

Capstone Project - The Battle of Neighborhoods

Introducing new bicycle parking locations

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1 Introduction Section :

[1] Düsseldorf is a city on the River Rhine in western Germany and is the capital city of the state of North Rhine-Westphalia. It is one of the economic centers of the country, and a major city within the Rhine-Ruhr metropolitan area, with a population of almost 600,000. The capital of North Rhine-Westphalia Germany, Düsseldorf is a regional economic powerhouse straddling the banks of the Rhine River. Altstadt is Düsseldorf's lovely old town.

1.1 Discussion and background

[2] Düsseldorf is connected to some national and international cycling paths, including EV15 The Rhine Cycle Route. The city of Düsseldorf is a member of the German North Rhine-Westphalia District, Municipality and City Friends of Pedestrians and Cyclists Working Group, who bestowed upon Düsseldorf the title of "Friend of Cyclists City" in 2007, although the city still has a few gaps in the network of cycle paths in the eyes of many of its citizens.

1.2 Problem to be resolved

City have some official bicycle parking spots but most all of them are located on railway station. Can we endorse a location in Düsseldorf to open a new bicycle parking?. New bicycle parking spot will motivate people to go shopping or hangout on bicycles which can reduce the traffic and car parking problem in the city.

1.3 Targeted audience

The report is aimed primarily at those involved in city planning, sports clubs and students learning data science.

2 Data Section:

2.1 Required data

We are going to predict a new bicycle parking location, so a list of existing bicycle location will a perfect point to start. We will need a list of coordinates where currently existing parking are located. For the sake of simplicity we will ignore the number of parking spaces assigned to each bicycle parking place. Also we will only consider bicycle parking which are official assigned from the city. A list of all the zip codes in the city which will be use to gather and cluster the bicycle friendly businesses from each neighbourhood. The other list we need is the number and type of businesses and avenue located around these existing parking places. Average distance of bicycle parking from avenues can be calculated later.

2.2 Data sources

A variety of publicly open data about the city of Düsseldorf is available on the city website. We will be using <https://opendata.duesseldorf.de/node/40945/download>, where a list of all bicycle parking locations with latitudes and longitudes are available as csv file. This data is maintained by the city itself

	LATITUDE	LONGITUDE	Name	PLZ
0	51.195687	6.768617	Aachener Straße - Aachener Platz	40223
1	51.241592	6.737520	Am Seestern U	40547
2	51.326056	6.775968	An den Kämpfen	40489
3	51.329916	6.782346	Angermund S	40489
4	51.328519	6.779024	Auf der Krone	40489
...
70	51.209476	6.793592	Volksgarten S	40227
71	51.229640	6.797494	Wehrhahn S	40211
72	51.193260	6.815090	Werstener Dorfstraße	40591
73	51.318502	6.745620	Wittlaer U	40489
74	51.236378	6.797515	Zoo S	40237

75 rows × 4 columns

from the record we can see there are 75 official bicycle parkings in the city.

We can get a json file about geo data from the following link. This geojson will be use to locate draw the boundaries of around every district and give district every district a u

<https://opendata.duesseldorf.de/node/42155/download>

3 Methodology

In this venture we will coordinate our endeavors on distinguishing territories of Düsseldorf that have bicycle friendly venues, especially those with low number bicycle parking. We will constrain our investigation to territory around any given parking place. In initial step we have gathered the necessary information: area and type of each existing parking inside from Düsseldorf focus bike+ride places. We have additionally distinguished bicycle friendly businesses (as indicated by Foursquare classification). Second step in our investigation will be figuring and investigation of 'bicycle friendly business density' across various territories of Düsseldorf - we will utilize maps to distinguish a couple of promising zones near focus with low number of eateries all in all (and no parking in region) and concentrate on those zones.

3.1 Analysis

In order to get the first impression, we will initialize our analysis by plotting the existing bicycle parking places on a map. For this project we are using folium library to plot the parking coordinates on the map.

