germany, located in the centre of the country. With its vibrant city-life, a wide range of employers and renowned universities, the city is highly attractive for new citizens.

(https://de.wikipedia.org/wiki/Frankfurt_am_Main)

Mostly, the decision for a place to live depends on many factors such as budget, distance to place of work or university etc. Often, a key decision criterion remains the number of coffee places and bars in the direct environment. This can be predominantly witnessed at students or young professionals.

The research will therefore focus on analysing the neighbourhoods in Frankfurt by answering the following research questions:

- **What are the neighbourhoods that show the highest density of venues?**
- **Using k-means clustering, in which neighbourhoods are predominantly bars, coffee places and restaurants located?**

Description of the data and how it will be used to solve the problem

A table with all neighbourhoods of Frankfurt is published on Wikipedia. The table is scraped directly into a pandas data frame for further processing. (e.g. drop of columns, deleting irrelevant information in columns etc.). The cleaned table builds the foundation for the neighbourhood analysis and some descriptive statistics of the city Frankfurt.

(https://de.wikipedia.org/wiki/Liste_der_Stadtteile_von_Frankfurt_am_Main)

Geographic coordinates for each neighbourhood are sourced using the Nominatim Geocoding service.

Locational data for venues is sourced from Foursquare via the Foursquare API. The locational data is used for clustering all neighbourhoods into distinctive clusters. The aim is to identify clusters that show a high rate of coffee places and bars – places likely visited by students and young professionals.

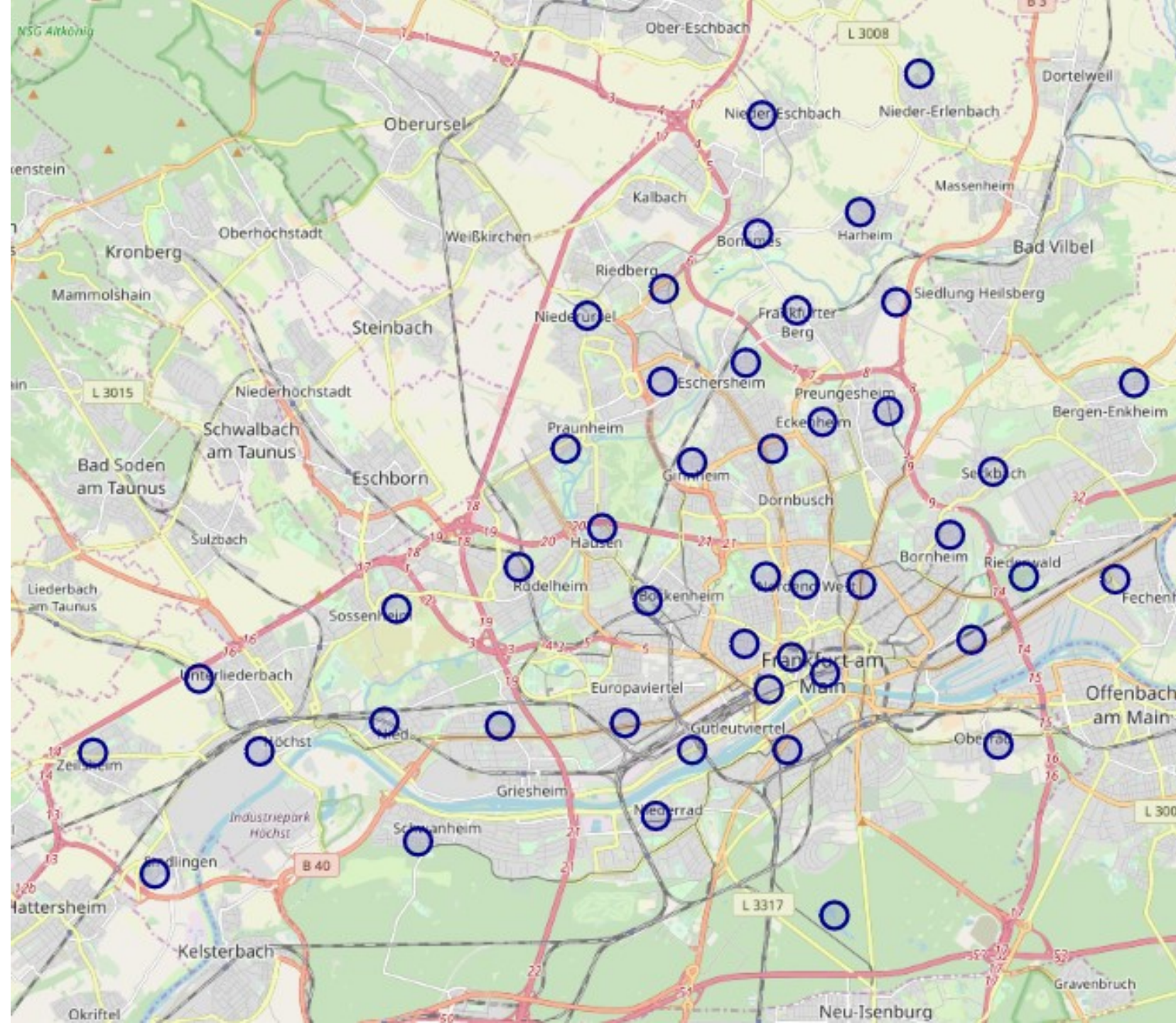
(<https://developer.foursquare.com/>)

