



# MUNICH - ANALYSIS OF THE NEIGHBOURHOODS FOR NEWCOMERS

Applied Data Science Capstone Project

J.Campa, Juli 2020

# Background

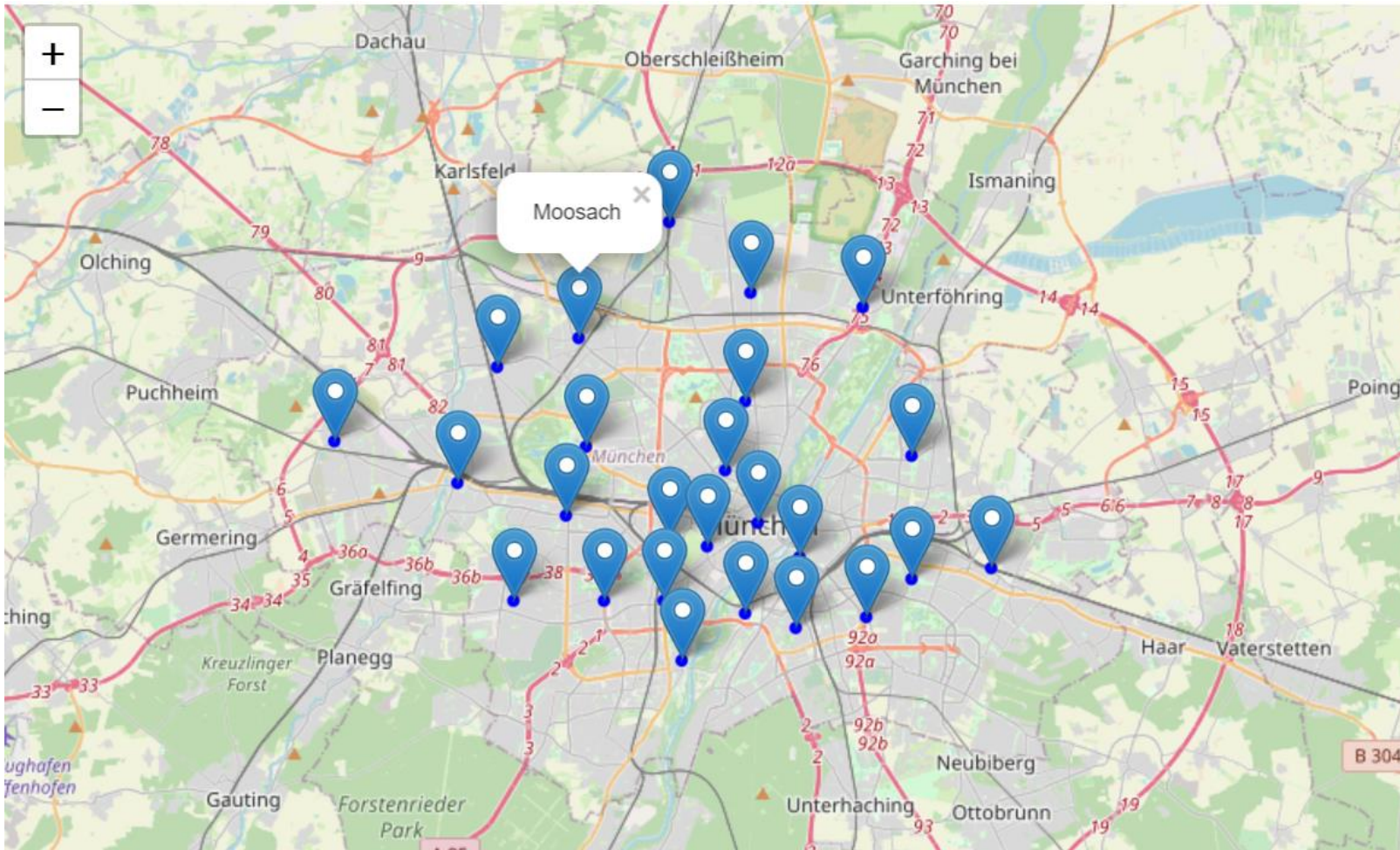
- According to the official city website, there were 118.000 new (domestic and foreign) inhabitants registered last year. That means, that 118.000 people came last year to Munich and needed to search for accommodation and a place to live.
- Each of the 25 city neighbourhoods is unique and offers a different setup and environment for its new inhabitants. The requirements of each newcomer are individual and requires personal assessment.
- The aim to this project is to provide a qualitative analysis of Munich neighbourhoods and help to answer the questions:
- **Which of the 25 neighbourhoods in Munich may be suitable for me/us?**
- **Which of the 25 neighbourhoods are similar to each other?**

# Data acquisition

- All of the basic geographical and demographical data of the city of Munich can be scraped on Wikipedia page in German language [here](#). This data was used as a base for neighbourhood analysis as well as for part of a demographical analysis.
- Further data about city criminality were used to analyse criminal rate occurrence for each neighbourhood. The data can be found [here](#).
- To be able to analyse one of the most important factors for newcomers (Real estate Price), data from [miet.check.de](#) were used. For purpose of this analysis, only average price/m2 for renting an apartment were used.
- For visualisation purposes, .json data of Munich neighbourhoods can be downloaded and adjusted [here](#).
- Foursquare data were used, to analyse Munich 25 neighbourhoods, cluster them and understand unique specifics of each of them.

