

Where to invest in Vienna: Real Estate Market

1. Description of the problem and discussion of the background

Vienna has been announced the most liveable city in the world by the Mercer Study ten times in a row, the prices for real estate are still relatively low (despite a strong increase in prices in the last years) compared to other big cities in Europe like Hamburg or Munich, the city's population is growing, the job market situation is very good and the interest rates for loans are extremely low in Europe.

But where in Vienna could you invest? As someone who might want to buy an apartment in Vienna it might be interesting to get an idea about the different boroughs in Vienna (there are 23 boroughs in Vienna), the average prices of apartments there and the venues offered (depending on how much someone is willing to pay per m² and what opportunities he or she wants to have near the apartment he might get an idea which borough could be interesting).

2. Description of the data / how it will be used to solve the problem

The following data sources will be used for the analysis:

- The boroughs of Vienna with the postal codes are drawn the following website: <https://www.vienna.at/features/bezirke-wien>
- The latitude and longitude of the boroughs are drawn from the geocoder package (using the provider ArcGIS).
- The latitude and longitude of Vienna is drawn from the Nominatim geocoder.
- Json File
from https://github.com/codeforamerica/click_that_hood/blob/master/public/data/vienna.geojson?short_path=91a4361 for a chorography of the boroughs of Vienna
- As there seems to be no actual official statistics publicly available (e.g. from Statistics Austria or Oesterreichische Nationalbank) on the average prices of apartments in Vienna per

borough I will use the price data of a site where a lot of apartments are advertised

(<https://derstandard.at/Immopreise/Wien/Wohnung/Eigentum>). The average price will be used as one variable in the analysis.

- Foursquare will be used to get an idea of the venues offered nearby (in the different boroughs).

3. Methodology

- a. I used webscraping to get the postalcodes and boroughs of Vienna from Vienna.at. After cleaning the dataframe looks like this:

| | Postalcode | Borough |
|---|------------|--------------|
| 0 | 1010 Wien | Innere Stadt |
| 1 | 1020 Wien | Leopoldstadt |
| 2 | 1030 Wien | Landstraße |
| 3 | 1040 Wien | Wieden |
| 4 | 1050 Wien | Margareten |

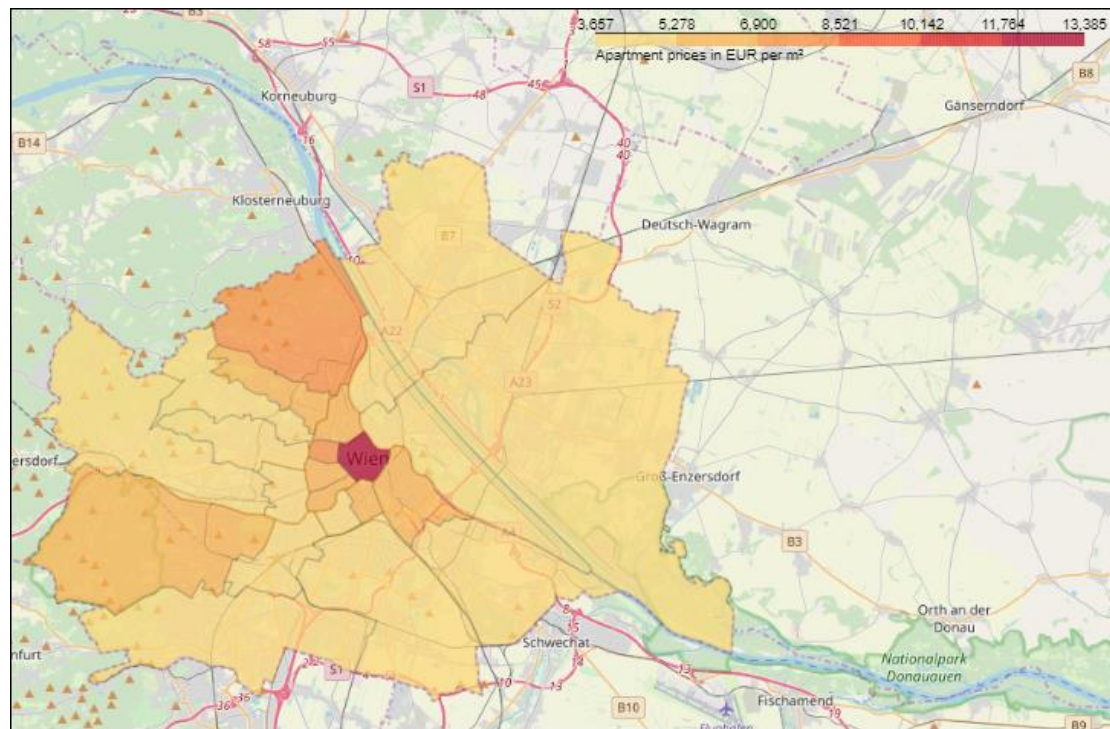
- b. Adding the latitude and longitude coordinates of each borough with the geocoder-Package (using arcgis instead of google as data source) the dataframe looks like this:

