Where to Go, Stay, and Play in Munich, Germany

Week 5 Assignment of the "Applied Data Science Course" of the IBM Data Science Certification

Introduction:

As a German living in the United States, I often get asked about where to go and what to see when Americans are visiting Germany. Being from Bavaria, I tend to make recommendations about visiting Munich, being world known about the annual Octoberfest, the English Garden (comparable to the Central Park in New York City), Nymphenburg Palace (home of the Bavarian kings), beer gardens, Lederhosens, beer steins, the annual "Christkindlmarkt" (Christmas market) and more. Being the third largest city in Germany (after the capitol of Berlin and Hamburg as a major seaport) and 11th largest within the European Union, Munich is a global center
for art, science, technology, finance, publishing, culture, innovation, education, business,
and tourism and enjoys a very high standard and quality of living, reaching first in Germany and third worldwide according to the 2018 Mercer survey [1], and being rated the world's most liveable city by the Monocle's Quality of Life Survey 2018 [2]. According to the Globalization and World Rankings Research Institute, Munich is considered an alpha-world city, as of 2019 [3]. Despite being "only" the third largest city in Germany, Munich can compete with any European major city when it comes to history (dating back to 1158), architecture, parks, sport venues, culture and more.

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[1] "Quality of living city ranking" - https://mobilityexchange.mercer.com/Insights/quality-of-living-rankings

[2] "Munich Named the Most Liveable City in the World" - https://www.forbes.com/sites/bishopjordan/2018/06/25/monocle-most-livable-city-quality-life-survey-2018-munich/#5de271cd6153

[3] "Alpha, Beta, and Gamma Cities (updated 2019)" - https://www.spottedbylocals.com/blog/alpha-beta-and-gamma-cities

While doing the research for this self-chosen topic of the Applied Data Science Capstone Project, I came to realize that there is a multitude of ways how you can inform yourself about Munich as a city, what to do, where to eat etc., but all the sources available (online guides, printed guides) lag the combination of touristic attraction and affordable places to stay.

The goal of this Capstone project is to provide insight and easily available information about where to stay, what to do and where to eat. While all this information is publically available in tourist guides and the internet, the goal is to pull all that data together in one centralized view.

Description of the data and how it will be used

As hotels in Munich, as a major tourist city, are fairly high for the average tourist, I am using an Airbnb dataset available on Kaggle (https://www.kaggle.com/chriskue/munich-airbnb-data). The actual and currently available dataset at https://data.insideairbnb.com/germany/bv/munich/2020-04-25/visualizations/listings.csv. The dataset was, for visualization purposes, updated by adding the available latitude and longitude data for the apartments. Germany, as part of the European Union, follows (compared to American laws) strict regulations regarding data and sharing thereof. For integrating neighborhood/district data for the city of Munich, I am also using a dataset posted on Kaggle, but available at https://data.insideairbnb.com/germany/bv/munich/2020-04-25/visualizations/neighbourhoods.geojson. The geojson file was converted to a .csv file so that it can easier be utilized within the Jupyter notebook application.

FourSquare will be utilized to retrieve data for Munich. The data includes venues like attractions, museums, or parks, and places to eat like restaurants or shops to eat. While, for the purpose of this work, a developer account for FourSquare will be used, the Food City Guide for Munich can be found at https://foursquare.com/explore?mode=url&near=Munich%2C%20Germany&nearGeoId=72057594040795650&q=Food.

Methodology

After loading all relevant Python libraries, the first dataset, for the neighborhoods in Munich (neighbourhoods_geojson.csv) got imported, cleaned up ("neighborhood" instead of "neighbourhood", for aligning it with American English) and returned the following result:

```
df1.rename(columns={'neighbourhood':'neighborhood'},inplace=True)
df1.head()
```

