CAPSTONE PROJECT - THE BATTLE OF NEIGHBORHOODS (Week 1-2)

INVESTMENT IN THE VIENNA REAL ESTATE MARKET

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Content:

1. Introduction and Business Context:

I am providing assistance to a prospective investor in the Austrian real estate market. The client's objective is to attain a foothold in the Vienna property market. The property must be within the client's ability to service the loan. Based on the client's approach to a bank, it will lend up to 350k EUR on a property. The desired option for the client - apartment with 3-4 rooms, costing less than 350k EUR and located in a desirable area (with restaurants, park, café in the near vicinity). This project is to support the investor in locating the most optimal apartments suiting their criteria.

The aim of this project is to provide an overview of the Vienna real-estate market:

- Which district has cheaper accommodation listings
- Which are similar districts in terms of pricing and venues
- Which districts suit the client's criteria

Interested Audience: I believe this is an interesting and useful challenge with valid questions for anyone who consider making an investment in any large city within the EU, etc. This case is also applicable for anyone interested in making any real estate investment or relocation. Finally, it can also serve as a good practical exercise to develop Data Science skills.

2. Methodology section

In this project, the focus will be directed on analysing areas of Vienna, Austria. Analysis will be limited to areas of Vienna only and take into account the investor's criteria (see Introduction and Data sections).

1. The first step includes cleaning and preparing data for analysis: Gathering data from real-estate web-site (*https://www.willhaben.at*) and forming a dataframe.
2. The second step involves pre-processing of obtained data - cleaning and formatting.
3. Analysis of the prepared data frame in order to overview the real-estate market in Vienna.

4. On the fourth and final step, identification of the most suitable areas that meet the criteria of the client venue preferences (restaurants, cafee, park, etc. nearby) by collecting Foursquare data is undertaken. Subsequently, the cluster analysis will be undertaken (using k-means clustering). The result will be a map that shows the most suitable areas for the client.

3. Data

Client Requirements:

Ideal property for client' personal circumstances and cashflow position, - apartment with 3-4 rooms, costing less than 350k EUR and located in a desirable area (with restaurants, park, café in the near vicinity).

Data:

In order to make a good choice of an appropriate apartment in Vienna, the following data is required:

- Information of available apartments in Vienna, (location, size, rooms, price)
- Information on Vienna districts with Geodata (latitude and longitude.)
- Venues and amenities in the Vienna districts suburbs (e.g. top 10).

	PostalCode	District	Size	Rooms	Price
0	1170	Hernals	107	4	475.000,10
1	1130	Hietzing	67	3	399.000,03
2	1220	Donaustadt	62	2	329.900,-
3	1140	Penzing	105	3	700.000,-
4	1210	Floridsdorf	110	4	527.500,-

Table 1. The DataFrame's (head) of properties for sale in Vienna constructed from gathering information from real-estate Vienna market. There are 10568 apartments in obtained DataFrame.

4. Data Processing

	PostalCode	District	Size	Rooms	Price	Price/m2
0	1170	Hernals	107.0	4.0	475000.10	4439.25
1	1130	Hietzing	67.0	3.0	399000.03	5955.22
2	1220	Donaustadt	62.0	2.0	329900.00	5320.97
3	1140	Penzing	105.0	3.0	700000.00	6666.67
4	1210	Floridsdorf	110.0	4.0	527500.00	4795.45

Table 2. Cleaned and formatted the DataFrame's (head) of properties for sale in Vienna constructed from gathering information from real-estate Vienna market. There are 9760 apartments in DataFrame.

5. Data Visualisation

Figure 1 shows that the distance from the CBD is directly proportional to the quantity of apartments for sale. Apartments with 2-3 rooms are the most commonly available size in the Vienna market (Figure 2).