Table with the first 12 neighbourhoods in Frankfurt including data for geographical coordinates

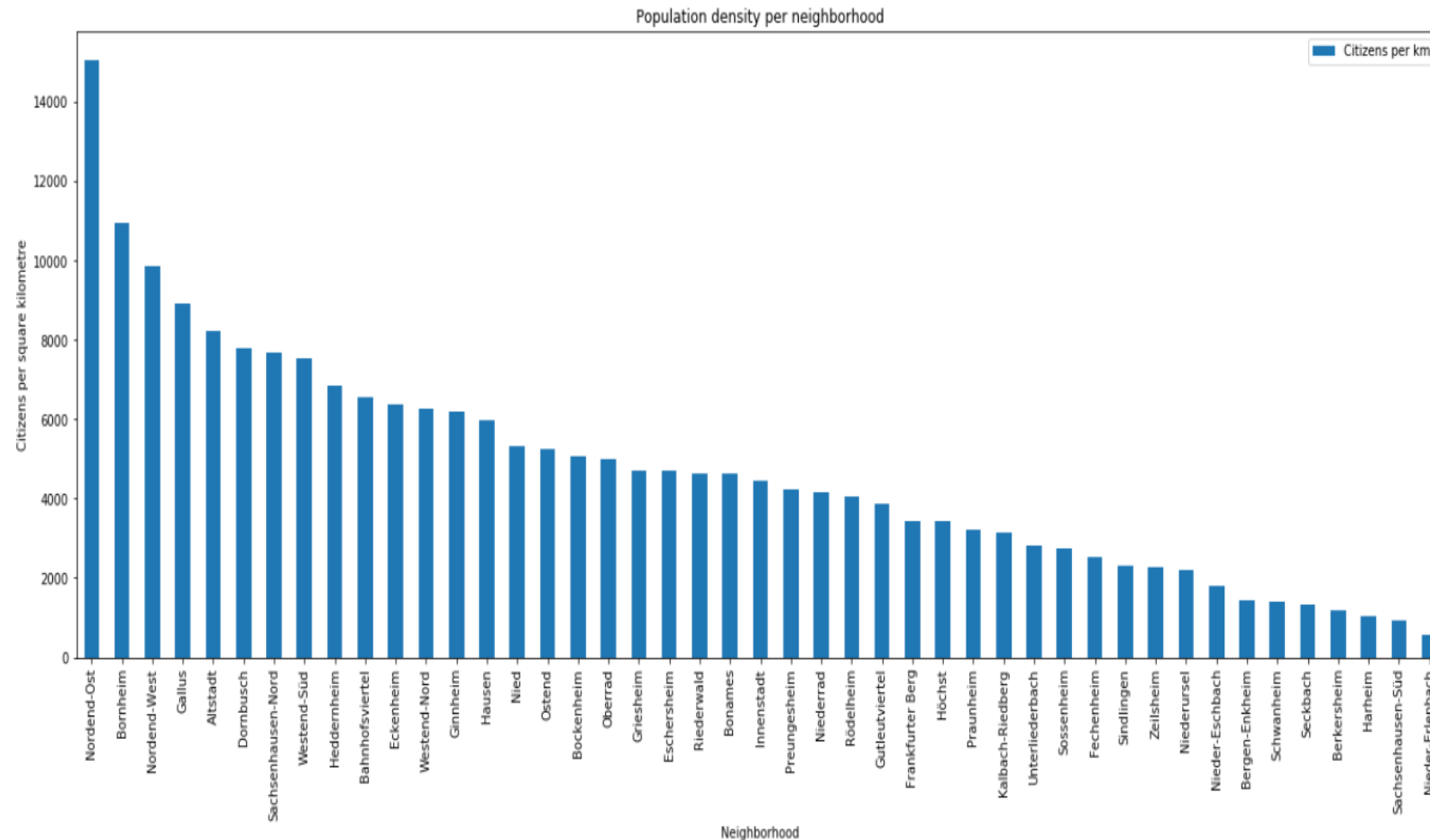
	Number	Neighborhood	Citizens per km ²	Neighborhood since	Address	Latitude	Longitude
0	1	Altstadt	8204	1866	Altstadt, Frankfurt am Main, Germany	50.110442	8.682901
1	2	Innenstadt	4430	1866	Innenstadt, Frankfurt am Main, Germany	50.112993	8.674341
2	3	Bahnhofsviertel	6570	1866	Bahnhofsviertel, Frankfurt am Main, Germany	50.107741	8.668676
3	4	Westend-Süd	7538	1866	Westend-Süd, Frankfurt am Main, Germany	50.115245	8.662270
4	5	Westend-Nord	6249	1866	Westend-Nord, Frankfurt am Main, Germany	50.126356	8.667921
5	6	Nordend-West	9845	1866	Nordend-West, Frankfurt am Main, Germany	50.124914	8.677950
6	7	Nordend-Ost	15031	1866	Nordend-Ost, Frankfurt am Main, Germany	50.124920	8.692317
7	8	Ostend	5243	1866	Ostend, Frankfurt am Main, Germany	50.115935	8.720546
8	9	Bornheim	10959	1877	Bornheim, Frankfurt am Main, Germany	50.133056	8.714932
9	10	Gutleutviertel	3864	1866	Gutleutviertel, Frankfurt am Main, Germany	50.097925	8.648964
10	11	Gallus	8911	1866	Gallus, Frankfurt am Main, Germany	50.102309	8.631984
11	12	Bockenheim	5079	1895	Bockenheim, Frankfurt am Main, Germany	50.122361	8.637532

Neighbourhoods in Frankfurt (GER)

- Frankfurt am Main has 45 neighbourhoods in total
- In the centre of the city, neighbourhoods are in general smaller and more aggregated



