



THE BATTLE OF NEIGHBORHOODS

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1. INTRODUCTION

- **Background:** Safety is a top concern when moving to a new area. If you don't feel safe in your own home, you're not going to be able to enjoy living there.
- **Problem:** This project aims to select the safest borough in Berlin based on the total crimes, explore the neighborhoods of that borough to find the 10 most common venues in each neighborhood and finally cluster the neighborhoods using k-mean clustering.
- **Interest:** Expats who are considering to relocate to Berlin will be interested to identify the safest borough in Berlin and explore its neighborhoods and common venues around each neighborhood.

2. DATA ACQUISITION AND CLEANING

Data Acquisition: The data acquired for this project is a combination of data from Kaggle:

- The data source of the project uses a Berlin crime data from kagle that shows the crime per borough in Berlin.

DATA CLEANING

The data cleaning process for each of the three sources of data are done separately.

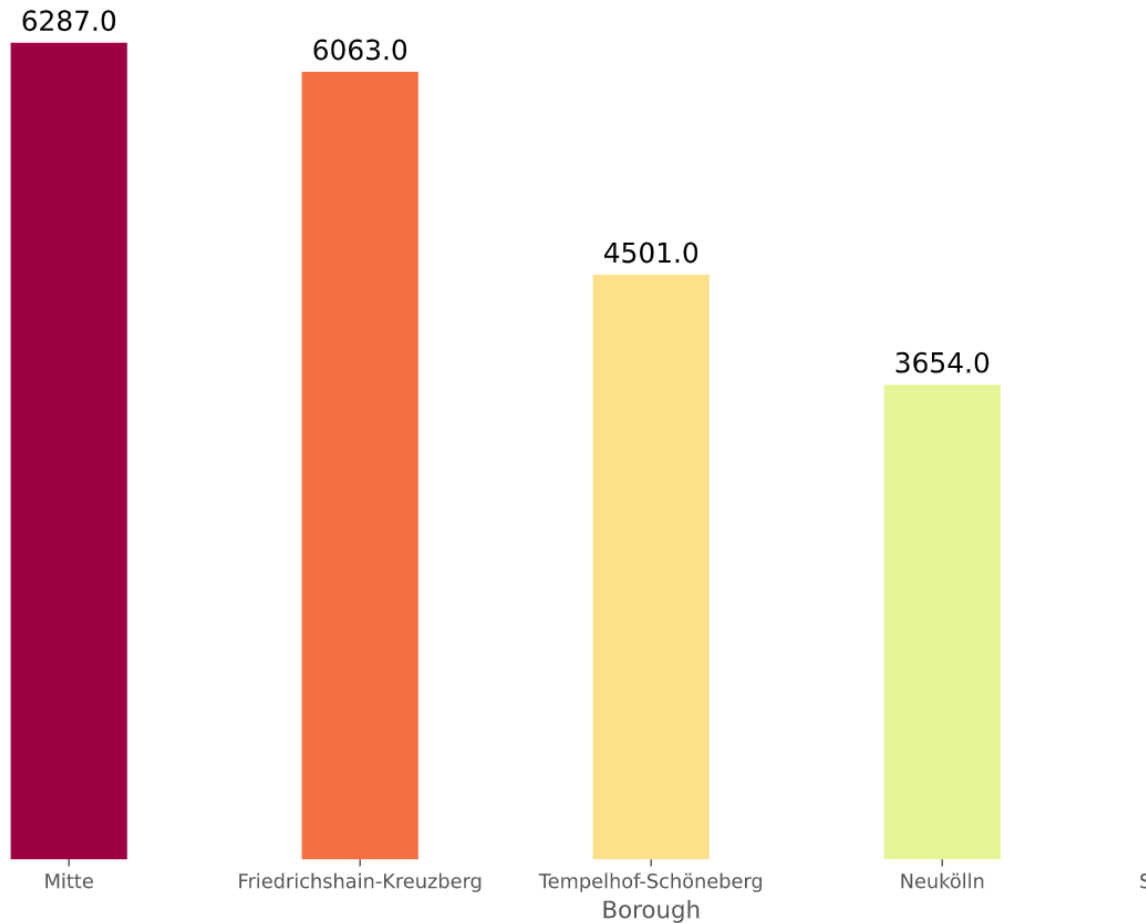
- From the Berlin crime data, the crimes during the most recent year (2019) are only selected.
- After visualizing the crime in each borough we can find the borough with the lowest crime rate. The third data set is created, with the names of the neighborhoods and the name of the borough with the latitude and longitude obtained using Google Maps API geocoding.
- The new data set is used to generate the 10 most common venues for each neighborhood using the Foursquare API, finally using k means clustering algorithm to cluster similar neighborhoods together.