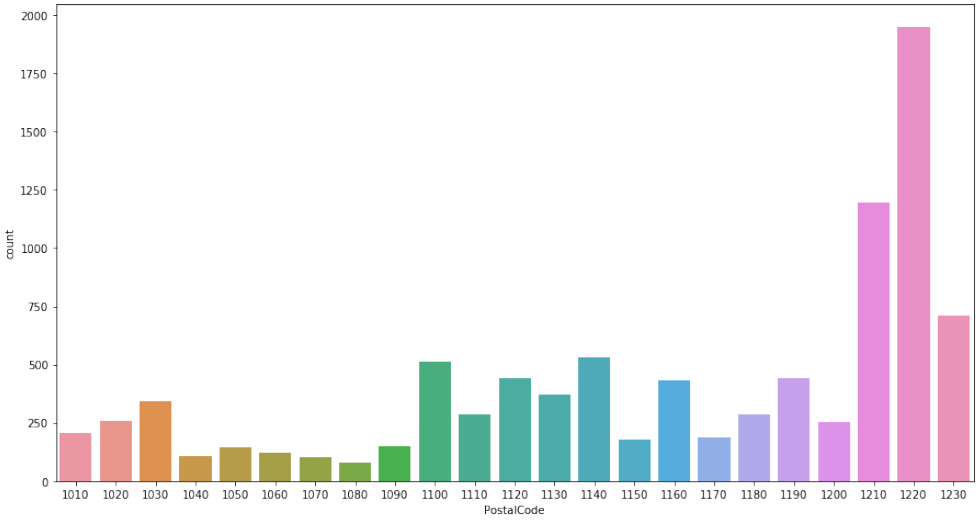

Figure 1. Distribution of accommodations for sale in Vienna by PostalCode (with room number <=4 as per investor requirement)

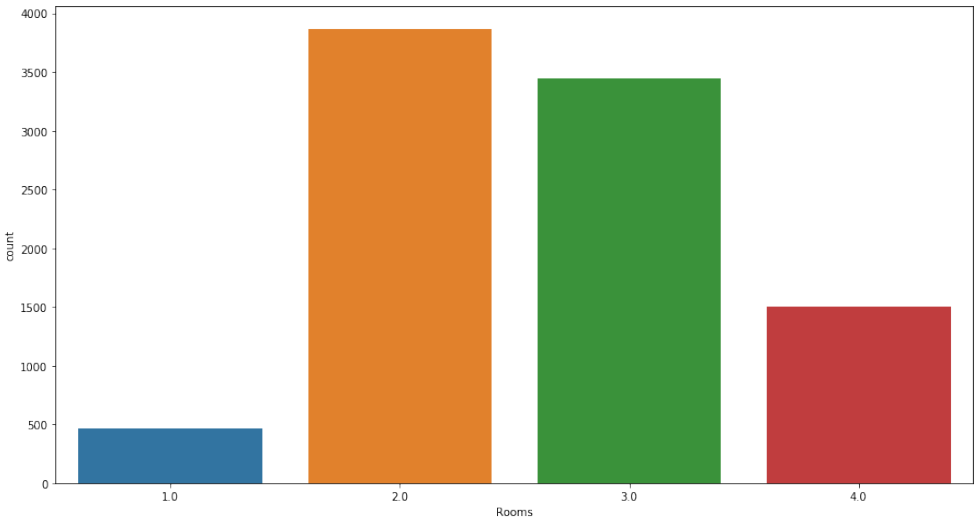

Figure 2. Distribution of accommodation for sale in Vienna by room quantity (with room quantity <=4)