# Feature selection

- Price (EUR/m<sup>2</sup>/Neighbourhood)
- Distance from the city centre (km)
- Criminality (number of criminal acts)
- Foreigners share (%)
- Density (Inhabitants/km<sup>2</sup>)
- Venues (Foursquare)



# Map of Munich neighborhoods

Munich has 25 neighbourhoods spread around the area of 310 square kilometres. Each of them has different specifics, geographical position, and history. At the map below, 25 neighbourhoods with its centre points are displayed for first and basic orientation in Munich.



# Correlation Analysis

## Results:

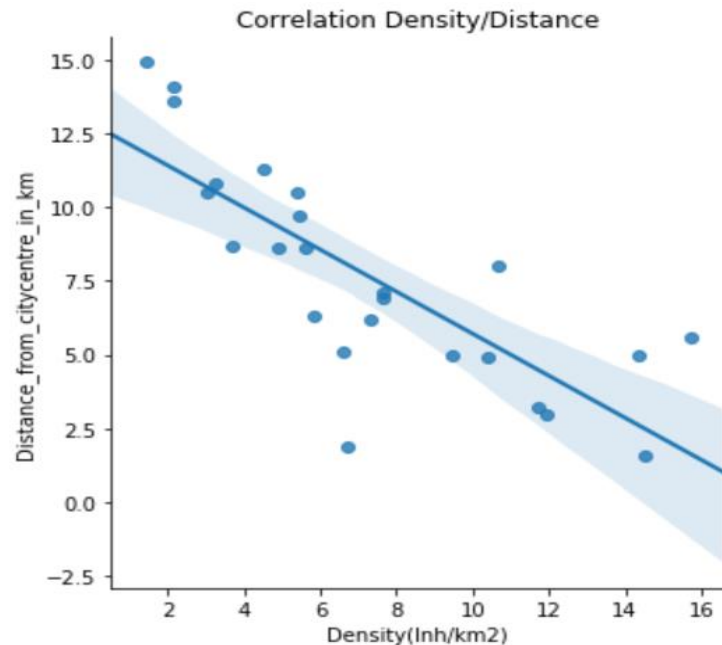
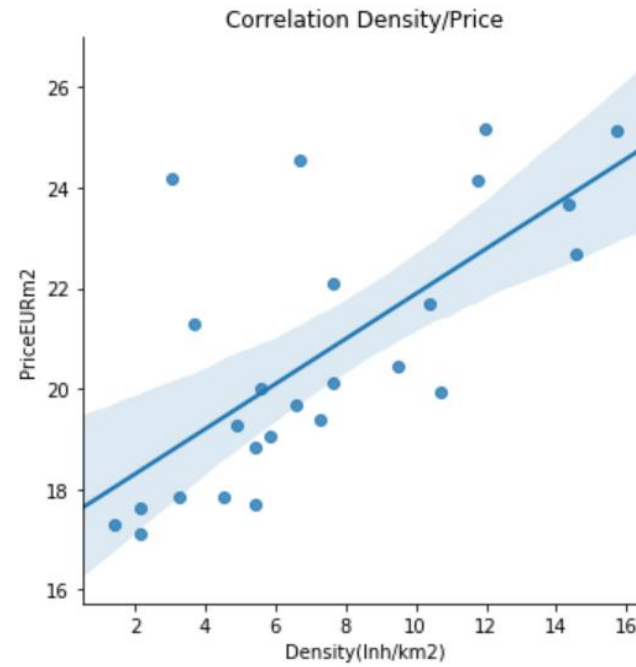
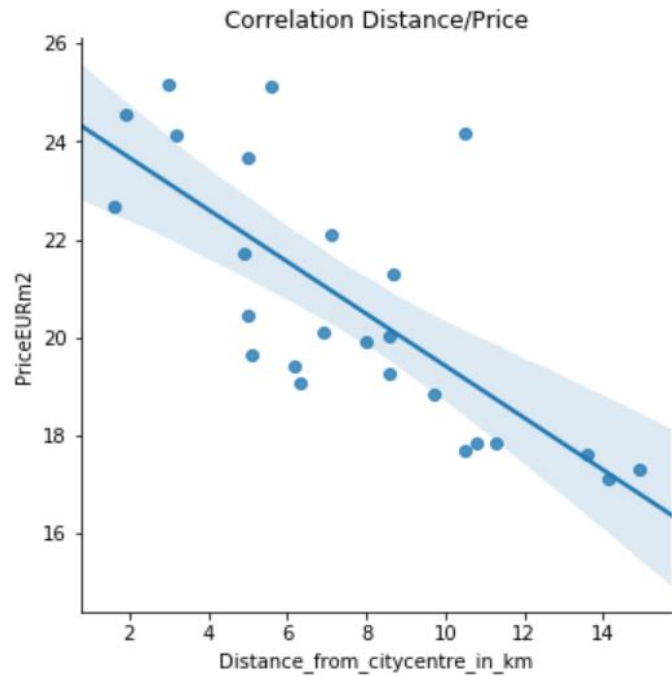
There is a significant correlation between Price/EUR/m2 & Distance from the city centre (-0.7427)

There is a correlation between Price/EUR/m2 & Density (0.6979)

There is a significant correlation between Density & Distance from the city centre (-0.7919)