| | Postalcode | Borough | Latitude | Longitude |
|---|------------|--------------|-----------|-----------|
| 0 | 1010 | Innere Stadt | 48.209075 | 16.369614 |
| 1 | 1020 | Leopoldstadt | 48.199922 | 16.425665 |
| 2 | 1030 | Landstraße | 48.194205 | 16.395600 |
| 3 | 1040 | Wieden | 48.192589 | 16.370290 |
| 4 | 1050 | Margareten | 48.187915 | 16.353721 |

- c. Adding the average apartment prices per borough (from derstandard.at) the dataframe looks like this:

| | Postalcode | Borough | Latitude | Longitude | EUR-Price |
|---|------------|--------------|-----------|-----------|-----------|
| 0 | 1010 | Innere Stadt | 48.209075 | 16.369614 | 13290 |
| 1 | 1020 | Leopoldstadt | 48.199922 | 16.425665 | 5201 |
| 2 | 1030 | Landstraße | 48.194205 | 16.395600 | 6142 |
| 3 | 1040 | Wieden | 48.192589 | 16.370290 | 6704 |
| 4 | 1050 | Margareten | 48.187915 | 16.353721 | 5098 |

- d. Creating a chorograph of the different boroughs of Vienna with the average apartment prices, you can see that the most expensive boroughs are in the center of Vienna, but apartment prices in Döbling and Hietzing are relatively expensive too.



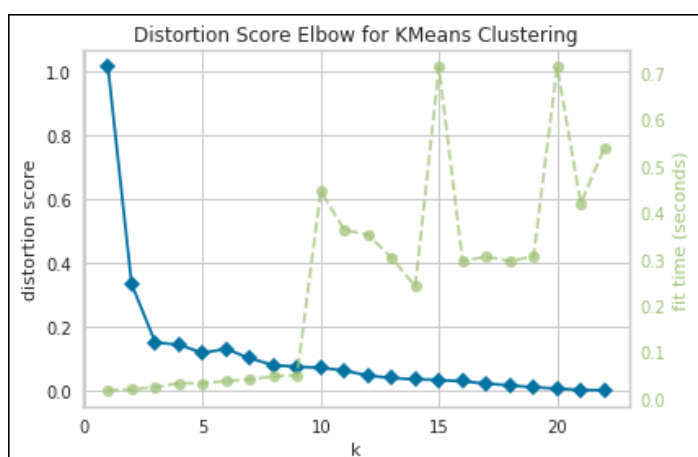
- e. By using a radius of 4000 metres you get enough venues for each borough using the Foursquare API:

| Borough | Borough Latitude | Borough Longitude | Venue | Venue Latitude | Venue Longitude | Venue Category |
|----------------------|------------------|-------------------|-------|----------------|-----------------|----------------|
| Alsergrund | 100 | 100 | 100 | 100 | 100 | 100 |
| Brigittenau | 100 | 100 | 100 | 100 | 100 | 100 |
| Donaustadt | 94 | 94 | 94 | 94 | 94 | 94 |
| Döbling | 100 | 100 | 100 | 100 | 100 | 100 |
| Favoriten | 100 | 100 | 100 | 100 | 100 | 100 |
| Floridsdorf | 100 | 100 | 100 | 100 | 100 | 100 |
| Hernals | 70 | 70 | 70 | 70 | 70 | 70 |
| Hietzing | 90 | 90 | 90 | 90 | 90 | 90 |
| Innere Stadt | 100 | 100 | 100 | 100 | 100 | 100 |
| Josefstadt | 100 | 100 | 100 | 100 | 100 | 100 |
| Landstraße | 100 | 100 | 100 | 100 | 100 | 100 |
| Leopoldstadt | 100 | 100 | 100 | 100 | 100 | 100 |
| Liesing | 100 | 100 | 100 | 100 | 100 | 100 |
| Margareten | 100 | 100 | 100 | 100 | 100 | 100 |
| Mariahilf | 100 | 100 | 100 | 100 | 100 | 100 |
| Meidling | 100 | 100 | 100 | 100 | 100 | 100 |
| Neubau | 100 | 100 | 100 | 100 | 100 | 100 |
| Ottakring | 100 | 100 | 100 | 100 | 100 | 100 |
| Penzing | 47 | 47 | 47 | 47 | 47 | 47 |
| Rudolfsheim-Fünfhaus | 100 | 100 | 100 | 100 | 100 | 100 |
| Simmering | 93 | 93 | 93 | 93 | 93 | 93 |
| Wieden | 100 | 100 | 100 | 100 | 100 | 100 |
| Währing | 100 | 100 | 100 | 100 | 100 | 100 |