3. METHODOLOGY

	Robbery	Street_robbery	Injury	Agg_assault	Threat	Theft	Car	From_car	Bike	Burglary	Fire	Arson	Damage	Graffiti	Drugs
count	12.000000	12.000000	12.000000	12.000000	12.000000	12.000000	12.000000	12.000000	12.000000	12.000000	12.000000	12.000000	12.000000	12.000000	12.000000
mean	33.250000	20.000000	315.333333	80.000000	106.750000	1465.916667	40.416667	187.250000	203.583333	57.083333	19.000000	8.000000	313.833333	70.750000	143.333333
std	23.775943	16.431677	167.226756	54.883347	45.104172	866.710968	10.689488	78.008304	119.960947	24.489175	6.980492	2.558409	147.709071	46.912152	170.997253
min	8.000000	5.000000	117.000000	27.000000	41.000000	529.000000	26.000000	83.000000	78.000000	22.000000	10.000000	4.000000	135.000000	24.000000	30.000000
25%	19.750000	10.750000	215.000000	46.000000	78.500000	853.000000	33.500000	130.500000	99.000000	38.250000	12.000000	5.750000	216.000000	36.750000	46.000000
50%	23.500000	13.000000	252.000000	56.500000	93.500000	1133.000000	38.500000	164.000000	188.500000	54.500000	19.500000	8.500000	258.000000	48.500000	63.000000
75%	44.000000	25.000000	382.250000	99.000000	134.000000	1866.000000	45.250000	241.500000	257.000000	78.500000	23.750000	10.250000	384.750000	92.250000	161.500000
max	91.000000	64.000000	690.000000	195.000000	196.000000	3236.000000	60.000000	319.000000	455.000000	97.000000	31.000000	11.000000	594.000000	162.000000	581.000000

The count for each of the major categories of crime returns the value 12 which is the number of Berlin boroughs. 'Theft' is the highest reported crime during the year 2019 followed by 'Damage' and 'Drugs'.

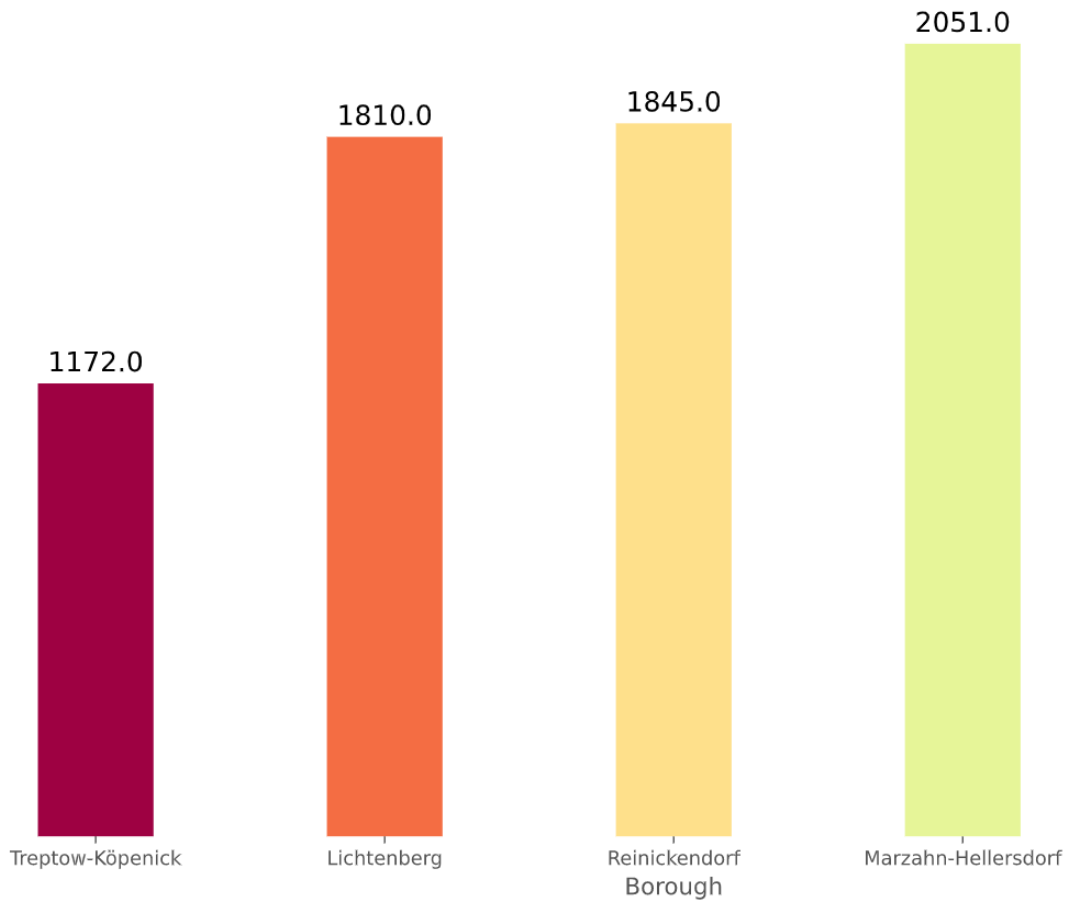
Berlin Boroughs with the Highest no. of crime