**These three correlations relationship will be examined closely.**

	Density(Inh/km2)	Foreigners(%)	PriceEURm2	Distance_from_citycentre_in_km	CriminalActs/Year
Density(Inh/km2)	1.000000	-0.098530	0.697905	-0.791994	0.124203
Foreigners(%)	-0.098530	1.000000	-0.138102	0.064809	0.037091
PriceEURm2	0.697905	-0.138102	1.000000	-0.742745	0.541222
Distance_from_citycentre_in_km	-0.791994	0.064809	-0.742745	1.000000	-0.373864
CriminalActs/Year	0.124203	0.037091	0.541222	-0.373864	1.000000



### **-0.7427 Distance/Price**

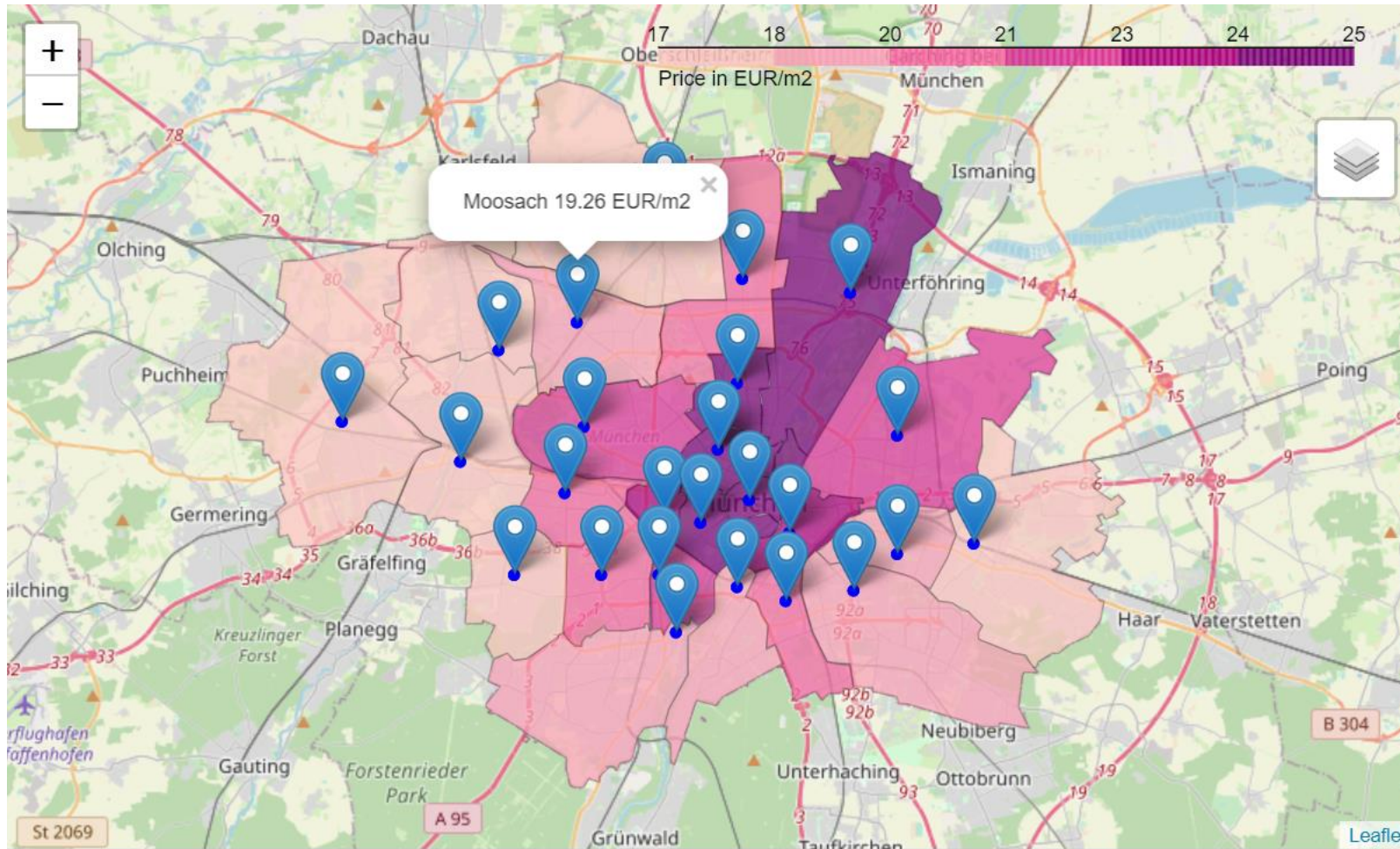
- further away from city centre, cheaper the prices for accommodation,
- cheapest and most expensive neighbourhoods are clearly defined,
- middle price segment is mixed.