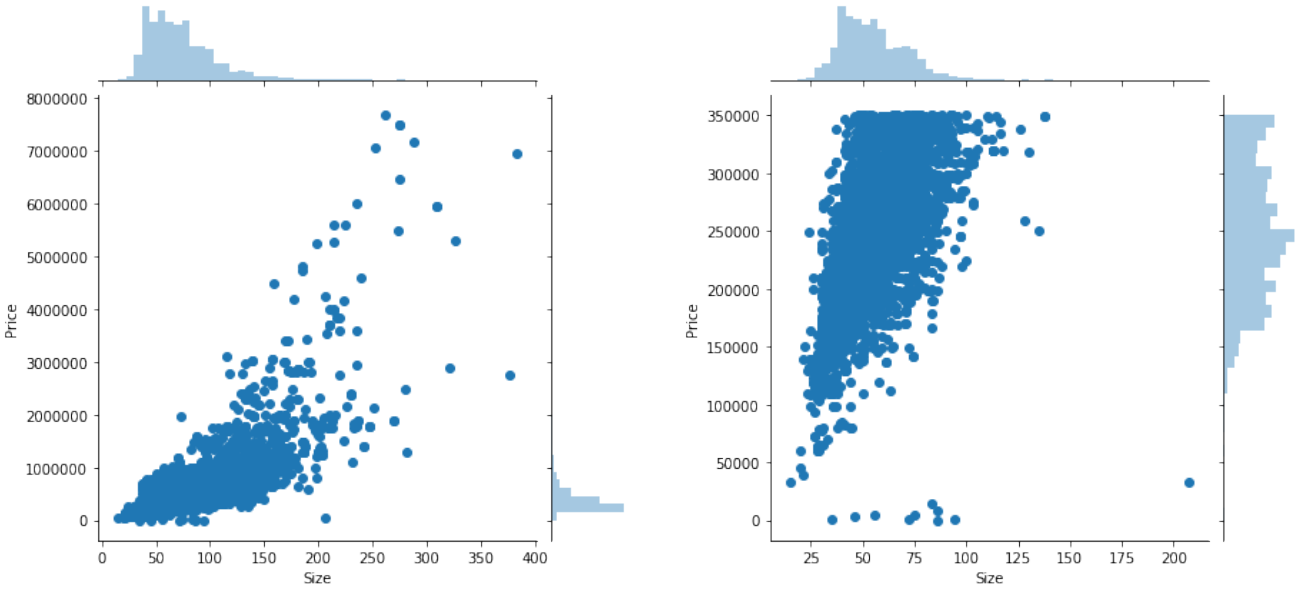

Figure 3. Correlation between size and price for Vienna accommodations for sale. From the investor's criteria, with room number <=4 (left) for all prices. On the right the chart shows those with room number <=4 and price <=350th EUR.

The difference in correlation is the most obvious change between the two charts when the upper value is adjusted. The right chart shows that at a given price, there is a big variety of properties of varying sizes up to 125m2 to choose from. This chart of course doesn't indicate qualitative factors such as condition of apartment, age or distance from the CBD.

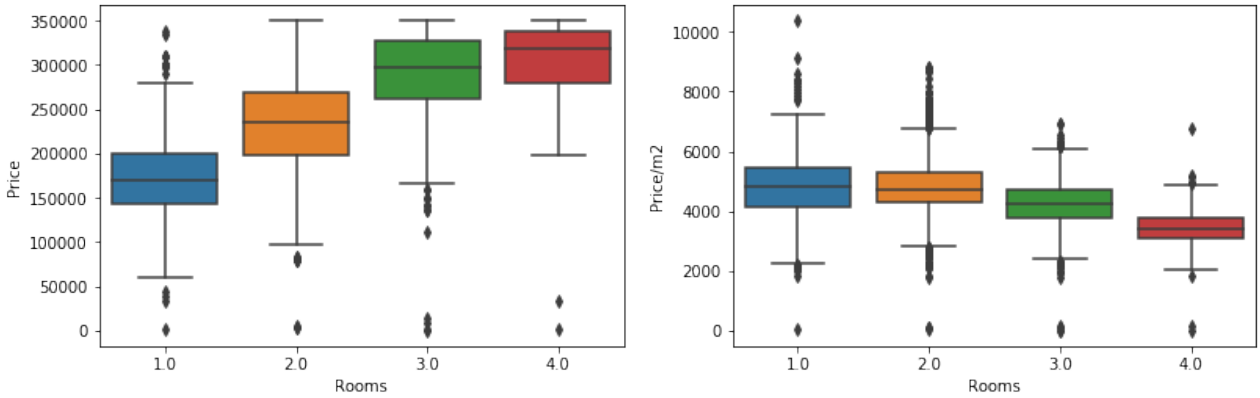

Figure 4. Correlation price vs number of rooms (left) and price/sqm vs number of rooms (right).

