# LOCATION ANALYSIS FOR AN ITALIAN RESTAURANT IN HAMBURG

CAPSTONE PROJECT - FINAL ASSIGNMENT

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# THE BUSINESS PROBLEM

- A customer of our data science consultancy wants to open an Italian restaurant in the inner city of Hamburg and wants to know in which borough - Altstadt, Neustadt or HafenCity

# THE MAIN DATA

- Demographic data from the official statistic office in Northern Germany (amount of residents, age, income and so on)
- Foursquare API for venues in the near, especially other restaurants

# THE METHODOLOGY

- Obtaining demographic data and intense explorative data analysis concerning the main criteria residents, age and income
- Obtaining venues via the Foursquare API and analyzing them concerning type, amount, vicinity
- Clustering the boroughs via k-Means
- Defining new key performance indicators on basis of the analyzed and pre processed data (for example restaurants per resident)
- → Giving a recommendation on basis of the work for the optimal borough

# INTERMEDIATE DATA 1

- Obtained data from the statistical office with 67 columns, which had to be reduced and properly analyzed.:

```
In [3]: df.head(5)
```

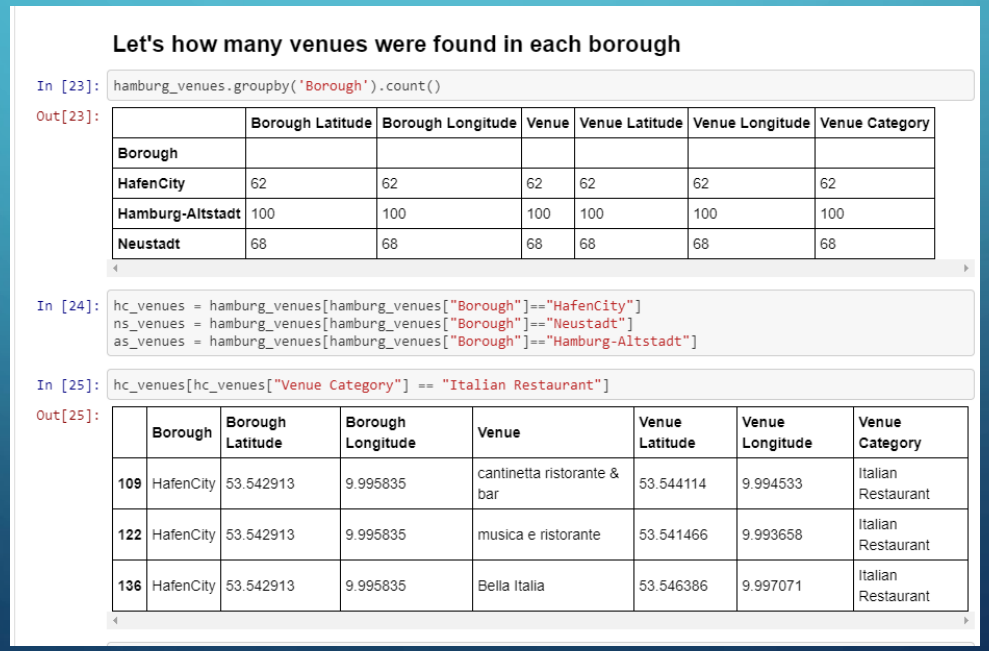
Out[3]:

| | Unnamed: 0 | Anzahl der Einwohnerinnen und Einwohner | Anzahl der Kinder und Jugendlichen unter 18 Jahren | Anteil Kinder und Jugendlicher unter 18 Jahren an der Gesamt-bevölkerung | Anzahl älterer Einwohnerinnen und Einwohner über 64 Jahren | Anteil älterer Einwohnerinnen und Einwohner über 64 Jahren an der Gesamt-bevölkerung | Anzahl ausländischer Einwohnerinnen und Einwohner | Anteil ausländis Einwohn und Einw an der Ge bevölker |
|---|---|---|---|---|---|---|---|---|
| 0 | Hamburg-Altstadt | 2305 | 277 | 12.017354 | 256 | 11.106291 | 506 | 21.95227 |
| 1 | HafenCity | 3627 | 756 | 20.843672 | 333 | 9.181141 | 1168 | 32.20292 |
| 2 | Neustadt | 12719 | 1456 | 11.447441 | 1836 | 14.435097 | 2580 | 20.28461 |
| 3 | St. Pauli | 22501 | 2991 | 13.292743 | 2150 | 9.555131 | 4880 | 21.68792 |
| 4 | St. Georg | 11055 | 1108 | 10.022614 | 1397 | 12.636816 | 2552 | 23.08457 |