### **0.6979 Density/Price**

- tendency: denser neighbourhoods are more expensive
- density around 2.000 Inh/km2 builds cheapest cluster

### **-0.7919 Density/Distance**

- further away from city centre, less dense
- probably more agriculture outside of the city
- more possibilities to find an accommodation outside of the city



# Price Analysis

## Insights:

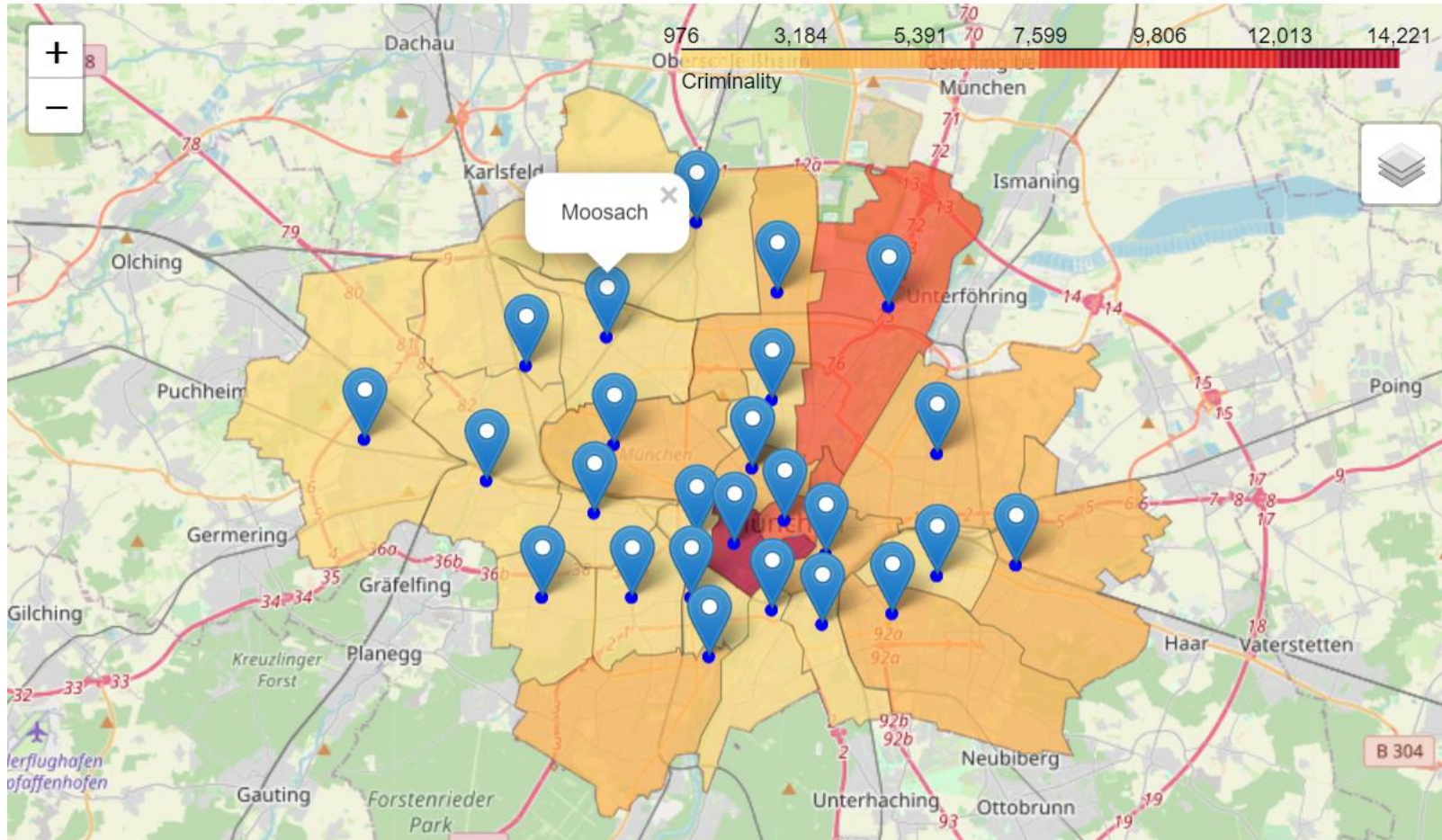
More central, more expensive

West of Munich has several cheap neighbourhoods

Schwabing Freiman, generally expensive also when further outside of the city