- f. One hot encoding and groupby will be used to get a data frame that can be used for k-means clustering and shows the frequency of occurrence of each category of venue per borough:

| | Borough | American Restaurant | Antique Shop | Aquarium | Arcade | Art Gallery | Art Museum | Arts & Crafts Store | Asian Restaurant | Athletics & Sports | Austrian Restaurant | BBQ Joint | Bakery |
|----|----------------------|---------------------|--------------|----------|--------|-------------|------------|---------------------|------------------|--------------------|---------------------|-----------|----------|
| 0 | Alsergrund | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.020000 | 0.000000 | 0.000000 | 0.00 | 0.060000 | 0.000000 | 0.010000 |
| 1 | Brigittenau | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000000 | 0.000000 | 0.010000 | 0.00 | 0.080000 | 0.000000 | 0.000000 |
| 2 | Donaustadt | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000000 | 0.000000 | 0.053191 | 0.00 | 0.021277 | 0.021277 | 0.042553 |
| 3 | Döbling | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.000000 | 0.000000 | 0.020000 | 0.00 | 0.100000 | 0.010000 | 0.020000 |
| 4 | Favoriten | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.010000 | 0.010000 | 0.040000 | 0.01 | 0.070000 | 0.000000 | 0.020000 |
| 5 | Floridsdorf | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000000 | 0.000000 | 0.020000 | 0.01 | 0.020000 | 0.000000 | 0.030000 |
| 6 | Hernals | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000000 | 0.000000 | 0.042857 | 0.00 | 0.057143 | 0.028571 | 0.014286 |
| 7 | Hietzing | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.011111 | 0.000000 | 0.011111 | 0.00 | 0.000000 | 0.000000 | 0.055556 |
| 8 | Innere Stadt | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.030000 | 0.000000 | 0.000000 | 0.00 | 0.060000 | 0.000000 | 0.010000 |
| 9 | Josefstadt | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.030000 | 0.000000 | 0.020000 | 0.00 | 0.030000 | 0.000000 | 0.000000 |
| 10 | Landstraße | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.030000 | 0.000000 | 0.010000 | 0.01 | 0.100000 | 0.000000 | 0.020000 |
| 11 | Leopoldstadt | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.020000 | 0.010000 | 0.020000 | 0.01 | 0.080000 | 0.000000 | 0.020000 |
| 12 | Liesing | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000000 | 0.000000 | 0.020000 | 0.00 | 0.020000 | 0.000000 | 0.000000 |
| 13 | Margareten | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.030000 | 0.000000 | 0.020000 | 0.00 | 0.030000 | 0.000000 | 0.000000 |
| 14 | Mariahilf | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.030000 | 0.000000 | 0.020000 | 0.00 | 0.040000 | 0.000000 | 0.000000 |
| 15 | Meidling | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000000 | 0.000000 | 0.000000 | 0.00 | 0.050000 | 0.000000 | 0.000000 |
| 16 | Neubau | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.030000 | 0.000000 | 0.020000 | 0.00 | 0.040000 | 0.000000 | 0.000000 |
| 17 | Ottakring | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.000000 | 0.000000 | 0.000000 | 0.00 | 0.050000 | 0.010000 | 0.010000 |
| 18 | Penzing | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.021277 | 0.000000 | 0.042553 | 0.00 | 0.042553 | 0.000000 | 0.000000 |
| 19 | Rudolfsheim-Fünfhaus | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.020000 | 0.000000 | 0.020000 | 0.00 | 0.040000 | 0.000000 | 0.010000 |
| 20 | Simmering | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000000 | 0.010753 | 0.010753 | 0.00 | 0.053763 | 0.000000 | 0.010753 |
| 21 | Wieden | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.030000 | 0.000000 | 0.030000 | 0.00 | 0.080000 | 0.000000 | 0.000000 |
| 22 | Währing | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.000000 | 0.000000 | 0.000000 | 0.00 | 0.080000 | 0.010000 | 0.020000 |