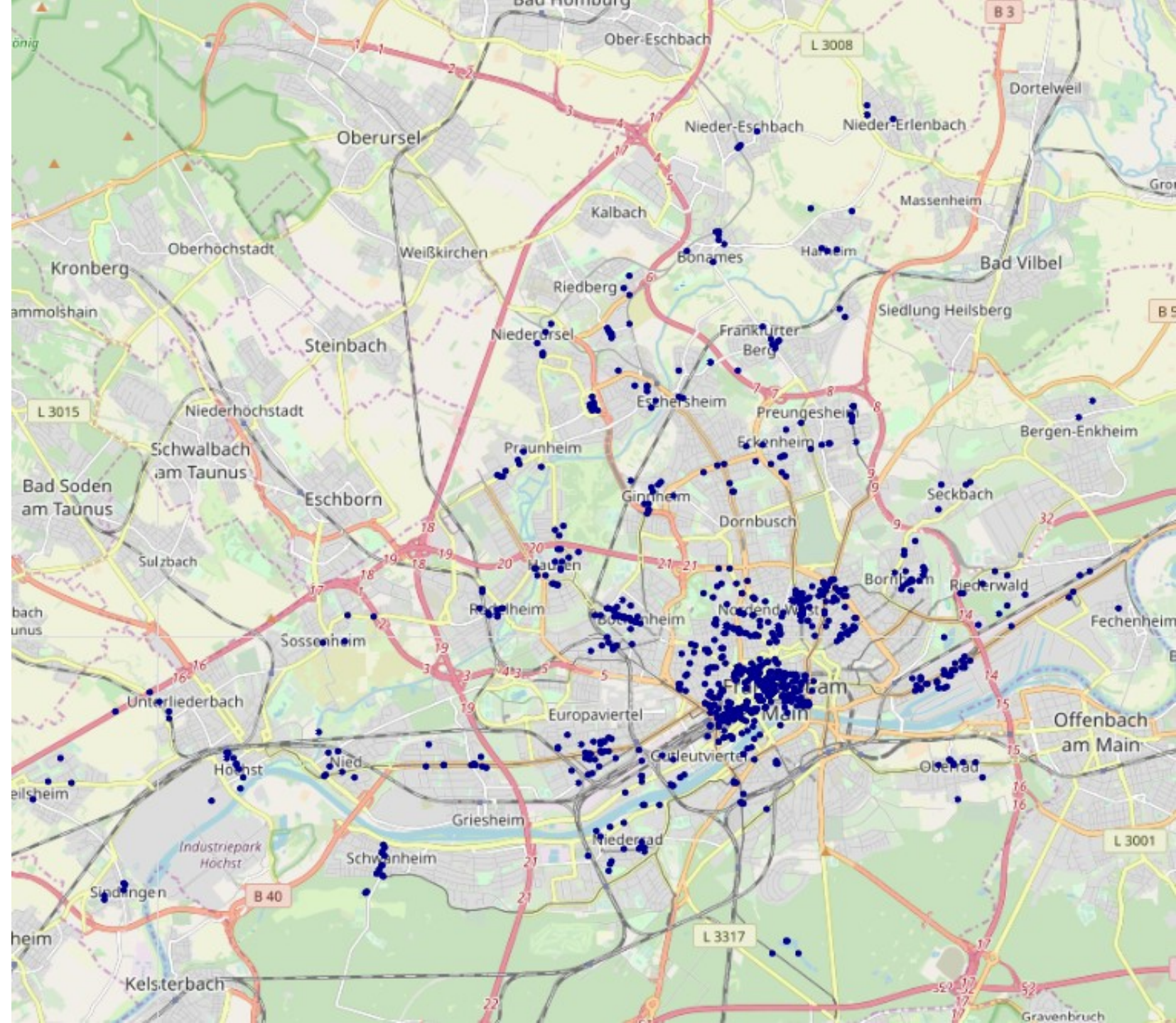
Population density per neighbourhood



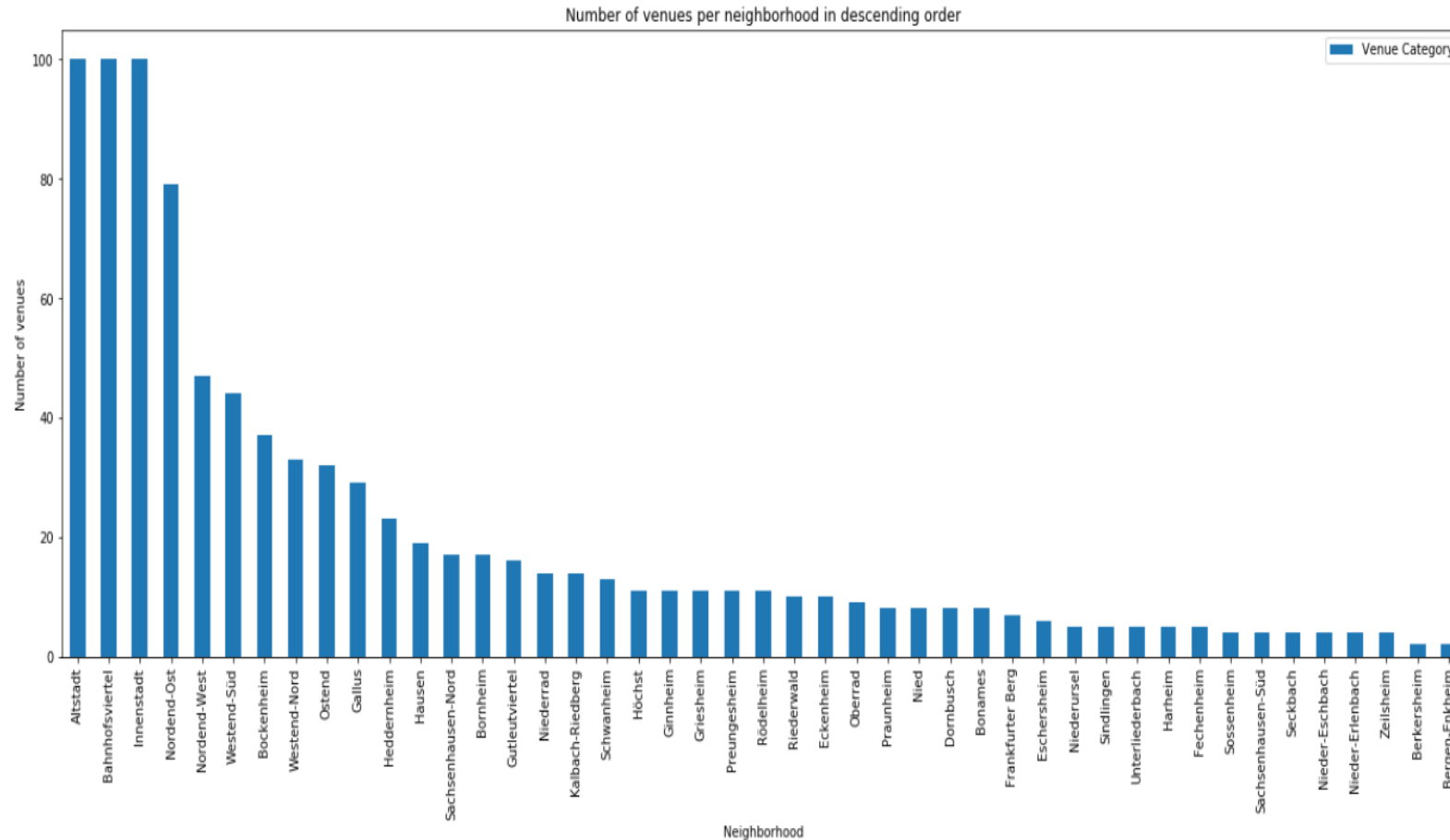
- With 15.031 citizens per square kilometre, Bornheim-Ost is the most dense neighbourhood
- Nieder-Erlenbach has the lowest density with 564 citizens per square kilometre
- The average population per square metre is 4711

Venues of all neighbourhood

- All venues per neighbourhood within a radius of 600 metres displayed in a map
- The number of venues increases the closer the neighbourhood is located to the city centre