All neighbourhoods close to the 'English garden' Park are expensive





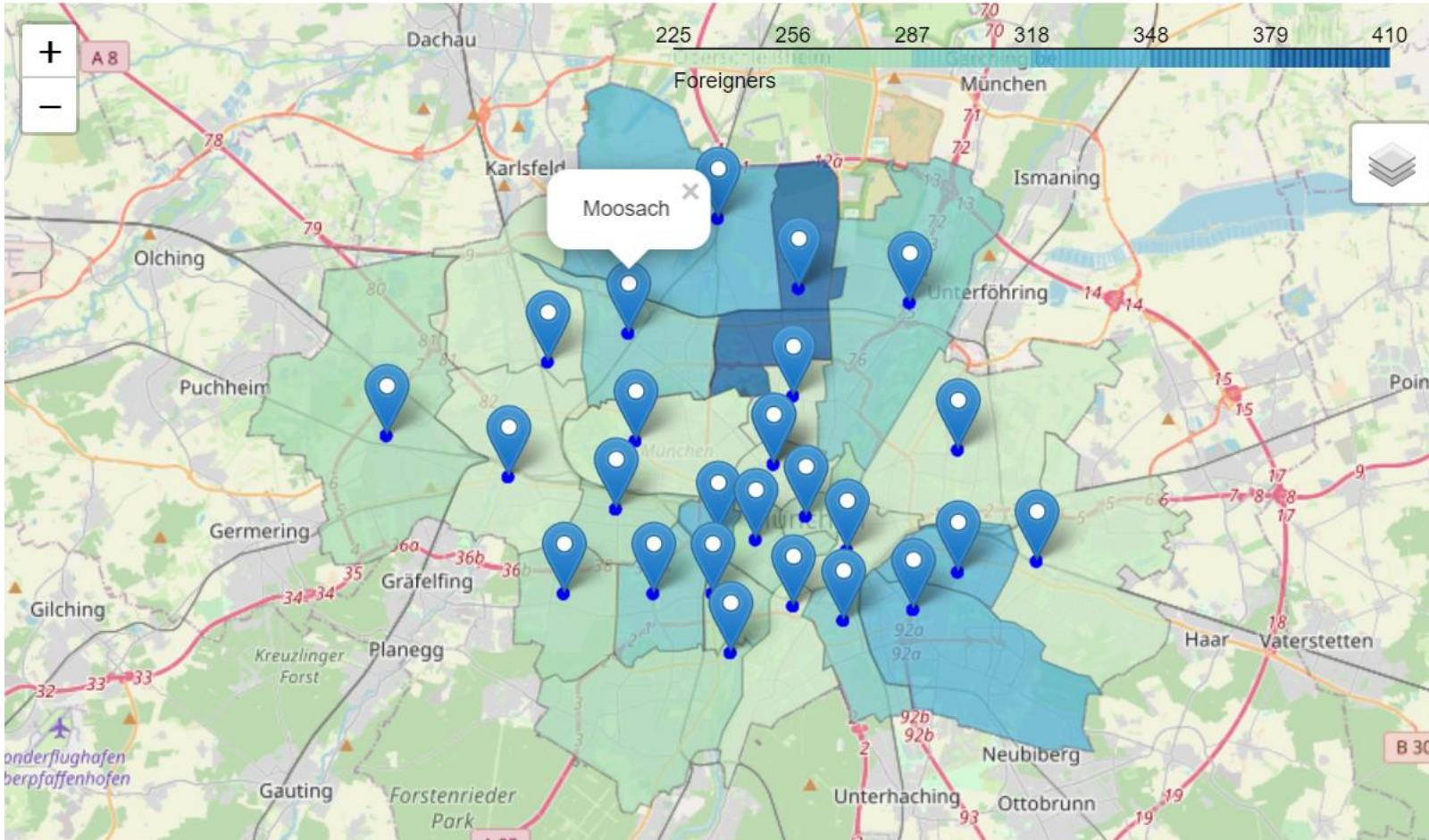
# Criminality Analysis

## Insights:

Central train station area belongs to the most dangerous neighbourhood

some of the most expensive neighbourhoods are also most dangerous

the further out of the city you go, the safer are the neighbourhoods



# Foreigners Analysis

## Insights:

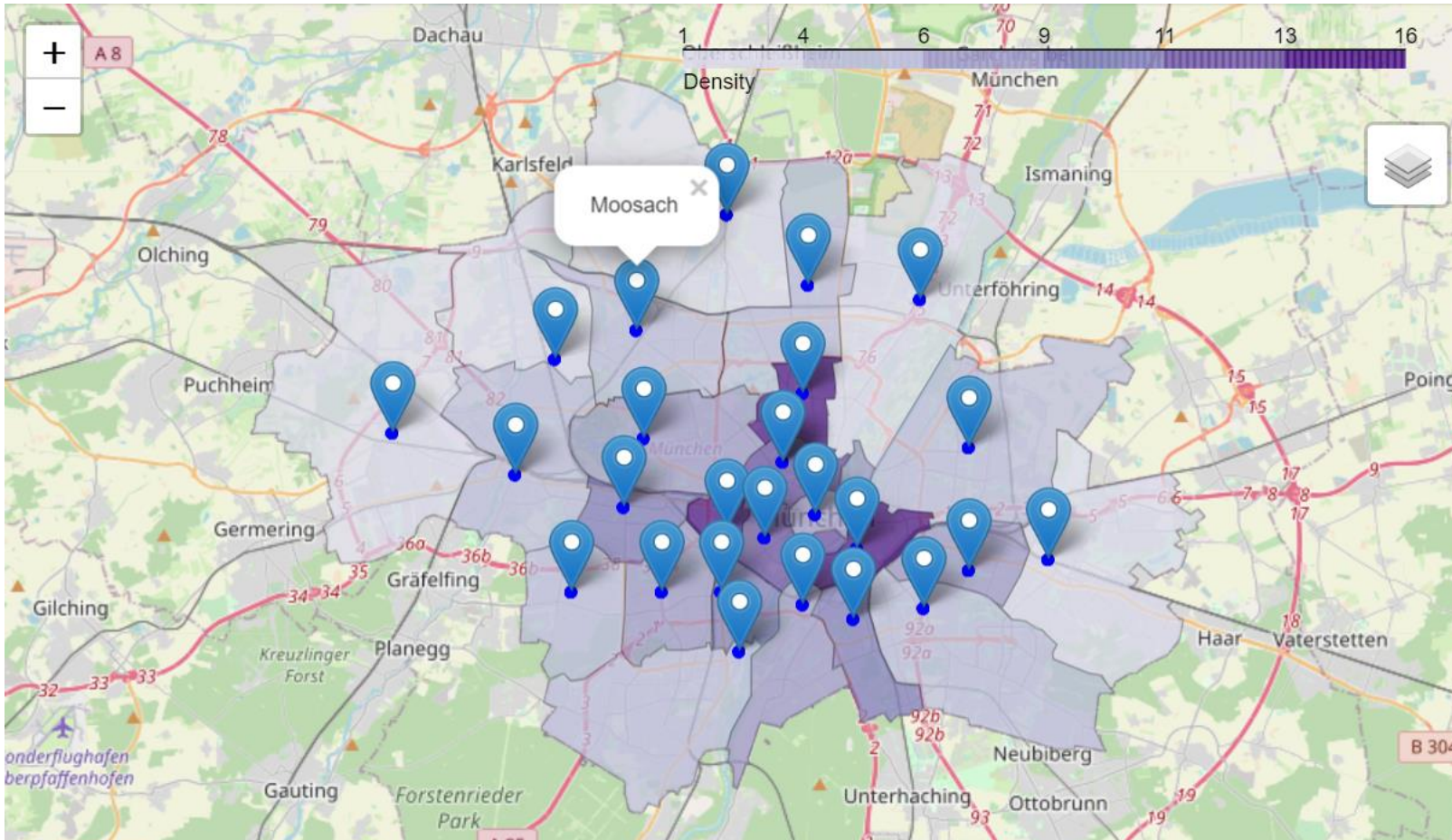
Highest percentage of foreigners: Milbertshofen - am Hart, 41%