- g. The standardized / feature scaled EUR-Price column will be added to the data frame as one column before clustering the data.
- h. Trying to find out how many clusters to build with k-means, the elbow method shows that 3 clusters should be used:



- i. K-Means Clustering (efficient and widely used method for clustering) was finally used to cluster the boroughs using the average apartment prices and the venues nearby as variables.

4. Results

The following data frame the boroughs of Vienna with the assigned cluster labels (created by k-means clustering), the average price of the apartments in each borough and the 10 most common venues in each borough:

| | Postcode | Borough | Latitude | Longitude | EUR-Price | Cluster Labels | 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 | 1010 | Innere Stadt | 48.209075 | 16.369614 | 13290 | 2 | Hotel | Plaza | Restaurant | Café | Austrian Restaurant | Ice Cream Shop | Italian Restaurant | Park | Museum | Art Museum |
| 1 | 1020 | Leopoldstadt | 48.199922 | 16.425665 | 5201 | 0 | Hotel | Austrian Restaurant | Restaurant | Café | Palace | Italian Restaurant | Pizza Place | Museum | Korean Restaurant | Irish Pub |
| 2 | 1030 | Landstraße | 48.194205 | 16.395600 | 6142 | 0 | Hotel | Austrian Restaurant | Café | Restaurant | Palace | Concert Hall | Palace | Italian Restaurant | Art Museum | Steakhouse |
| 3 | 1040 | Wieden | 48.192589 | 16.370290 | 6704 | 0 | Hotel | Plaza | Austrian Restaurant | Palace | Ice Cream Shop | Restaurant | Concert Hall | Café | Art Museum | Asian Restaurant |
| 4 | 1050 | Margareten | 48.187915 | 16.353721 | 5098 | 0 | Hotel | Ice Cream Shop | Plaza | Café | Palace | Restaurant | Art Museum | Austrian Restaurant | Bar | Coffee Shop |
| 5 | 1060 | Mariahilf | 48.195410 | 16.347158 | 5548 | 0 | Hotel | Plaza | Restaurant | Ice Cream Shop | Austrian Restaurant | Café | Concert Hall | Park | Art Museum | Thai Restaurant |
| 6 | 1070 | Neubau | 48.202235 | 16.349052 | 6667 | 0 | Hotel | Café | Plaza | Ice Cream Shop | Austrian Restaurant | Restaurant | Park | Art Museum | Museum | Hotel |
| 7 | 1080 | Josefstadt | 48.210840 | 16.347200 | 7669 | 0 | Café | Hotel | Plaza | Restaurant | Park | Austrian Restaurant | Ice Cream Shop | Coffee Shop | Art Museum | Gastropub |
| 8 | 1090 | Alsergrund | 48.225165 | 16.356308 | 6875 | 1 | Restaurant | Plaza | Austrian Restaurant | Park | Hotel | Café | Ice Cream Shop | Cocktail Bar | Italian Restaurant | Japanese Restaurant |
| 9 | 1100 | Favoriten | 48.153020 | 16.382927 | 3752 | 0 | Hotel | Restaurant | Austrian Restaurant | Café | Asian Restaurant | Supermarket | Park | Grocery Store | Fast Food Restaurant | Gym / Fitness Center |