**BERLIN BOROUGH WITH
HIGHEST NO. OF CRIMES**

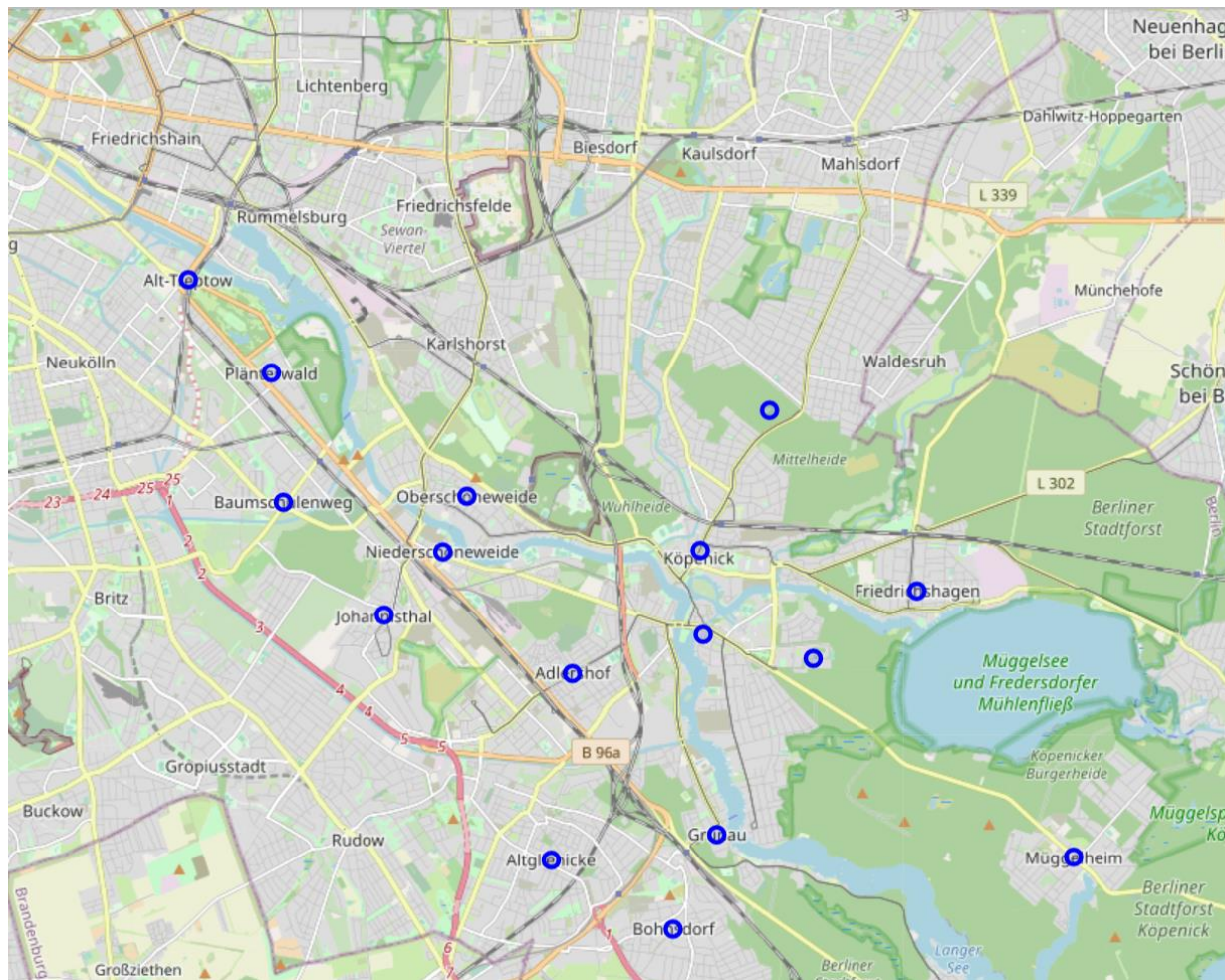
- Comparing five boroughs with the highest crime rate during the year 2019 it is evident that Mitte has the highest crimes recorded followed by Friedrichshain-Kreuzberg, Tempelhof-Schöneberg, Neuköl and Steglitz-Zehlendorf.
- Mitte has a significantly higher crime rate than the other 4 boroughs