Minimum of 22.5% of foreigners in each neighbourhood

Western and Eastern outside neighbourhood have lowest amount of foreigners

North Area has highest amount of foreigners





# Density Analysis

Insights:

city centre neighbourhoods  
are denser populated as  
outside neighbourhoods

Within outside ring,  
probably more 'village'  
feeling and agriculture land

Schwabing West, most  
denser part of the city

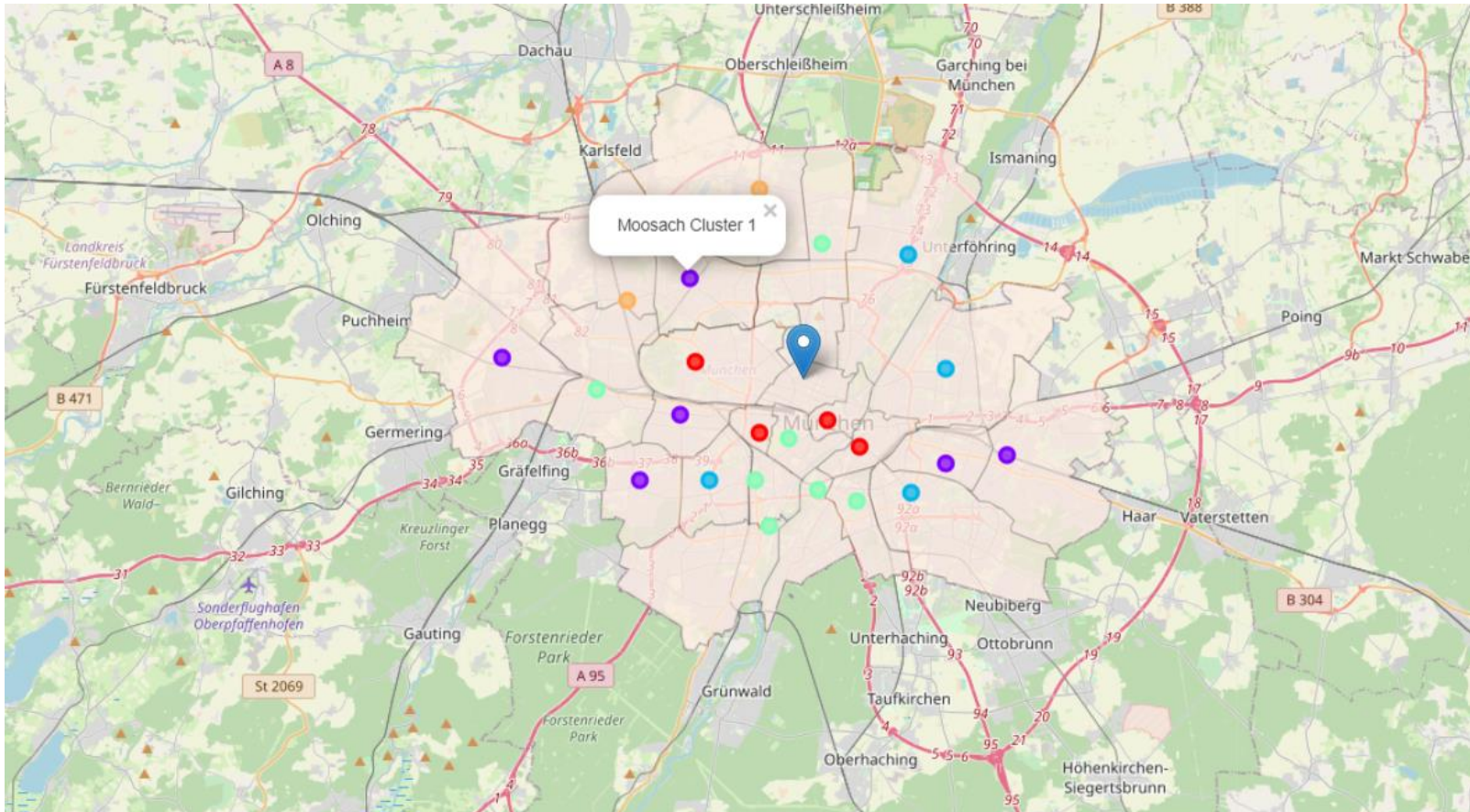
	name	categories	lat	lng
0	Westpark	Park	48.122594	11.514015
1	Wöllinger	Brewery	48.113050	11.519748
2	Thalassa	Greek Restaurant	48.111216	11.517364
3	Seebühne im Westpark	Performing Arts Venue	48.123489	11.511789
4	Kino, Mond & Sterne	Indie Movie Theater	48.123530	11.511852