| 10 | 1110 | Simmering | 48.162720 | 16.452277 | 4106 | 0 | Hotel | Supermarket | Austrian Restaurant | Train Station | Café | Restaurant | Park | Fast Food Restaurant | Concert Hall | Grocery Store |
| 11 | 1120 | Meidling | 48.171990 | 16.328655 | 4468 | 0 | Hotel | Zoo Exhibit | Café | Austrian Restaurant | History Museum | Restaurant | Pub | Park | Pool | Supermarket |
| 12 | 1130 | Hietzing | 48.179570 | 16.254176 | 5587 | 2 | Zoo Exhibit | Restaurant | Supermarket | Park | Bakery | Italian Restaurant | Gym / Fitness Center | Greek Restaurant | Gastropub | Ice Cream Shop |
| 13 | 1140 | Penzing | 48.225750 | 16.230794 | 4732 | 2 | Restaurant | Supermarket | Park | Asian Restaurant | Italian Restaurant | Café | Austrian Restaurant | Scenic Lookout | Shopping Mall | Shoe Store |
| 14 | 1150 | Rudolfshim-Funfhaus | 48.195445 | 16.326433 | 4473 | 0 | Hotel | Ice Cream Shop | Café | History Museum | Austrian Restaurant | Restaurant | Pizza Place | Hotel | Thai Restaurant | Breakfast Spot |
| 15 | 1160 | Ottakring | 48.213815 | 16.305448 | 4723 | 2 | Café | Austrian Restaurant | Restaurant | Park | Hotel | History Museum | Italian Restaurant | Greek Restaurant | Ice Cream Shop | Breakfast Spot |
| 16 | 1170 | Hernals | 48.235265 | 16.285738 | 4780 | 2 | Park | Café | Supermarket | Austrian Restaurant | Restaurant | Asian Restaurant | Gastropub | Italian Restaurant | Scenic Lookout | Plaza |
| 17 | 1180 | Währing | 48.234095 | 16.321634 | 6378 | 0 | Café | Italian Restaurant | Austrian Restaurant | Park | Restaurant | Gastropub | Coffee Shop | Wine Bar | Plaza | Supermarket |
| 18 | 1190 | Döbling | 48.260930 | 16.328358 | 7158 | 2 | Austrian Restaurant | Supermarket | Wine Bar | Restaurant | Italian Restaurant | Park | Gastropub | Café | Scenic Lookout | Gym |
| 19 | 1200 | Brigittenau | 48.240313 | 16.378181 | 4175 | 0 | Restaurant | Austrian Restaurant | Hotel | Park | Café | Cocktail Bar | Coffee Shop | Italian Restaurant | Ice Cream Shop | Pizza Place |
| 20 | 1210 | Floridsdorf | 48.280172 | 16.414040 | 4372 | 0 | Supermarket | Ice Cream Shop | Grocery Store | Pizza Place | Fast Food Restaurant | Restaurant | Gym | Gym / Fitness Center | Furniture / Home Store | Bakery |
| 21 | 1220 | Donaustadt | 48.235382 | 16.489213 | 4811 | 2 | Supermarket | Clothing Store | Asian Restaurant | Electronics Store | Grocery Store | Bus Stop | Bakery | Pizza Place | Gym | Restaurant |
| 22 | 1230 | Liesing | 48.141110 | 16.294063 | 4530 | 0 | Supermarket | Italian Restaurant | Motorcycle Shop | Clothing Store | Hotel | Electronics Store | Ice Cream Shop | Chinese Restaurant | Wine Bar | Grocery Store |