5 rows × 67 columns

# INTERMEDIATE DATA 2

- Obtaining the needed data about venues / restaurants from Foursquare (here as an example for all venues in the boroughs and then each borough divided into restaurants in general and Italian restaurants:



**Let's how many venues were found in each borough**

In [23]:
```
hamburg_venues.groupby('Borough').count()
```

Out[23]:

| | Borough Latitude | Borough Longitude | Venue | Venue Latitude | Venue Longitude | Venue Category |
|---|---|---|---|---|---|---|
| **Borough** | | | | | | |
| **HafenCity** | 62 | 62 | 62 | 62 | 62 | 62 |
| **Hamburg-Altstadt** | 100 | 100 | 100 | 100 | 100 | 100 |
| **Neustadt** | 68 | 68 | 68 | 68 | 68 | 68 |

In [24]:
```
hc_venues = hamburg_venues[hamburg_venues["Borough"]=="HafenCity"]
ns_venues = hamburg_venues[hamburg_venues["Borough"]=="Neustadt"]
as_venues = hamburg_venues[hamburg_venues["Borough"]=="Hamburg-Altstadt"]
```

In [25]:
```
hc_venues[hc_venues["Venue Category"] == "Italian Restaurant"]
```

Out[25]:

| | Borough | Borough Latitude | Borough Longitude | Venue | Venue Latitude | Venue Longitude | Venue Category |
|---|---|---|---|---|---|---|---|
| **109** | HafenCity | 53.542913 | 9.995835 | cantinetta ristorante & bar | 53.544114 | 9.994533 | Italian Restaurant |
| **122** | HafenCity | 53.542913 | 9.995835 | musica e ristorante | 53.541466 | 9.993658 | Italian Restaurant |
| **136** | HafenCity | 53.542913 | 9.995835 | Bella Italia | 53.546386 | 9.997071 | Italian Restaurant |

# INTERMEDIATE DATA 3

- Preparing the data for the clustering of the boroughs via k-Means on basis of their venues:

```
In [39]: hamburg_grouped = hamburg_onehot.groupby('Borough').mean().reset_index()
         hamburg_grouped
```

Out[39]:

| | Borough | Art Gallery | Art Museum | Arts & Crafts Store | Asian Restaurant | BBQ Joint | Bakery | Bar | Bavarian Restaurant | Bistro | ... | Tapas Restaurant | Te Rc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | HafenCity | 0.016129 | 0.00 | 0.000000 | 0.048387 | 0.00 | 0.016129 | 0.048387 | 0.016129 | 0.032258 | ... | 0.032258 | 0.0 |
| 1 | Hamburg-Altstadt | 0.000000 | 0.01 | 0.000000 | 0.020000 | 0.01 | 0.010000 | 0.010000 | 0.000000 | 0.000000 | ... | 0.000000 | 0.0 |
| 2 | Neustadt | 0.014706 | 0.00 | 0.014706 | 0.000000 | 0.00 | 0.014706 | 0.000000 | 0.000000 | 0.000000 | ... | 0.000000 | 0.0 |

3 rows × 102 columns

# RESULTS

- On basis of the explorative analysis, inferentiell statistics work and clustering I can recommend to open the restaurant in the borough Neustadt.

| | Borough | Yearly Income | Adults | Longitude | Latitude | Italian Restaurants | Restaurants | Restaurants per Resident | Summed income per Restaurant | Cluster |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Hamburg-Altstadt | 31336 | 1772 | 9.994640 | 53.550468 | 4 | 28 | 0.015801 | 1983121.14 | 1 |
| 1 | HafenCity | 93206 | 2538 | 9.995835 | 53.542913 | 3 | 23 | 0.009062 | 10285079.48 | 0 |
| 2 | Neustadt | 34521 | 9427 | 9.979048 | 53.549881 | 5 | 29 | 0.003076 | 11221705.76 | 1 |

- It has the best ratios of income, age and venues / potential customers.
- Now – good luck for the founding and opening of the restaurant! ☺