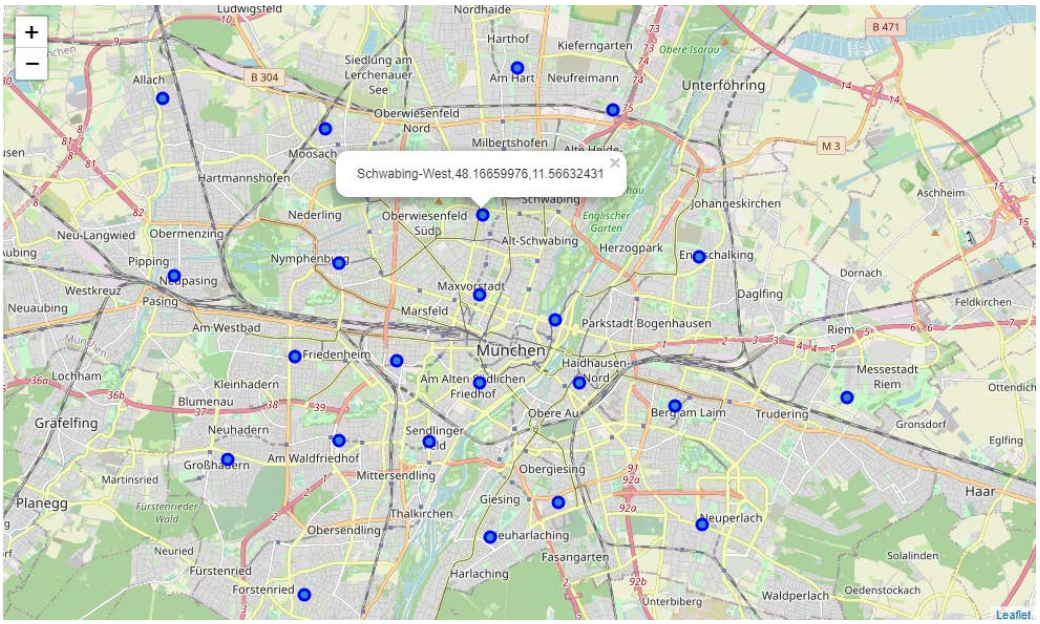
	neighborhood	longitude	latitude
0	Altstadt-Lehel	11.589991	48.143700
1	Ludwigsvorstadt-Isarvorstadt	11.565144	48.129800
2	Maxvorstadt	11.565295	48.149200
3	Schwabing-West	11.566324	48.166600
4	Au-Haidhausen	11.597847	48.129901

The visual validation of the original csv file, compared to the output, shows that all 25 districts got imported.

```
1 df1.shape
```

```
(25, 3)
```

The map of Munich with the districts, indicated by the icons, can be displayed as a folium map like this. The longitude and latitude information for Schwabing-West aligns with the data displayed in df1.

