

Studying Japanese restaurants distribution in the city center area of Dusseldorf, Germany

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Introduction

Dusseldorf is the capital city of North Rhine-Westphalia Land (state) in Germany. It is the 7th-largest city in Germany, with a population around 600,000 and area 217.41 km^2 . The City of Dusseldorf consists of 50 city parts, which are collected into 10 city districts. In this work, we will study the categories of restaurants (including Café, pub and bakery) in the city center of Dusseldorf. The city center area of Dusseldorf consists of three city parts: ‘Altstadt’, ‘Stadtmitte’ and ‘Carlstadt’. The results are useful for the people who want to open a new restaurant in Dusseldorf. In this work, we will find an appropriate place to open a Japanese restaurant.

Data Preparation

A list of the 50 city parts of Dusseldorf can be found at Wikipedia: https://de.wikipedia.org/wiki/Liste_der_Stadtteile_von_Düsseldorf. Since the data source is in German which contains umlaut (e.g. ä, ö, ü), when import the data the encoding should be set as ‘UTF-8’. The latitude and longitude data of each city part is searched and obtained by Nominatim. Foursquare location data is then used to explore the restaurants by setting the endpoint group as ‘venues’, using the ‘explore’ endpoint and setting the section as ‘food’. Since the area of ‘Altstadt’ (0.48 km^2), ‘Stadtmitte’ (1.72 km^2) and ‘Carlstadt’ (0.46 km^2) are small, we explore all the restaurants by setting the geographical coordinate of ‘Stadtmitte’ with radius equals 1000m. Then the category and the geographical coordinate of each restaurant can be extracted from the explored results. The data analysis will focus on this information.

Methodology

Plotting the map of Dusseldorf city and mark the 50 city parts

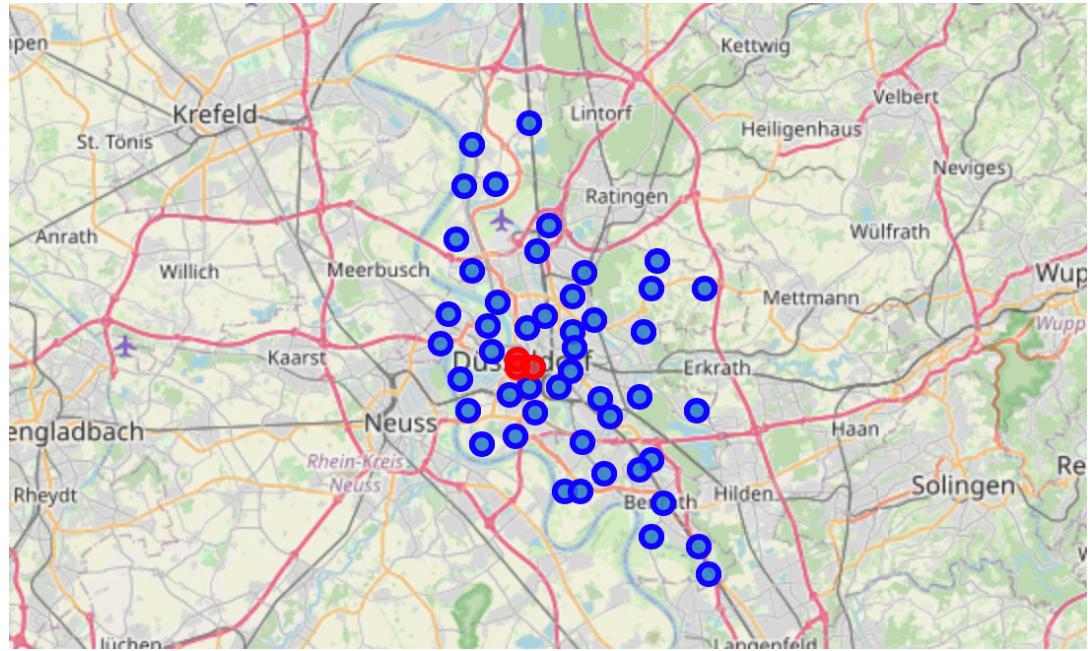
The name of 50 city parts of Dusseldorf was obtained from Wikipedia. Based the name of each city part, the geographical coordinate, i.e. the latitude and longitude data, was searched and obtained by Nominatim. Then the Dusseldorf city with marks of 50 city parts was plotted by using Folium.