As with pricing norms around the world, with similar apartments in terms of quality and location, price/m2 will reduce as the size of the apartment increases. This may also indicate that as desirability of the location or apartment block decreases, price/m2 will be in the lower of each colour banding. For example, with a 2 bedroom apartment according to the left chart, the price ranges from circa 200k Euro to 275k Euro. This may be due to slight differences in sizes, price/m2, age and condition of apartment and/or block, distance from CBD, supply of apartments for sale, demand for the area, infrastructure and venues in vicinity.

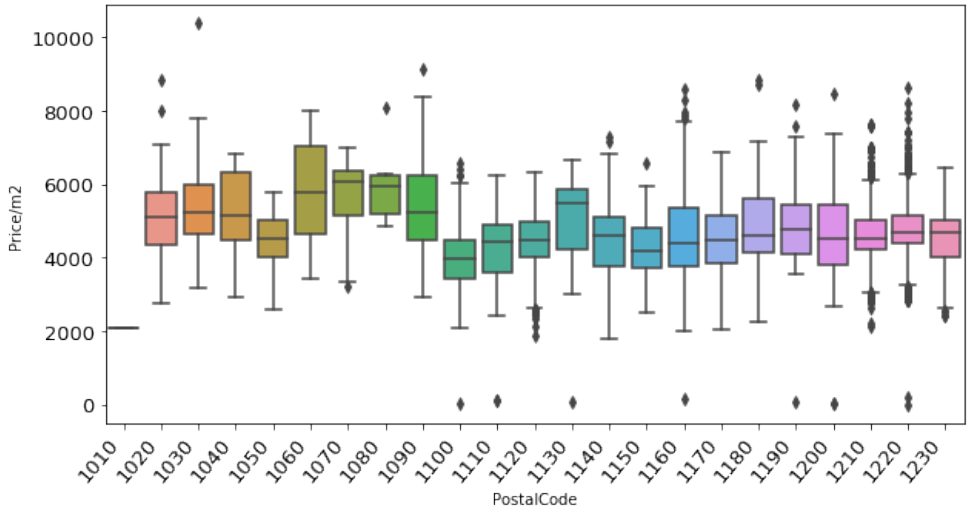

Figure 5. Distribution of apartment cost per m2 by districts (for apartments with 3-4 rooms – the ideal option according investor's desires).

For the investor, this indicates that for a 3-4 room apartment, if they are willing to compromise on distance from the CBD, price per sqm will be more favourable for them. In certain postcodes such as 1100, 1200 and 1230 for example, 350k EUR may purchase an apartment from circa 100sqm in size. Referring back to Figure 1, given higher supply in 1050 (Margareten), 1100 (Favoriten), 1120 (Meidling), 1140 (Penzing), this may indicate a better ability for negotiation towards the lower end of the price/m2 spectrum