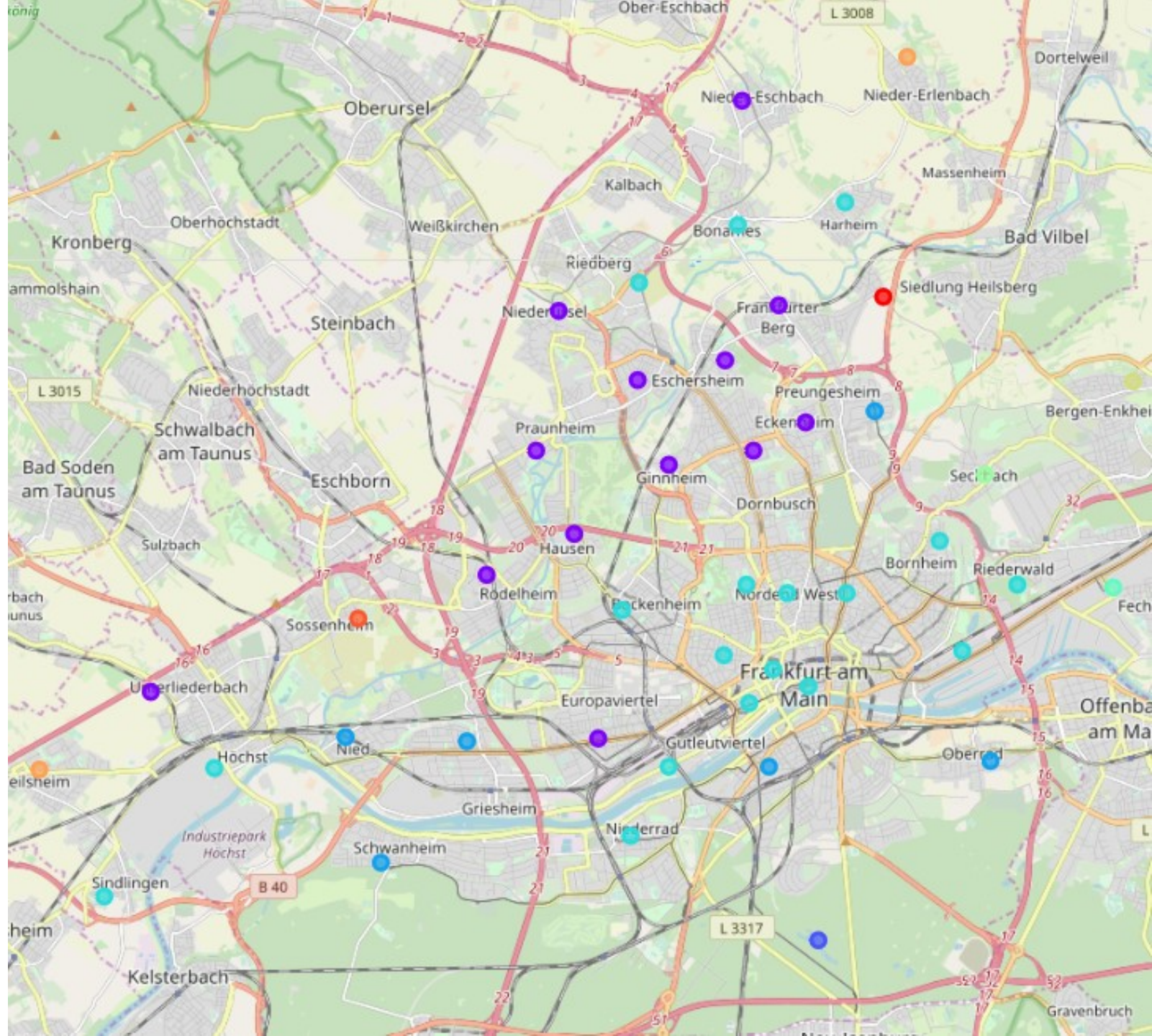
Number of venues per neighbourhood in descending order



- Average of 20 venues per neighbourhood within a radius of 600 metres
- The three neighbourhoods Altstadt, Bahnhofsviertel and Innenstadt reach the maximum of 100 venues that can be requested via Foursquare

Neighbourhood clustering

- Neighbourhoods have been clustered into 10 clusters
- Cluster number 1 (purple) and 4 (turquoise) are the clusters that have the most neighbourhoods
- Cluster 1 has 13 neighbourhoods and is characterized by supermarkets, restaurants and public transport
- Cluster 4 has 18 neighbourhoods and is characterized by cafés, restaurants and bars



Conclusions

- Only two neighborhoods (Ostend-Ost and Bornheim) have a population density of 10.000 citizens per square kilometer
- The density of venues increases the closer a neighborhood is located to the city centre
- Three neighborhoods (Altstadt, Bahnhofsviertel and Innenstadt) have at least 100 venues within a radius of 600 metres
- Neighborhoods that fall into the cluster 4 are highly attractive for living especially for students and young professionals, as those neighborhoods are characterized by café's, restaurants and bars