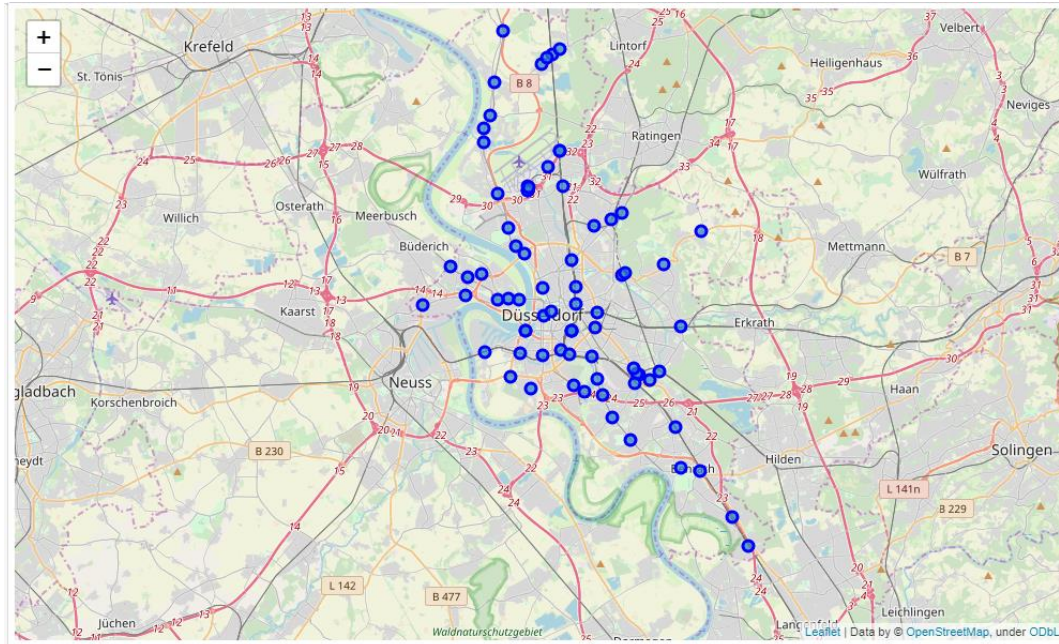


Fig.1 Locations of all bicycle parking stands in the city of Düsseldorf

Next, we are going to start utilizing the Foursquare API to explore the neighborhoods and segment them. Define Foursquare Credentials and Version. Table below shows how many venues were returned for each parking spot.

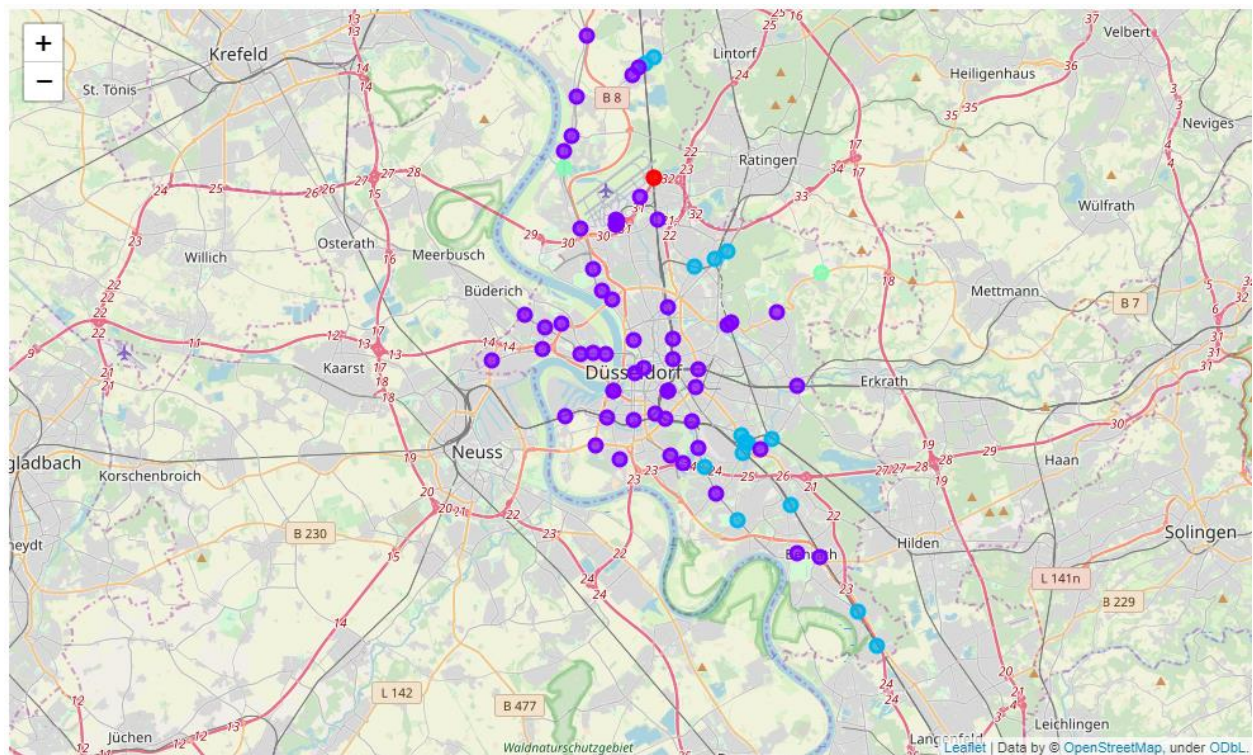
ParkingName	Parking Latitude	Parking Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Aachener Straße - Aachener Platz	21	21	21	21	21	21
Am Seestern U	17	17	17	17	17	17
An den Kämpen	2	2	2	2	2	2
Angermund S	6	6	6	6	6	6
Auf der Krone	5	5	5	5	5	5
...
Völklinger Straße S	33	33	33	33	33	33
Wehrhahn S	34	34	34	34	34	34
Werstener Dorfstraße	6	6	6	6	6	6
Wittlaer U	5	5	5	5	5	5
Zoo S	40	40	40	40	40	40