5.1 Districts Analysis (Venue and Cluster Analysis)

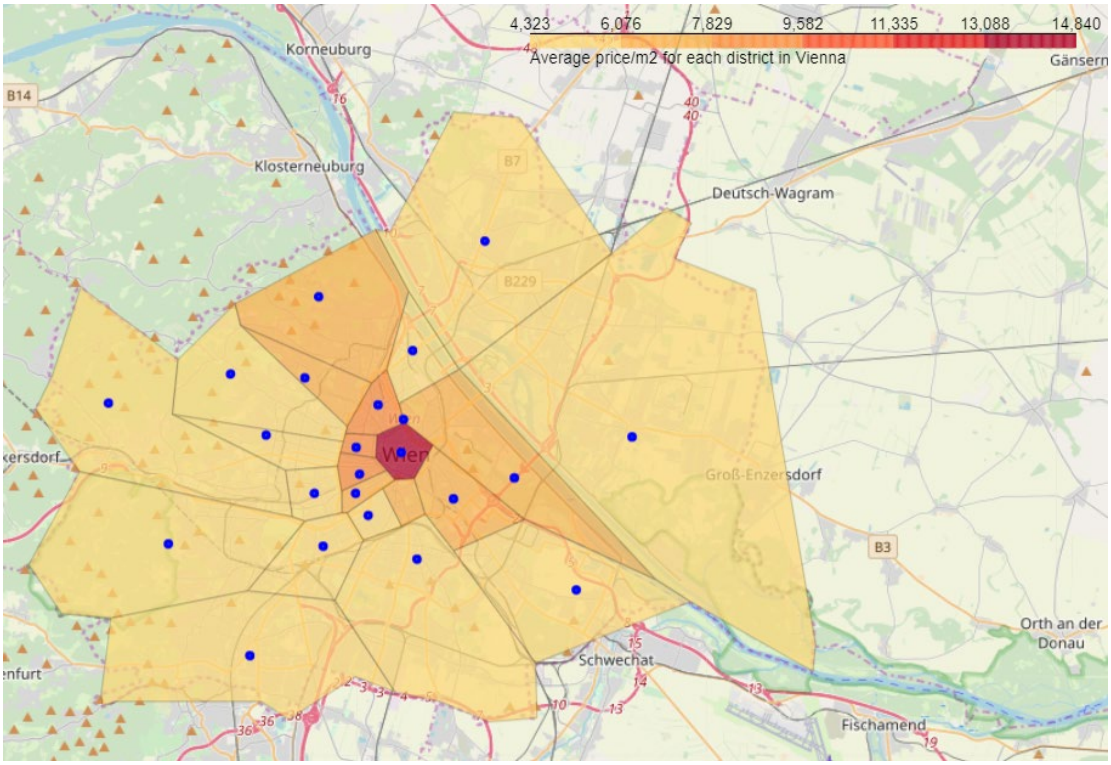

Figure 6. Choropleth map shows average price/m2 for districts in Vienna.

	District	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Innere Stadt	0	Plaza	Austrian Restaurant	Restaurant	Hotel	Italian Restaurant
1	Leopoldstadt	0	Restaurant	Supermarket	Hotel	Bakery	Café
2	Landstraße	0	Hotel	Austrian Restaurant	Restaurant	Concert Hall	Café
3	Wieden	0	Restaurant	Café	Austrian Restaurant	Hotel	Plaza
4	Margareten	0	Austrian Restaurant	Hotel	Bar	Café	Ice Cream Shop
5	Mariahilf	0	Hotel	Austrian Restaurant	Ice Cream Shop	Japanese Restaurant	Clothing Store
6	Neubau	0	Hotel	Ice Cream Shop	Plaza	Austrian Restaurant	Theater
7	Josefstadt	0	Plaza	Hotel	Coffee Shop	Café	Park
8	Alsergrund	0	Café	Restaurant	Hotel	Coffee Shop	Park
9	Favoriten	0	Hotel	Restaurant	Supermarket	Café	Park
10	Simmering	0	Tram Station	Restaurant	Fast Food Restaurant	Light Rail Station	Flower Shop
11	Meidling	0	Hotel	Austrian Restaurant	Café	Zoo Exhibit	History Museum
13	Penzing	0	Restaurant	Trail	Electronics Store	Cosmetics Shop	Café
14	Rudolfsheim-Fünfhaus	0	Hotel	Restaurant	Italian Restaurant	Austrian Restaurant	History Museum
16	Hernals	0	Austrian Restaurant	Park	Bus Stop	Café	Scenic Lookout
18	Döbling	0	Café	Austrian Restaurant	Restaurant	Wine Bar	Italian Restaurant

Table 3. First cluster by top 10 most common venues.

