



Predicting a suitable Neighborhood for a Hotel using Foursquare data

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Introduction



A hotel owner in "Stuyvesant Town" in Manhattan, NY would like to open a new Hotel in the German City of Düsseldorf and would like to know which neighborhood in Düsseldorf would be most similar to "Stuyvesant Town" based on the most common venues.

The task is to identify which neighborhood in Düsseldorf is most similar to Stuyvesant Town and make the recommendation for the potential location of the hotel in Düsseldorf.

The Data



There is plenty of data available online but we will be using the official data provided by the city's official website "<https://opendata.duesseldorf.de/>" for location and neighborhood information. We will also be exploring the the venues in target neighborhoods using the Foursquare services. ,

The client has also provided a reference venue data for "Stuyvesant Town" on which the analysis should be based.

Neighborhood	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
Stuyvesant Town	Park	Harbor / Marina	Cocktail Bar	Baseball Field	Bar	Gym / Fitness Center	Heliport	Bistro	Farmers Market	Boat or Ferry

Exploring the Data

The raw data looks as following

The Düsseldorf City Data

	Stadtteil; Stadtteilnummer; Stadtbezirksnummer
0	Altstadt;011;1
1	Angermund;055;5
2	Benrath;095;9
3	Bilk;036;3
4	Carlstadt;012;1

The Foursquare Data

```
{
  'meta': {
    'code': 200,
    'requestId': '5f96b0c908bd407f2d4310d1'
  },
  'response': {
    'suggestedFilters': {
      'header': 'Tap to show:',
      'filters': [
        {
          'name': 'Open now',
          'key': 'openNow'
        }
      ]
    },
    'headerLocation': 'Altstadt',
    'headerFullLocation': 'Altstadt, Düsseldorf',
    'headerLocationGranularity': 'neighborhood',
    'totalResults': 188,
    'suggestedBounds': {
      'ne': {
        'lat': 51.2299018045,
        'lng': 6.7834858252
      },
      'sw': {
        'lat': 51.2209017955,
        'lng': 6.769141574778134
      }
    },
    'groups': [
      {
        'type': 'Recommended Places',
        'name': 'recommended',
        'items': [
          {
            'reasons': {
              'count': 0,
              'items': [
                {
                  'summary': 'This spot is popular',

```

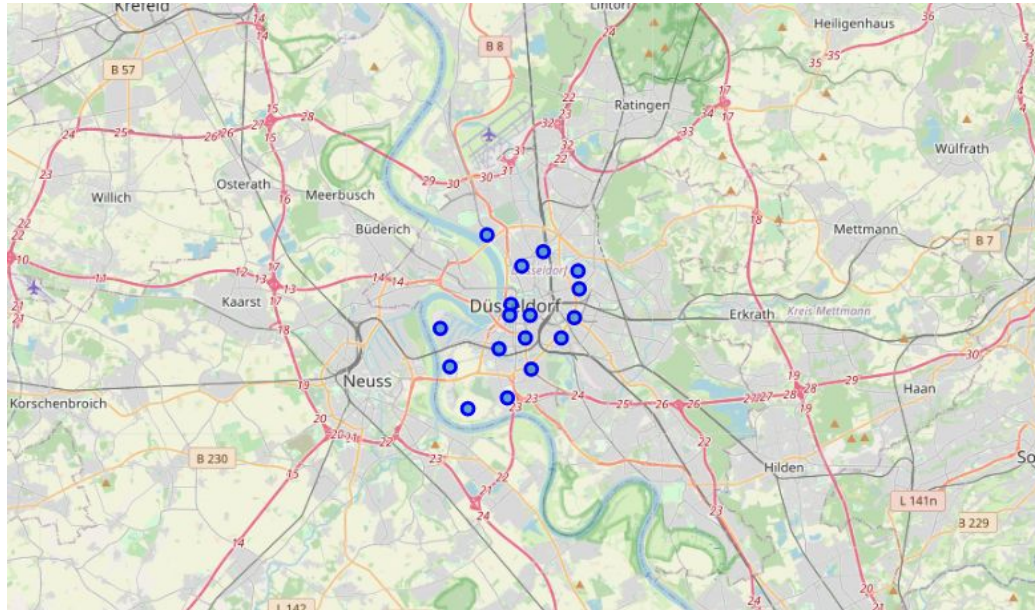
Data wrangling and cleaning

After cleaning, wrangling and merging the data from both data sources into a dataframe, the data looks as following