72 rows x 6 columns

	ParkingName	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	Aachener Straße - Aachener Platz	Supermarket	Greek Restaurant	Skate Park	Soccer Field	Tram Station	Ice Cream Shop	Park	Financial or Legal Service	Flea Market	Beach
1	Am Seestern U	Hotel	German Restaurant	Italian Restaurant	Gym / Fitness Center	Bus Stop	Chinese Restaurant	Gastropub	Bakery	Ramen Restaurant	Japanese Restaurant
2	An den Kämpen	Business Service	Bus Stop	Zoo Exhibit	Food & Drink Shop	Flower Shop	Flea Market	Financial or Legal Service	Fast Food Restaurant	Farmers Market	Falafel Restaurant
3	Angermund S	Supermarket	Bakery	Pizza Place	Restaurant	Light Rail Station	Zoo Exhibit	Flower Shop	Flea Market	Financial or Legal Service	Fast Food Restaurant
4	Auf der Krone	Light Rail Station	Restaurant	Bed & Breakfast	Bus Stop	Bar	Electronics Store	Food & Drink Shop	Flower Shop	Flea Market	Financial or Legal Service

3.2 Clustering

Run k-means to cluster the parkings into 5 clusters.



We are considering the most bicycle friendly areas where venues like supermarket, bakery, playground etc. are located. Most bicycle friendly cluster is shown in the table below.

	Name	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
3	Angermund S	Supermarket	Bakery	Pizza Place	Restaurant	Light Rail Station	Zoo Exhibit	Flower Shop	Flea Market	Financial or Legal Service	Fast Food Restaurant
14	Eller Mitte	Supermarket	Drugstore	Light Rail Station	Bakery	Pizza Place	Brewery	Shoe Store	Metro Station	Zoo Exhibit	Flea Market
15	Eller Mitte S	Supermarket	Drugstore	Light Rail Station	Bakery	Pizza Place	Brewery	Shoe Store	Metro Station	Zoo Exhibit	Flea Market
16	Eller S	Light Rail Station	Mini Golf	Garden	Supermarket	Zoo Exhibit	Flower Shop	Flea Market	Financial or Legal Service	Fast Food Restaurant	Farmers Market
17	Eller Süd S	Light Rail Station	Bakery	Shoe Store	Metro Station	Supermarket	Drugstore	Zoo Exhibit	Flower Shop	Flea Market	Financial or Legal Service
27	Garath S	Supermarket	Light Rail Station	Pizza Place	Pharmacy	Outlet Mall	Zoo Exhibit	Flea Market	Financial or Legal Service	Fast Food Restaurant	Farmers Market
33	Hellerhof S	Supermarket	Light Rail Station	Bakery	Zoo Exhibit	Food & Drink Shop	Flower Shop	Flea Market	Financial or Legal Service	Fast Food Restaurant	Farmers Market
34	Holthausen	Supermarket	Drugstore	Hotel	Middle Eastern Restaurant	Duty-free Shop	Food & Drink Shop	Flower Shop	Flea Market	Financial or Legal Service	Fast Food Restaurant
36	Im Großen Winkel	Supermarket	Bakery	Pizza Place	Restaurant	Light Rail Station	Zoo Exhibit	Flower Shop	Flea Market	Financial or Legal Service	Fast Food Restaurant
37	Jägerstaße U	Supermarket	Metro Station	Drugstore	Light Rail Station	Food & Drink Shop	Zoo Exhibit	Flower Shop	Flea Market	Financial or Legal Service	Fast Food Restaurant
51	Oberrath	German Restaurant	Soccer Field	Playground	Tram Station	Supermarket	Light Rail Station	Drugstore	Flea Market	Financial or Legal Service	Fast Food Restaurant
58	Rath S	Pizza Place	Tram Station	Supermarket	Drugstore	Bakery	Soccer Field	Turkish Restaurant	Light Rail Station	German Restaurant	Flea Market



4. Discussion

Our investigation shows that in spite of the fact that there is an incredible number of bicycle parking in Düsseldorf, there are pockets of low parking thickness genuinely near downtown area (Werstener Dorfstrasse). Most noteworthy centralization of parkings was distinguished north and west from the city

5. Results

As shown in the figure above a new bike parking station between 'Werstener Dorfstrasse' and 'Elle r Süd' may provide an efficient bicycle parking place for the for the riders. This new parking place will tightly couple the bicycle friendly parking cluster (cluster 2).

6 Conclusion

In this report for the sake of simplicity and learning we have taken a very simple approach to find a new location for the parking. For further optimization we can consider the distance between city center and the parking spaces and add it to our dataset to have a even better clustering.

Further more boundaries of the city districts can be user in relation to bicycle friendly areas to create a heat map of the city. Such a heat map can provide a better understanding of the unfilled gaps of parking between different districts

references

1. <https://en.wikipedia.org/wiki/D%C3%BCsseldorf>
2. <https://en.wikivoyage.org/wiki/D%C3%BCsseldorf>