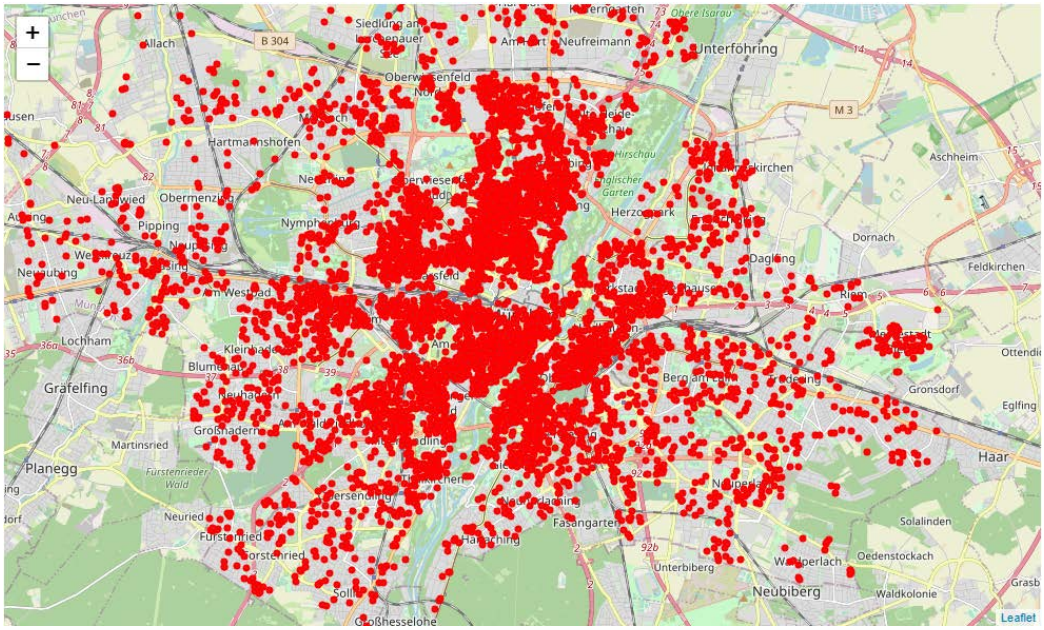


After importing the AirBNB data, the data is cleaned up and reduced to the required dataset and information to conduct a meaningful analysis. As we consider that not every traveler has “deep pockets”, an average price of equal or less than $100 is assumed to target cost conscious American tourists. Further analysis shows that every district has at least 48, and up to 632 AirBNB locations/apartments available.

```
In [165]: pd.value_counts(df3["neighborhood"])
```

```
Out[165]: Ludwigsvorstadt-Isarvorstadt                          632
          Maxvorstadt                                           627
          Schwabing-West                                        533
          Neuhausen-Nymphenburg                                 485
          Au-Haidhausen                                         440
          Schwabing-Freimann                                    399
          Bogenhausen                                           341
          Milbertshofen-Am Hart                                 337
          Ramersdorf-Perlach                                    312
          Laim                                                  262
          Thalkirchen-Obersendling-Forstenried-Fürstenried-Solln 259
          Sendling                                              249
          Sendling-Westpark                                     242
          Obergiesing                                           236
          Untergiesing-Harlaching                               234
          Schwanthalerhöhe                                      208
          Tudering-Riem                                         184
          Moosach                                               173
          Altstadt-Lehel                                        164
          Pasing-Obermenzing                                    156
          Berg am Laim                                          137
          Hadern                                                100
          Feldmoching-Hasenbergl                                 77
          Aubing-Lochhausen-Langwied                             59
          Allach-Untermenzing                                    48
          Name: neighborhood, dtype: int64
```

Consolidated and displayed on a map for Munich, the distribution of AirBNB locations shows as:



From a tourist perspective, "Maxvorstadt" as district will be selected for further analysis.

The geographical location of Maxvorstadt can be determined by:

Determining the geographical location of Maxvorstadt

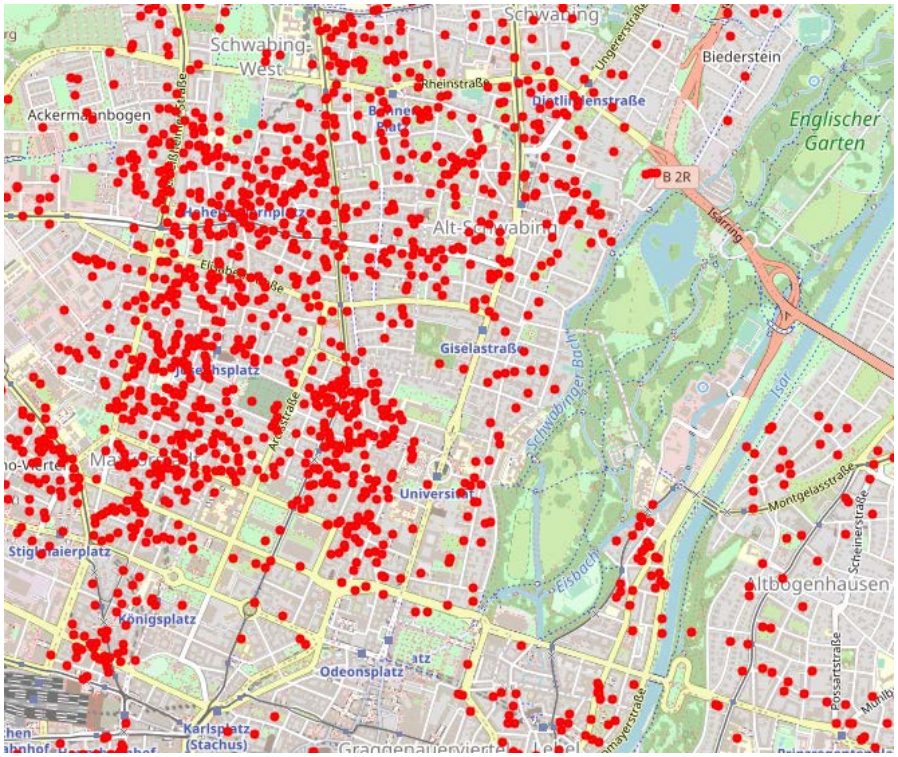
```
# neighborhood latitude
neighborhood_latitude=df1.loc[2,'latitude']

# neighborhood longitude
neighborhood_longitude=df1.loc[2,'longitude']

# neighborhood name
neighborhood_name=df1.loc[2,'neighborhood']

print('Latitude and Longitude values of {} are {}, {}.'.format(neighborhood_name, neighborhood_latitude,neighborhood_longitude))
```

```
Latitude and Longitude values of Maxvorstadt are 48.14920045, 11.56529535.
```

Reasons for that decision were driven by:

1. Maxvorstadt is centrally located, and just north of the Munich central train station. This allows travelers to be independent of car rentals and they can use the well maintained public transportation system.
2. Maxvorstadt has the second most AirBNB locations, thus offering a wide variety of places to stay.
3. Maxvorstadt is one of the oldest districts having various tourist attractions like the "Koenigsplatz" where you can find the City Hall and various well known outlets for Bavarian breweries. Other places of note are the Pinakothek (a collection of four art museums) or the Ludwig-Maximilian University, the 6th oldest university in Germany, dating back to 1472.