	District	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
12	Hietzing	1	Park	Supermarket	Bakery	Hotel	Scenic Lookout
15	Ottakring	1	Supermarket	Austrian Restaurant	Restaurant	Wine Bar	Tram Station
17	Währing	1	Supermarket	Café	Park	Ice Cream Shop	Austrian Restaurant
19	Brigittenau	1	Supermarket	Austrian Restaurant	Italian Restaurant	Plaza	Park
20	Floridsdorf	1	Supermarket	Electronics Store	Fast Food Restaurant	Café	Shopping Mall
21	Donaustadt	1	Supermarket	Pizza Place	Bakery	Bus Stop	Breakfast Spot
22	Liesing	1	Supermarket	Hotel	Bus Stop	Italian Restaurant	Plaza

Table 4. Second cluster by top 10 most common venues.

Obtained Foursquare data for each district contains 1753 venues and 217 unique categories. For district cluster analysis the top 10 most common venues were selected and used two clusters (more touristy area, what the investor desired and sleeping/industrial area). Results shown in table 3 (first cluster) and table 4 (second cluster).

	PostalCode	District	Latitude	Longitude
0	1010	Innere Stadt	48.209133	16.369992
1	1020	Leopoldstadt	48.200638	16.426895
2	1030	Landstraße	48.193644	16.396286
3	1040	Wieden	48.220210	16.371216
4	1050	Margareten	48.188073	16.353386
5	1060	Mariahilf	48.195475	16.347023
6	1070	Neubau	48.201881	16.349056
7	1080	Josefstadt	48.210852	16.347360
8	1090	Alsergrund	48.225073	16.358398
9	1100	Favoriten	48.173423	16.377914
10	1110	Simmering	48.163109	16.458009
11	1120	Meidling	48.177762	16.330749
12	1130	Hietzing	48.178541	16.252986
13	1140	Penzing	48.225662	16.222790
14	1150	Rudolfsheim-Fünfhaus	48.195475	16.326301
15	1160	Ottakring	48.214955	16.302153
16	1170	Hernals	48.235403	16.284214
17	1180	Währing	48.234115	16.321606
18	1190	Döbling	48.261251	16.328471
19	1200	Brigittenau	48.243226	16.375703
20	1210	Floridsdorf	48.279815	16.412135
21	1220	Donaustadt	48.214361	16.486072
22	1230	Liesing	48.141106	16.293912