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Allach-Untermenzing	Bus Stop	Supermarket	Italian Restaurant	Home Service	Turkish Restaurant
1	Altstadt-Lehel	Café	Department Store	Boutique	Hotel	Clothing Store
2	Au-Haidhausen	Concert Hall	Thai Restaurant	Afghan Restaurant	Restaurant	Pool
3	Aubing-Lochhausen-Langwied	Bakery	Supermarket	Bus Stop	Soccer Field	Hotel
4	Berg am Laim	Bakery	Hotel	Supermarket	Metro Station	Asian Restaurant

## Foursquare neighborhood analysis

Foursquare API provides free data and rich content about more than 100k venues. This data were used to analyse further Munich 25 neighbourhoods to better understand each individual characteristics and prepare the data for clustering.





# K-mean clustering

The data from **foursquare API** were analysed, cleaned and prepared for clustering using combination of main Munich dataframe and new dataframe gained from foursquare API. Within the foursquare data, focused lied on first 30 venues within Radius of 1km of centre point of each neighbourhood.

Cluster column were added for further clustering of the neighbourhoods. K-means clustering, and folium libraries were used to cluster and visualize the data.

# Results – Cluster No.1

	Neighborhood_x	Latitude	Longitude	PriceEURm2	Distance_from_citycentre_in_km	CriminalActs/Year	Label	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Altstadt-Lehel	48.137828	11.574582	24.55	1.9	8205.0	Altstadt-Lehel\n24.55 EUR/m2	0	Café	Department Store	Boutique	Hotel	Clothing Store
4	Au-Haidhausen	48.128753	11.590536	22.68	1.6	3531.0	Au-Haidhausen\n22.68 EUR/m2	0	Concert Hall	Thai Restaurant	Afghan Restaurant	Restaurant	Pool
7	Schwanthalerhöhe	48.133782	11.541057	23.67	5.0	1703.0	Schwanthalerhöhe\n23.67 EUR/m2	0	Café	Asian Restaurant	Italian Restaurant	Outdoor Sculpture	Museum
8	Neuhausen-Nymphenburg	48.157124	11.509703	22.09	7.1	3913.0	Neuhausen-Nymphenburg\n22.09 EUR/m2	0	Café	Italian Restaurant	Greek Restaurant	German Restaurant	Tram Station

## Cluster No. 1 Characteristics:

- Coffee and Restaurants cluster
- Distance from the city centre up to 7km
- Average renting price is more than 22EUR/per m2 – expensive neighbourhoods

# Results – Cluster No.2

	Neighborhood_x	Latitude	Longitude	PriceEURm2	Distance_from_citycentre_in_km	CriminalActs/Year	Label	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
9	Moosach	48.184241	11.506496	19.26	8.6	2796.0	Moosach\n19.26 EUR/m2	1	Supermarket	Bakery	Drugstore	Plaza	Hotel
13	Berg am Laim	48.123483	11.633451	19.40	6.2	2322.0	Berg am Laim\n19.40 EUR/m2	1	Bakery	Hotel	Supermarket	Metro Station	Asian Restaurant
14	Trudering-Riem	48.126036	11.663338	17.84	10.8	3251.0	Trudering-Riem\n17.84 EUR/m2	1	Supermarket	Drugstore	Bakery	German Restaurant	Hotel
19	Hadern	48.118064	11.481842	17.69	10.5	1556.0	Hadern\n17.69 EUR/m2	1	Supermarket	Bus Stop	German Restaurant	Metro Station	Asian Restaurant
21	Aubing-Lochhausen-Langwied	48.158437	11.414066	17.30	14.9	1620.0	Aubing-Lochhausen-Langwied\n17.30 EUR/m2	1	Bakery	Supermarket	Bus Stop	Soccer Field	Hotel
24	Laim	48.139551	11.502166	19.93	8.0	2413.0	Laim\n19.93 EUR/m2	1	Supermarket	Greek Restaurant	Gastropub	Drugstore	Doner Restaurant

## Cluster No. 2 Characteristics:

- Supermarket and Bakeries neighbourhoods
- Distance from the city centre between 6.2 - 15km
- Average renting price is between 17.30 – 19.93EUR/per m2 – average neighbourhoods
- Low criminality rate