4. Maxvorstadt is also located just south of Schwabing. This district known for its restaurant and bar scenes, and beer gardens. Both districts share their eastern border “Englischer Garten”, the equivalent of the Central Park in New York City.



By importing & cleansing an AirBNB for Munich, first the total list, and then a list for affordable accomodations (<$100 per night) was created.

for cost conscious travellers, dropping locations that are > $100 per night

```
df3=df2[df2['price']<100]
df3.head()
```

	neighborhood	latitude	longitude	room_type	price	minimum_nights
0	Ludwigsvorstadt-Isarvorstadt	48.13057	11.56929	Entire home/apt	95	2
1	Ludwigsvorstadt-Isarvorstadt	48.12456	11.55567	Private room	40	14
2	Hadern	48.11476	11.48782	Entire home/apt	80	2
3	Berg am Laim	48.11923	11.63726	Entire home/apt	95	1
5	Schwabing-West	48.16381	11.56089	Private room	35	1

Lastly, via the integration of FourSquare data,

Integrating the FourSquare data

In [146]:
```
CLIENT_ID = 'HQLEZBYY1RIPENCCOS1GAIAYATZFJSUTBHDXG0IQVAU4OP2N'
CLIENT_SECRET = 'XYSUHBXS503T3MKVANDFIVFSC0XEP2ROMJIKRYWYDSLH3Q5P'
VERSION = '20200511'

print('Your credentails:')
print('CLIENT_ID: ' + CLIENT_ID)
print('CLIENT_SECRET:' + CLIENT_SECRET)
```

```
Your credentails:
CLIENT_ID: HQLEZBYY1RIPENCCOS1GAIAYATZFJSUTBHDXG0IQVAU4OP2N
CLIENT_SECRET:XYSUHBXS503T3MKVANDFIVFSC0XEP2ROMJIKRYWYDSLH3Q5P
```

The top 100 venues for Maxvorstadt are determined and returned:

Out[176]:

	name	categories	lat	lng
0	Vorhoelzer Forum	Event Space	48.148330	11.567714
1	Von&Zu	Café	48.147885	11.565158
2	Rooftop Bar TU München	Roof Deck	48.148311	11.568174
3	Frida	Pub	48.149690	11.564807
4	Joon	Café	48.150940	11.565307
5	Königsplatz	Plaza	48.146503	11.565578
6	Sim Sim	Falafel Restaurant	48.150206	11.563655
7	Café im Vorhoelzer Forum	Café	48.148413	11.567786
8	Heinrich Matters	Café	48.149310	11.566003
9	Maxvorstadt Wirtshaus	German Restaurant	48.149168	11.562620
10	Städtische Galerie im Lenbachhaus	Art Museum	48.146761	11.563529

In [177]:
```
print('{} venues were returned by Foursquare.'.format(nearby_venues.shape[0]))
```

```
100 venues were returned by Foursquare.
```

Results

While it is good to know what is available in the selected district, it is also, from the perspective of a tourist in general, good to know what else is available in Munich. Overall, there are 1279 different options

```
1 print(Munich_venues.shape)
2 Munich_venues.head()
```

```
(1279, 7)
```

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Altstadt-Lehel	48.1437	11.589991	Eisbachwelle	48.143532	11.587754	Surf Spot
1	Altstadt-Lehel	48.1437	11.589991	Fräulein Grüneis	48.143715	11.589003	Snack Place
2	Altstadt-Lehel	48.1437	11.589991	Die Goldene Bar	48.144107	11.586004	Cocktail Bar
3	Altstadt-Lehel	48.1437	11.589991	Wasserfall im Englischen Garten	48.145013	11.587465	Waterfall
4	Altstadt-Lehel	48.1437	11.589991	Pepino	48.144752	11.593377	Pizza Place

In 210 different unique categories available.

```
1 print('There are {} uniques categories.'.format(len(Munich_venues['Venue Category'].unique())))
```