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Altstadt	51.225912	6.773567	Casita Mexicana	51.226676	6.775478	Mexican Restaurant
1	Altstadt	51.225912	6.773567	Rösterei VIER	51.224536	6.773703	Coffee Shop
2	Altstadt	51.225912	6.773567	Rösterei VIER	51.225940	6.772294	Coffee Shop
3	Altstadt	51.225912	6.773567	Elephant Bar	51.226851	6.772636	Cocktail Bar
4	Altstadt	51.225912	6.773567	Bar Chérie	51.226886	6.772424	Bar

Data visualization

The labels represent all the target neighborhoods for our analysis. Please note that only the neighborhoods that are in Düsseldorf City Center are considered and not suburbs.



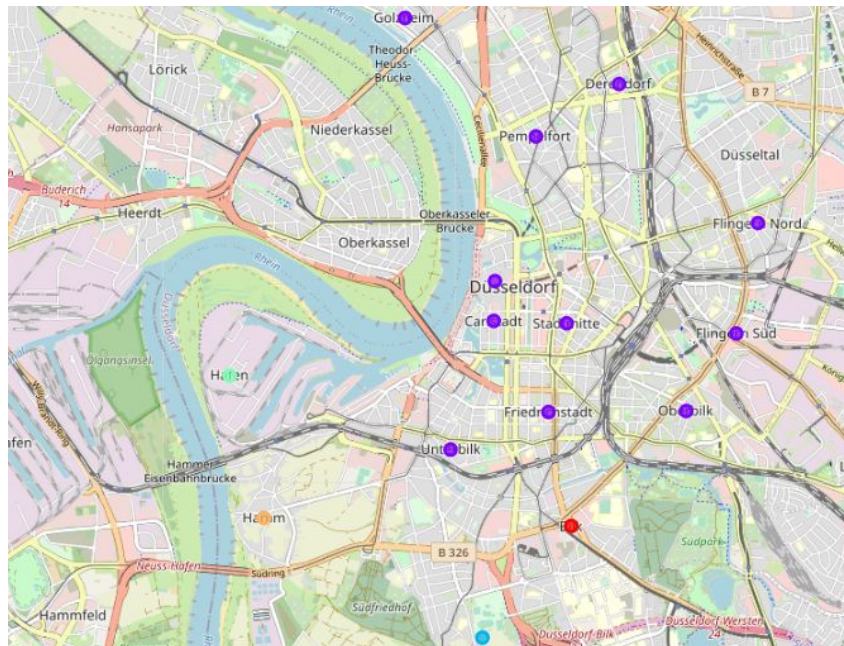
Data Analysis

After analysing the data based on the most common places in each of target neighborhoods we can put all the neighborhoods in one data frame that is similar to the reference data provided by the client.

	Neighborhood	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	Altstadt	Café	Plaza	Brewery	Coffee Shop	Bar	Italian Restaurant	Steakhouse	Boutique	Ice Cream Shop	German Restaurant
1	Bilk	Tram Station	Hotel	Bakery	Greek Restaurant	Doner Restaurant	Shipping Store	Costume Shop	Café	Supermarket	Italian Restaurant
2	Carlstadt	Italian Restaurant	Coffee Shop	Boutique	Café	Clothing Store	Plaza	Ice Cream Shop	German Restaurant	Bakery	Brewery
3	Derendorf	Liquor Store	Supermarket	Restaurant	Colombian Restaurant	Shipping Store	Gym / Fitness Center	Juice Bar	Kids Store	German Restaurant	Gastropub
4	Flehe	Soccer Field	Skate Park	Tram Station	Gym	Park	Bakery	Drugstore	Doner Restaurant	Electronics Store	Dive Bar

Modeling and Clustering the Data

We run k-means algorithm on the resulting data frame to cluster the neighborhoods into 5 different clusters based on venue category type. The 5 different clusters are labeled on the map in purple, green, orange, red and blue