Exploratory data analysis on the restaurant distribution in city center area of Dusseldorf

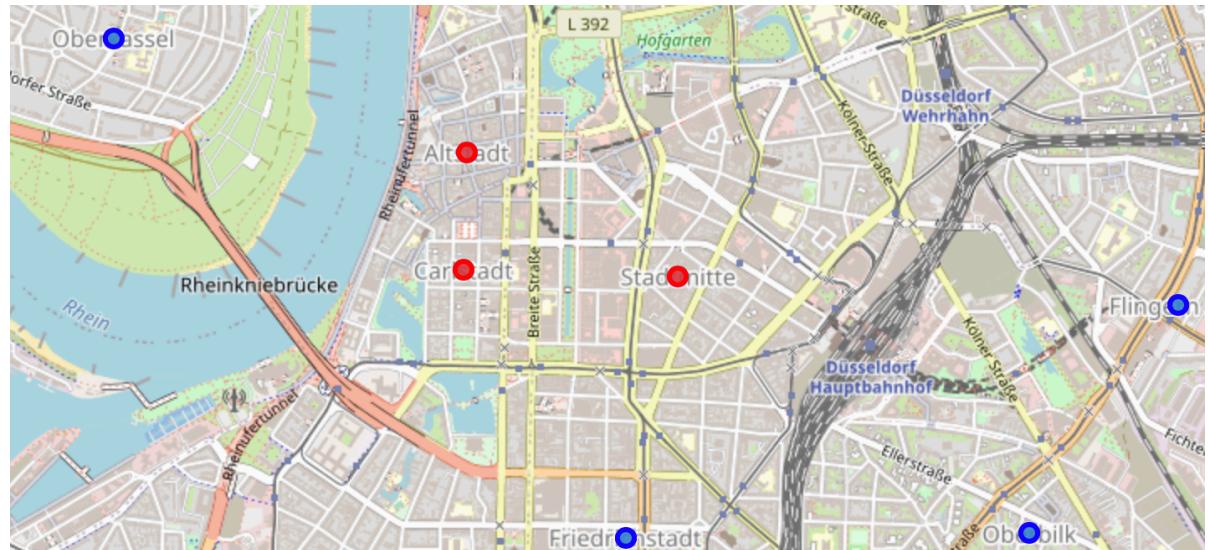
The information of all the restaurant of city center area is obtained by querying Foursquare location data. The name, category and geographical data of each restaurant are extracted and put into a data frame. Then we should regroup some categories. For example, Ramen, Sushi and Soba are belong to Japanese cuisine. Therefore, the categories of ‘Ramen Restaurant’, ‘Sushi Restaurant’ and ‘Soba Restaurant’ were renamed as ‘Japanese Restaurant’. In addition, the category ‘Café’ is renamed as ‘Coffee Shop’. Next, group the restaurants by its category and count the number of each category. The rank of restaurant category is then obtained. Since we are interested in the Japanese restaurants, a data frame of Japanese restaurants, including name and geographical coordinate, was generated. By using Folium, all the Japanese restaurants are then marked on the city center area. Therefore, we can get the distribution of Japanese restaurants in the city center area of Dusseldorf. Similarly, the other 2 top ranking categories of restaurants are also marked on the map. In addition, for each Japanese restaurant, the street where it locates is obtained by passing the geographical information to Nominatim. Then grouping the Japanese restaurants by the street name gives the number of Japanese restaurants on each street.