6. Result

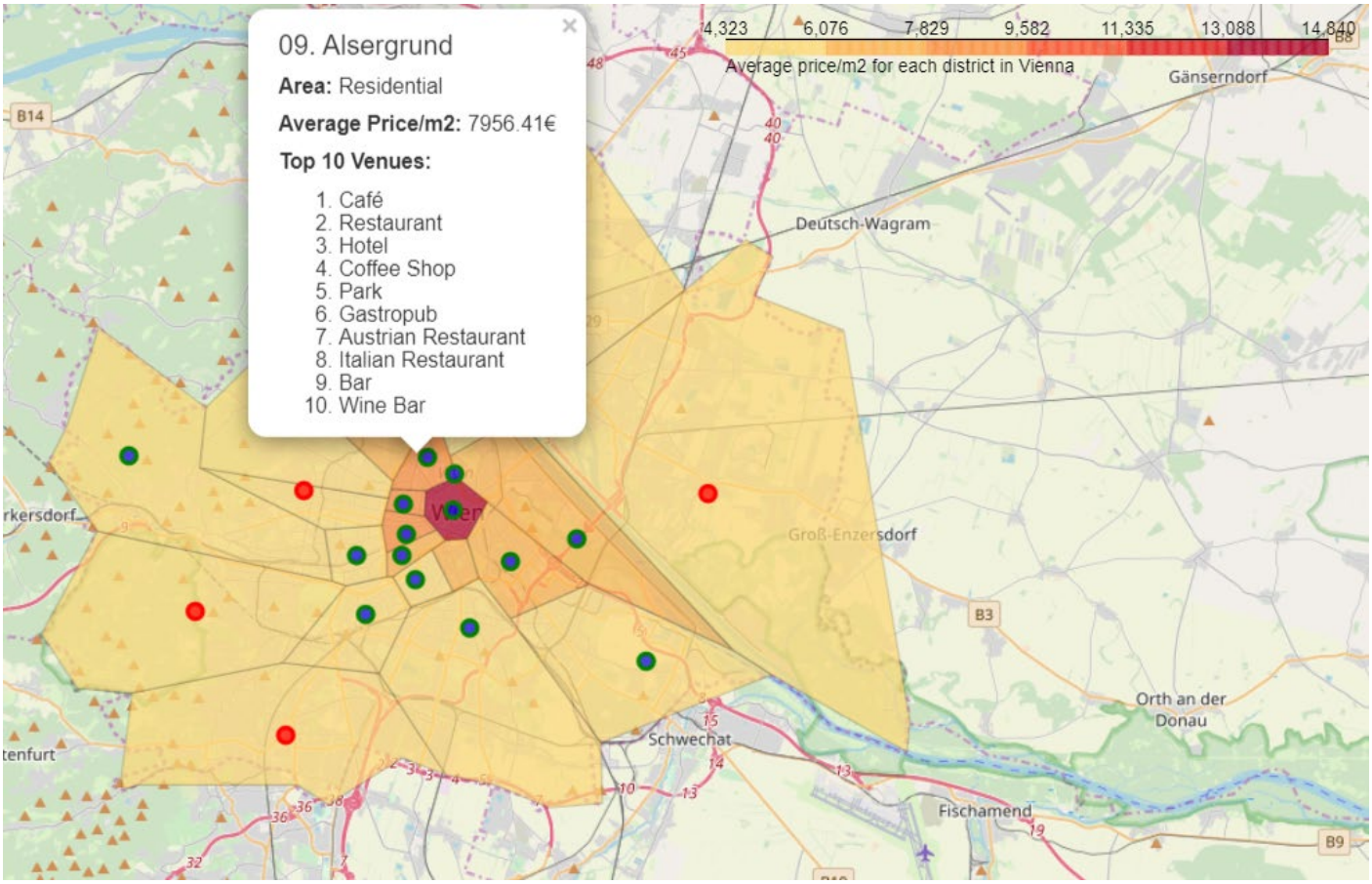

Figure 7. Choropleth map shows average price/m2 for districts in Vienna. Green (first cluster) – more touristic areas, red (second claster) – sleeping/industrial area.

7. Discussion and Conclusion

Based on the client's original criteria to locate an apartment in a desirable area of Vienna =< 350k EUR, 3-4 rooms, this project has sought to analyse the property market, pricing and venue location of Vienna.

The most desirable suburbs that suit the above criteria are identified as postcodes 1050 (Margareten), 1100 (Favoriten), 1120 (Meidling), 1140 (Penzing). These are all within 6 to 10km of the CBD, with Penzing being the furtherst. Due to the higher number of apartments supplied to the market and relatively lower price/m2, the ability to negotiate to the lower end of the price spectrum may be available.

It is suggested, the client focus their attention to those properties in the above mentioned postcodes first. If these are not suitable due to some other qualitative criteria or distance, then the next most desirable postcodes can be used as per the above tables. For example moving within the 6km limit from the CBD such as to 1060 (Mariahilf) or 1090 (Alsergrund) will find higher price/m2 and smaller apartments but offer close proximity to the cultural centre, nightlife, business district and infrastructure of the city.