Examining the results

Cluster 0

	Neighborhood	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
1	Bilk	Tram Station	Hotel	Bakery	Greek Restaurant	Doner Restaurant	Shipping Store	Costume Shop	Café	Supermarket	Italian Restaurant

Cluster 2

	Neighborhood	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	Flehe	Soccer Field	Skate Park	Tram Station	Gym	Park	Bakery	Drugstore	Doner Restaurant	Electronics Store	Dive Bar

Examining the results

Cluster 3

	Neighborhood	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
9	Hafen	Scenic Lookout	Boat or Ferry	River	Yoga Studio	Fried Chicken Joint	French Restaurant	Fountain	Food	Fast Food Restaurant	Farmers Market

Cluster 4

	Neighborhood	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
10	Hamm	Beach	Café	Gastropub	Garden	German Restaurant	Greek Restaurant	Bank	Hotel	Restaurant	Drugstore

Examining the results

Cluster 1

	Neighborhood	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	Altstadt	Café	Plaza	Brewery	Coffee Shop	Bar	Italian Restaurant	Steakhouse	Boutique	Ice Cream Shop	German Restaurant
2	Carlstadt	Italian Restaurant	Coffee Shop	Boutique	Café	Clothing Store	Plaza	Ice Cream Shop	German Restaurant	Bakery	Brewery
3	Derendorf	Liquor Store	Supermarket	Restaurant	Colombian Restaurant	Shipping Store	Gym / Fitness Center	Juice Bar	Kids Store	German Restaurant	Gastropub
5	Flingern Nord	Café	Asian Restaurant	Bakery	Pizza Place	Greek Restaurant	Italian Restaurant	Vietnamese Restaurant	Hotel	German Restaurant	Office
6	Flingern Süd	Hotel	Portuguese Restaurant	Electronics Store	Greek Restaurant	Italian Restaurant	Gourmet Shop	Doner Restaurant	Music Venue	Rock Club	Chinese Restaurant
7	Friedrichstadt	Hotel	Café	Vietnamese Restaurant	Bakery	Pizza Place	Bar	Italian Restaurant	Pub	Miscellaneous Shop	Middle Eastern Restaurant
8	Golzheim	Italian Restaurant	Bakery	Café	Metro Station	Salad Place	Fast Food Restaurant	Steakhouse	Supermarket	Beach	Modern European Restaurant
11	Oberbilk	Hotel	Bar	Hookah Bar	Korean Restaurant	Massage Studio	Metro Station	Mobile Phone Shop	Drugstore	Doner Restaurant	Comfort Food Restaurant
12	Pempelfort	Italian Restaurant	Café	Ice Cream Shop	Bakery	Hotel	Drugstore	Supermarket	Restaurant	Trattoria/Osteria	Vietnamese Restaurant
13	Stadtmitte	Japanese Restaurant	Korean Restaurant	Café	Hotel	Ramen Restaurant	Italian Restaurant	Coffee Shop	Grocery Store	Shopping Mall	Sushi Restaurant
14	Unterbilk	Café	Italian Restaurant	Restaurant	Ice Cream Shop	Pizza Place	Coffee Shop	Deli / Bodega	Dive Bar	Pub	Plaza

Conclusion



Neighborhood	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
Stuyvesant Town	Park	Harbor / Marina	Cocktail Bar	Baseball Field	Bar	Gym / Fitness Center	Heliport	Bistro	Farmers Market	Boat or Ferry

Looking at the reference Data we can quickly dismiss cluster 1 which happens to be the largest cluster with the most venues. It is packed with restaurants, cafes and bars which is not the kind of neighborhood we are looking for.

Comparing the reference data to the remaining clusters we can recommend the most suitable location to be in Cluster 3 which is neighborhood "Hafen" which means „harbor“ in german. Stuyvesant and Hafen are similar neighborhoods since they are both on the river side, have harbors/boat/ferries, they contain public recreational venues like Fountains and Parks and they both have a farmer's market as one of the most frequent venue categories. In addition to the similarities it is worth noting that "Hafen" does not have hotels which minimizes potential competition and has few restaurants which is beneficial for the hotel's restaurant.

The second choice would be Cluster 4 or neighborhood "Hamm" which is adjacent to "Hafen" and has similar attributes.