# Results – Cluster No.3

	Neighborhood_x	Latitude	Longitude	PriceEURm2	Distance_from_citycentre_in_km	CriminalActs/Year	Label	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
6	Sendling-Westpark	48.117986	11.516253	20.11	6.9	2234.0	Sendling-Westpark\n20.11 EUR/m2	2	Bus Stop	Bakery	Garden	Intersection	Italian Restaurant
11	Schwabing-Freimann	48.191958	11.614275	24.18	10.5	8413.0	Schwabing-Freimann\n24.18 EUR/m2	2	Fast Food Restaurant	Concert Hall	Bakery	Bus Stop	Comedy Club
12	Bogenhausen	48.154782	11.633484	21.30	8.7	3225.0	Bogenhausen\n21.30 EUR/m2	2	Bus Stop	Park	Drugstore	Hotel	Italian Restaurant
15	Ramersdorf-Perlach	48.113916	11.615699	19.05	6.3	4712.0	Ramersdorf-Perlach\n19.05 EUR/m2	2	Bus Stop	Bakery	Chinese Restaurant	Park	Taverna

## Cluster No. 3 Characteristics:

- Supermarket and Bakeries neighbourhoods
- Distance from the city centre between 6.3 – 10.5km
- Average renting price is between 19.05– 24.18EUR/per m2 – tendence expensive neighbourhoods
- Average to high criminality rate



# Results – Cluster No.4

	Neighborhood_x	Latitude	Longitude	PriceEURm2	Distance_from_citycentre_in_km	CriminalActs/Year	Label	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
1	Ludwigsvorstadt-Isarvorstadt	48.131771	11.555809	24.15	3.2	14091.0	Ludwigsvorstadt-Isarvorstadt\n24.15 EUR/m2	3	Café	Vietnamese Restaurant	German Restaurant	Italian Restaurant	Outdoor Sculpture
5	Sendling	48.118012	11.539083	21.71	4.9	1983.0	Sendling\n21.71 EUR/m2	3	Café	German Restaurant	Hotel	Drugstore	Gym
10	Milbertshofen-Am Hart	48.195925	11.571815	20.01	8.6	3987.0	Milbertshofen-Am Hart\n20.01 EUR/m2	3	Café	Hotel	Bus Stop	Bakery	Metro Station
16	Obergiesing-Fasangarten	48.111156	11.588909	20.45	5.0	2574.0	Obergiesing-Fasangarten\n20.45EUR/m2	3	Greek Restaurant	Ice Cream Shop	Gym / Fitness Center	Café	Hotel
17	Untergiesing-Harlaching	48.114963	11.570189	19.66	5.1	1691.0	Untergiesing-Harlaching\n19.66 EUR/m2	3	German Restaurant	Italian Restaurant	Restaurant	Beach	Café
18	Thalkirchen-Obersendling-Forstenried-Fürstenried-Riem	48.102840	11.545979	18.84	9.7	3311.0	Thalkirchen-Obersendling-\n18.84 EUR/m2	3	Zoo Exhibit	German Restaurant	Beer Garden	Greek Restaurant	Italian Restaurant
20	Pasing-Obermenzing	48.147785	11.460701	17.83	11.3	3103.0	Pasing-Obermenzing\n17.83 EUR/m2	3	Coffee Shop	Café	German Restaurant	Drugstore	Spa

## Cluster No. 4 Characteristics:

- Biggest cluster
- Distance from the city centre between 3 – 11km
- Average renting price is between 17.83 – 24.15EUR/per m2 – mixed from cheap to expensive
- Low criminality rate, except 'Ludwigsvorstadt-Isarvorstadt'

# Results – Cluster No.5

	Neighborhood_x	Latitude	Longitude	PriceEURm2	Distance_from_citycentre_in_km	CriminalActs/Year	Label	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
22	Allach-Untermenzing	48.176884	11.476058	17.62	13.6	1106.0	Allach-Untermenzing\n17.62 EUR/m2	4	Bus Stop	Supermarket	Italian Restaurant	Home Service	Turkish Restaurant
23	Feldmoching-Hasenberg	48.213804	11.541275	17.12	14.1	2035.0	Feldmoching-Hasenberg\n17.12 EUR/m2	4	Bus Stop	Plaza	Supermarket	Bakery	Café

## Cluster No. 5 Characteristics:

- Price Range around 17 EUR/m2
- Good connectivity
- Distance Range around 14 km
- Outside of the city

# Discussion

Munich – Analysis of the neighbourhoods for newcomers, showed how different the neighbourhoods really are.

I would like to highlight several key insights from this analysis:

- Further from the city centre, cheaper, safer, and emptier the neighbourhoods are,
- Higher foreigner proportion has nothing to do with criminality rate in Munich,
- All neighbourhoods close to the 'English garden' Park are generally expensive,
- Main train Station Neighbourhood (Ludwigsvorstadt-Isarvorstadt) ist most dangerous and also one of the most expensive places to live in Munich,
- Density proportion may be a good key to assume accommodation availability.

# Conclusion

In this study, I analysed Munich 25 neighbourhoods, their similarities and differences to help newcomers orientate and find suitable and appropriate place to start their live in Munich.

I identified price as a main feature for decision making process. Along price there were another important feature as distance from the city centre, foreigners share, criminality, and density.

I discovered the data using statistical approaches as a correlation matrix to show relationships between the features as well as machine learning model using k-mean clustering to show similarities between Munich neighbourhoods.

These models can be helpful to compare neighbourhoods of newcomer choice with other maybe cheaper or safer neighbourhoods with same characteristics