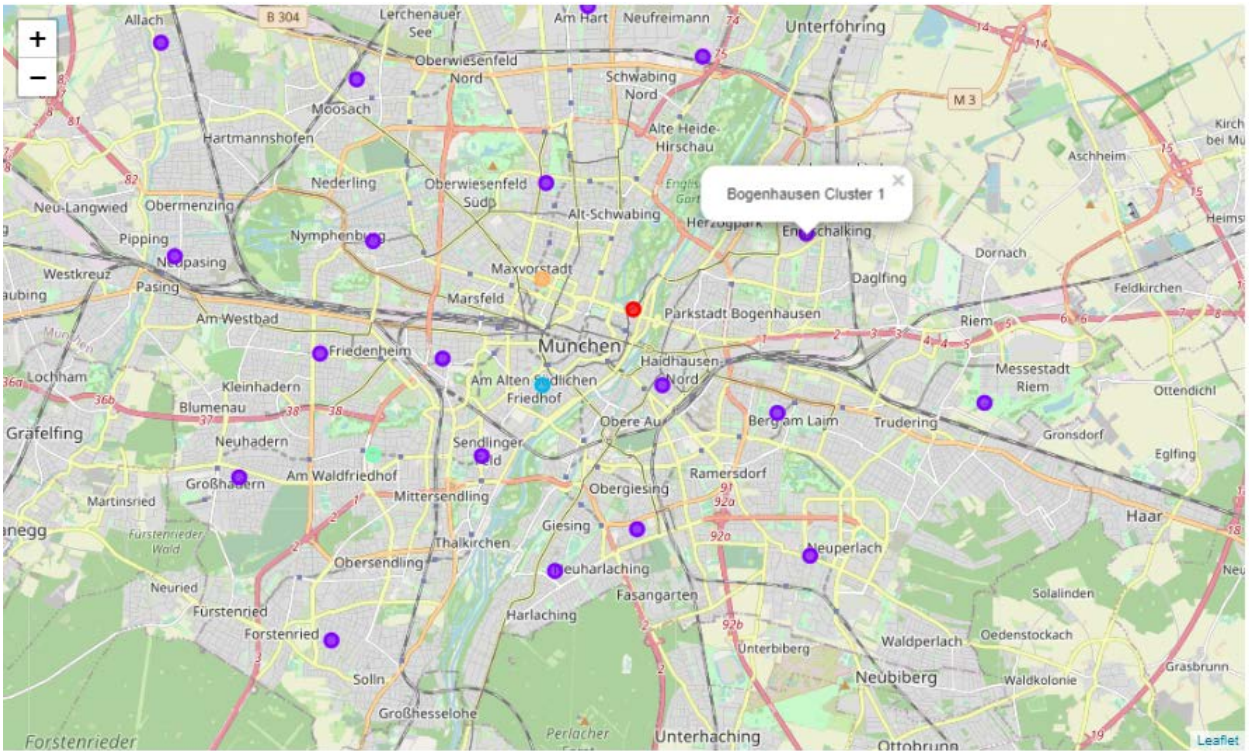
```
There are 210 uniques categories.
```

Considering that Munich is not the Capital of Germany, there are plenty of options available for any mood or interest.

As most Americans are, some way or another, related to European heritage (1st, 2nd, 3rd, etc. generation), most are interested also in European history. Maxvorstadt, as the chosen district, offers Art & History Museums as available options within the Top 5 categories available.

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Allach-Untermenzing	Sporting Goods Shop	Trattoria/Osteria	Supermarket	Bavarian Restaurant	Bakery
1	Altstadt-Lehel	Café	Cocktail Bar	Italian Restaurant	Plaza	Monument / Landmark
2	Au-Haidhausen	Italian Restaurant	Café	Plaza	German Restaurant	Bakery
3	Aubing-Lochhausen-Langwied	Construction & Landscaping	Soccer Field	Beer Garden	Parking	Park
4	Berg am Laim	Supermarket	Hotel	Bus Stop	Italian Restaurant	Doner Restaurant
5	Bogenhausen	Italian Restaurant	Bakery	Park	Bus Stop	German Restaurant
6	Feldmoching-Hasenbergl	Bus Stop	Café	Bakery	German Restaurant	Lake
7	Hadern	Bus Stop	Supermarket	German Restaurant	Metro Station	ATM
8	Laim	Supermarket	Bank	Restaurant	Greek Restaurant	Bus Stop
9	Ludwigsvorstadt-Isarvorstadt	Café	Italian Restaurant	Bar	Ice Cream Shop	German Restaurant
10	Maxvorstadt	Café	Art Museum	Italian Restaurant	Vietnamese	History Museum

Applying the Machine Learning technique of k-means Clustering we can categorize that overall there are four different clusters present. The clusters are displayed on the map for Munich.



Discussion

While it appears that Maxvorstadt has “less options” available, this is driven by the fact that, as a district in the center of Munich, it has more unique and less “mainstream” options available. The author highly recommends, based on the uniqueness of the district and his own experience, to choose the area of Maxvorstadt & Schwabing, as a neighboring district to the north, as primary options for a first time visit.

Conclusion

As demonstrated, Munich can compete, as it relates to affordable place to stay, places to see, and places to eat, with any other major city on the planet.