The first cluster is dominated by hotels:

| | Borough | Cluster Labels | EUR-Price | 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 | Leopoldstadt | 0 | 5201 | Hotel | Austrian Restaurant | Restaurant | Café | Palace | Italian Restaurant | Pizza Place | Museum | Korean Restaurant | Irish Pub |
| 2 | Landstraße | 0 | 6142 | Hotel | Austrian Restaurant | Café | Restaurant | Plaza | Concert Hall | Palace | Italian Restaurant | Art Museum | Steakhouse |
| 3 | Wieden | 0 | 6704 | Hotel | Plaza | Austrian Restaurant | Palace | Ice Cream Shop | Restaurant | Concert Hall | Café | Art Museum | Asian Restaurant |
| 4 | Margareten | 0 | 5098 | Hotel | Ice Cream Shop | Plaza | Café | Palace | Restaurant | Art Museum | Austrian Restaurant | Bar | Coffee Shop |
| 5 | Mariahilf | 0 | 5548 | Hotel | Plaza | Restaurant | Ice Cream Shop | Austrian Restaurant | Café | Concert Hall | Park | Art Museum | Thai Restaurant |
| 6 | Neubau | 0 | 6667 | Hotel | Café | Plaza | Ice Cream Shop | Austrian Restaurant | Restaurant | Park | Art Museum | Museum | Hotel |
| 7 | Josefstadt | 0 | 7669 | Café | Hotel | Plaza | Restaurant | Park | Austrian Restaurant | Ice Cream Shop | Coffee Shop | Art Museum | Gastropub |
| 9 | Favoriten | 0 | 3752 | Hotel | Restaurant | Austrian Restaurant | Café | Asian Restaurant | Supermarket | Park | Grocery Store | Fast Food Restaurant | Gym / Fitness Center |
| 10 | Simmering | 0 | 4106 | Hotel | Supermarket | Austrian Restaurant | Train Station | Café | Restaurant | Park | Fast Food Restaurant | Concert Hall | Grocery Store |
| 11 | Meidling | 0 | 4468 | Hotel | Zoo Exhibit | Café | Austrian Restaurant | History Museum | Restaurant | Pub | Park | Pool | Supermarket |
| 14 | Rudolfshim-Funfhaus | 0 | 4473 | Hotel | Ice Cream Shop | Café | History Museum | Austrian Restaurant | Restaurant | Pizza Place | Hotel | Thai Restaurant | Breakfast Spot |
| 17 | Währing | 0 | 6378 | Café | Italian Restaurant | Austrian Restaurant | Park | Restaurant | Gastropub | Coffee Shop | Wine Bar | Plaza | Supermarket |
| 19 | Brigittenau | 0 | 4175 | Restaurant | Austrian Restaurant | Hotel | Park | Café | Cocktail Bar | Coffee Shop | Italian Restaurant | Ice Cream Shop | Pizza Place |
| 20 | Floridsdorf | 0 | 4372 | Supermarket | Ice Cream Shop | Grocery Store | Pizza Place | Fast Food Restaurant | Restaurant | Gym | Gym / Fitness Center | Furniture / Home Store | Bakery |
| 22 | Liesing | 0 | 4530 | Supermarket | Italian Restaurant | Motorcycle Shop | Clothing Store | Hotel | Electronics Store | Ice Cream Shop | Chinese Restaurant | Wine Bar | Grocery Store |

The second cluster is dominated by restaurants:

| | Borough | Cluster Labels | EUR-Price | 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 |
|---|------------|----------------|-----------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|
| 8 | Alsergrund | 1 | 6875 | Restaurant | Plaza | Austrian Restaurant | Park | Hotel | Café | Ice Cream Shop | Cocktail Bar | Italian Restaurant | Japanese Restaurant |

The third cluster is dominated by restaurants and cafés:

| | Borough | Cluster Labels | EUR-Price | 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 | Innere Stadt | 2 | 13290 | Hotel | Plaza | Restaurant | Café | Austrian Restaurant | Ice Cream Shop | Italian Restaurant | Park | Museum | Art Museum |
| 12 | Hietzing | 2 | 5587 | Zoo Exhibit | Restaurant | Supermarket | Park | Bakery | Italian Restaurant | Gym / Fitness Center | Greek Restaurant | Gastropub | Ice Cream Shop |
| 13 | Perching | 2 | 4732 | Restaurant | Supermarket | Park | Asian Restaurant | Italian Restaurant | Café | Austrian Restaurant | Scenic Lookout | Shopping Mall | Shoe Store |
| 15 | Ottakring | 2 | 4723 | Café | Austrian Restaurant | Restaurant | Park | Hotel | History Museum | Italian Restaurant | Greek Restaurant | Ice Cream Shop | Breakfast Spot |
| 16 | Hernals | 2 | 4780 | Park | Café | Supermarket | Austrian Restaurant | Restaurant | Asian Restaurant | Gastropub | Italian Restaurant | Scenic Lookout | Plaza |
| 18 | Döbling | 2 | 7158 | Austrian Restaurant | Supermarket | Wine Bar | Restaurant | Italian Restaurant | Park | Gastropub | Café | Scenic Lookout | Gym |
| 21 | Donaustadt | 2 | 4811 | Supermarket | Clothing Store | Asian Restaurant | Electronics Store | Grocery Store | Bus Stop | Bakery | Pizza Place | Gym | Restaurant |

5. Discussion

- K-means does a good job clustering the boroughs of Vienna into three clusters that are dominated by different venues.
- The maximum number of venues shown by Foursquare is unfortunately somehow limited to 100.
- The coverage of venues in the boroughs by Foursquare varies.
- In my opinion it would also be useful to have categories and sub-categories as the venues “Restaurant” and “Italian Restaurant” should be in the same category.
- For the analysis it might be useful to include additional data sources like public transport connection.

6. Conclusion

- Foursquare offers a wide range of data for analyzing boroughs even though the data is not optimal for some reasons.
- K-means is a great method for clustering data, getting insights into data.
- The analysis made only gives an idea where you might want to buy a borough. Additional data could improve the outcome.