Results

Fig.1a shows the map of Dusseldorf with the 50 marked city parts. The city center area, where we want to open a Japanese restaurant, consists of 3 city parts, 'Altstadt', 'Carlstadt' and 'Stadtmitte'. These 3 city parts are marked by red. By zooming in, we can see the city center area more clearly.



(a)



(b)

Figure 1: a) The map of city Dusseldorf with 50 marked city parts. The city center area consists of 3 city parts: Altstadt', 'Carlstadt' and 'Stadtmitte', which are marked by red; b) Zoomed into the city center area.

After running the Foursquare query, extracting and cleaning data, it was found that there are 204 restaurants in the city center area. The numbers of different restaurant categories in the city center area are shown in Fig.2. It is shown that Japanese restaurant (27), Italian restaurant (22) and Coffee shop (21) are the top 3 restaurant categories in the city center area. The 27 Japanese restaurants are then marked on the city center area by blue circle (Fig. 3). In addition, 22 Italian restaurants (red circle) and 21 Coffee shops (green circle) are also marked on the map (Fig. 3). The 27 Japanese restaurants are then grouped by the street where they locate. As shown in Fig.4, Immermann street has the highest number of Japanese restaurants, which is 7.

The numbers of different restaurant categories in the city center area

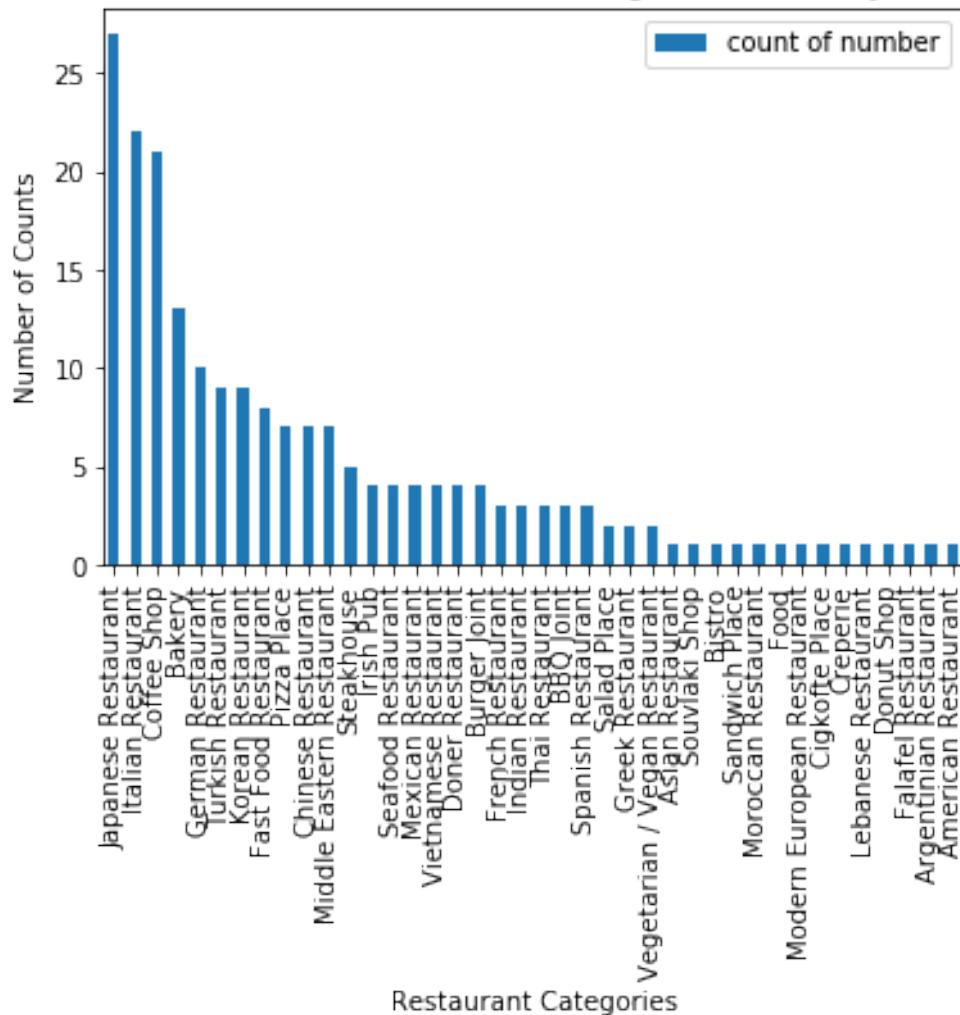


Figure 2: The numbers of different restaurant categories in the city center area of Dusseldorf.

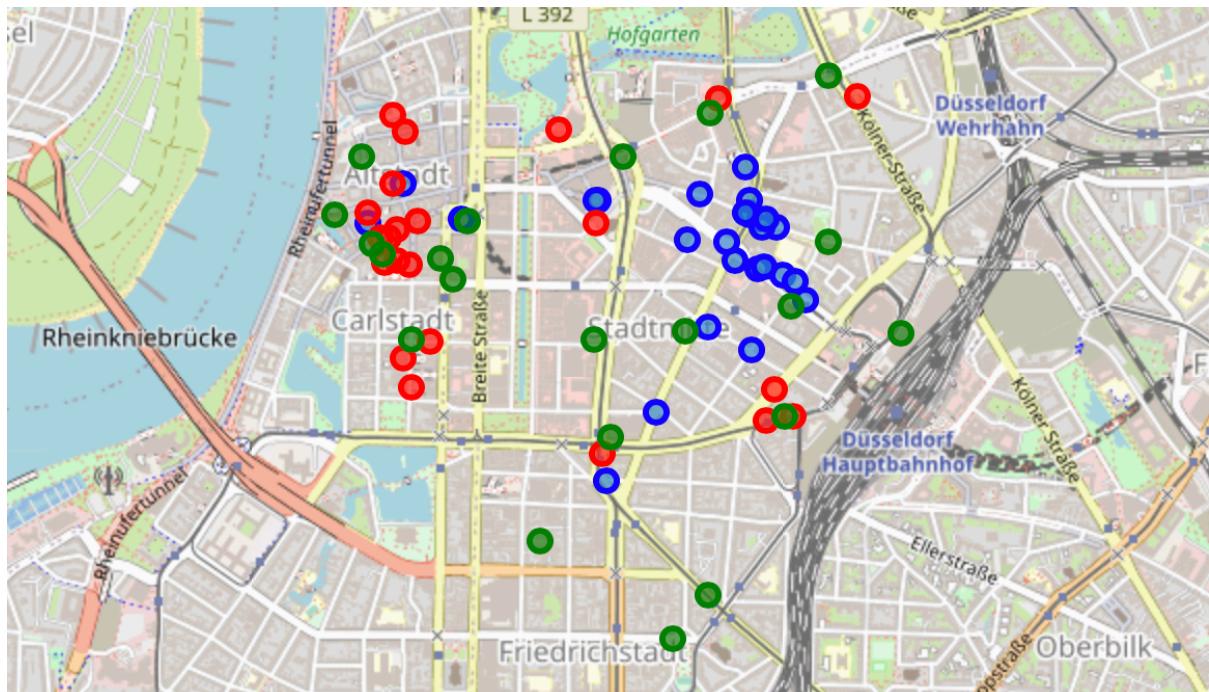


Figure 3: The distribution of Japanese restaurants (blue circle), Italian restaurants (red circle) and Coffee shops (green circle) in the city center area of Dusseldorf.

The numbers of Japanese restaurants on the different streets in the city center area

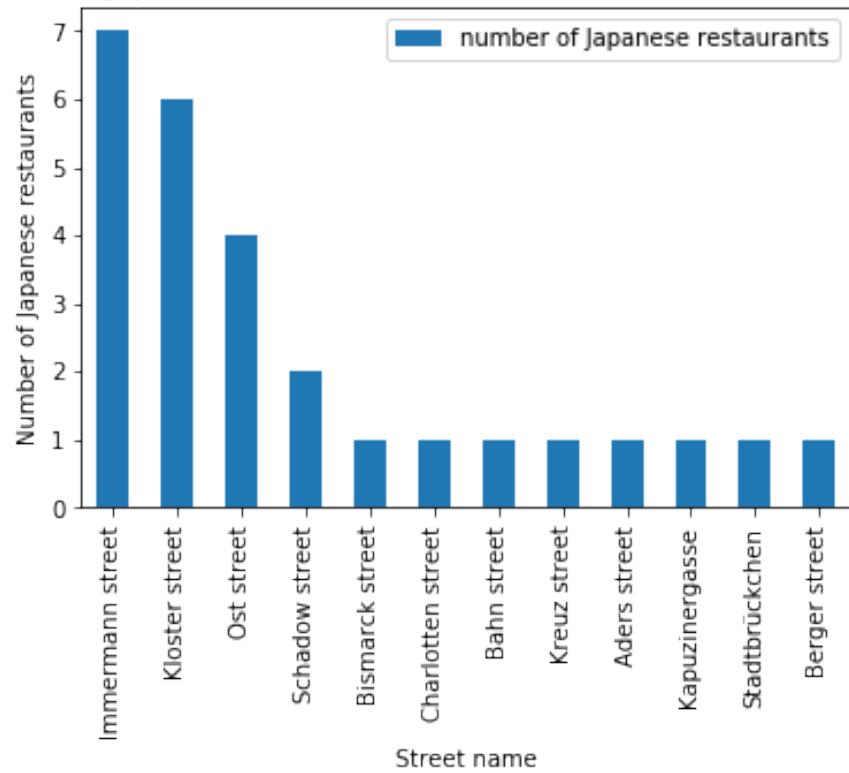


Figure 4: The numbers of Japanese restaurants on the different streets in the city center area.

Discussion

Among the 204 restaurants in the city center area of Dusseldorf, Japanese restaurant, Italian restaurant and coffee shop are the top 3 restaurant categories, which accounts for respectively 13.23%, 10.78% and 10.29% of the total amount. As shown in Fig. 3, the Japanese restaurants (blue circle) mainly distribute in the city part ‘Stadtmitte’, while, the Italian restaurants (red circle) mainly distribute in the city part ‘Altstadt’ and ‘Carlstadt’. Compared to Japanese restaurants and Italian restaurants, the distribution of coffee shop (green circle) in the city center area is more uniform. Based on the Fig. 4, the majority (17/27) of Japanese restaurants locate at Immermann street (7), Kloster street (6) and Ost street (4). It might due to that the Japanese consulate is at the Immermann street. Additionally, Kloster street and Ost street is near the Immermann street. There are many Japanese living in this area. Therefore, an appropriate place to open a Japanese restaurant is in the city part ‘Stadtmitte’. And it is better on Immermann street or Kloster street or Ost street and close to other Japanese restaurants. Because if people want to have Japanese cuisine, at high probability they will go to Immermann street or Kloster street or Ost street.

Conclusions

- There are 204 restaurants in the city center area of Dusseldorf.
- Japanese restaurant (27), Italian restaurant (22) and coffee shop (21) are the top 3 restaurant categories in the city center area of Dusseldorf.
- The Japanese restaurants (blue circle) mainly distribute in the city part ‘Stadtmitte’.
- In the city part ‘Stadtmitte’, 7 Japanese restaurants are at Immermann street, 6 Japanese restaurants are at Kloster street and 4 Japanese restaurants are at Ost street, which compose a cluster of Japanese restaurants.
- An appropriate place to open a Japanese restaurant is in the city part ‘Stadtmitte’, on Immermann street or Kloster street or Ost street and it is better to close to other Japanese restaurants.