Berlin Boroughs with the Lowest no. of crime



**BERLIN BOROUGH WITH
LOWEST NO. OF CRIMES**

- Comparing five boroughs with the lowest crime rate during the year 2019, Treptow-Köpenick has the lowest recorded crimes followed by Lichtenberg, Reinickendorf, Marzahn-Hellersdorf and Spandau



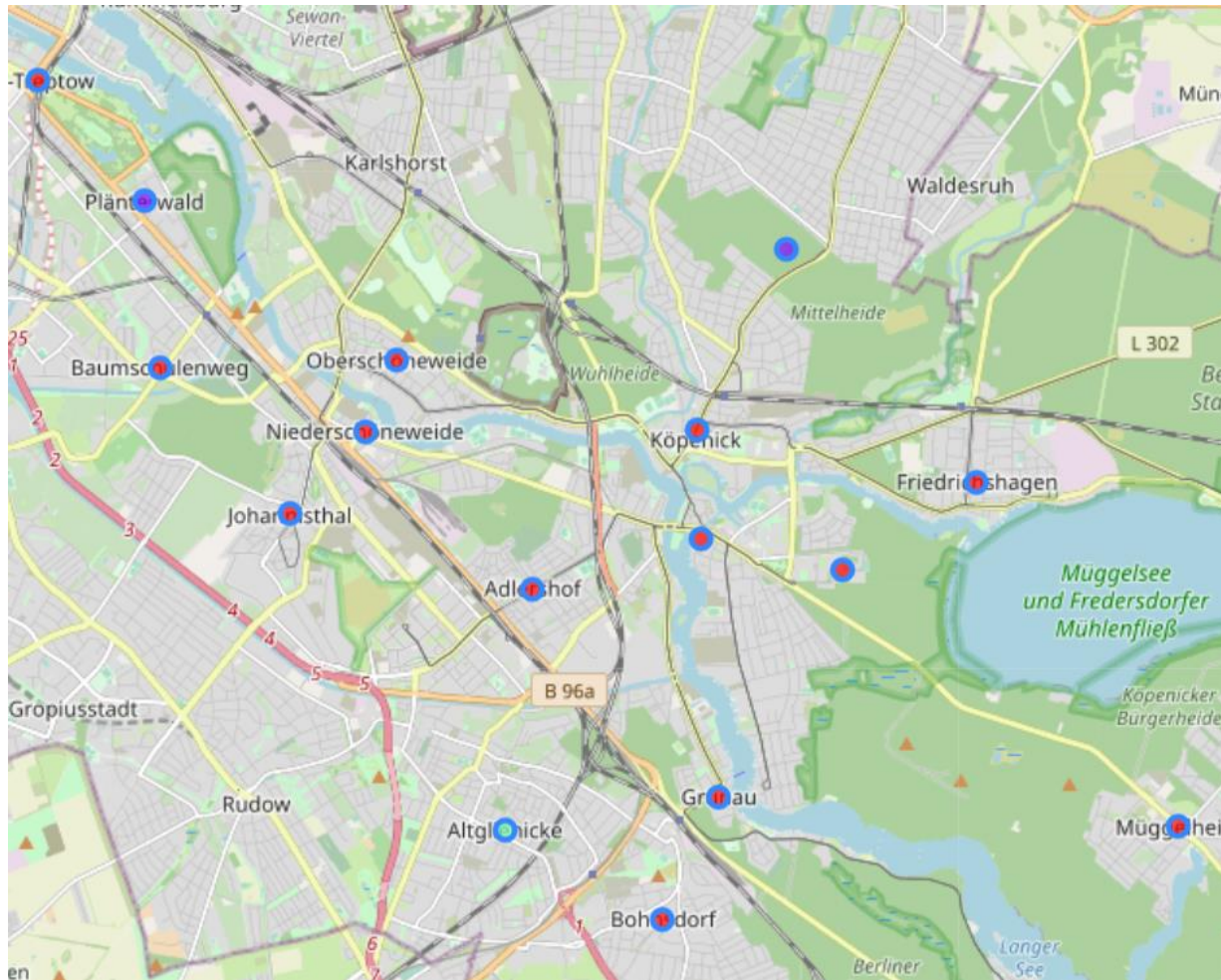
There are 16 neighborhoods in the royal borough of Treptow-Köpenick, they are visualised on a map using folium on python.

NEIGHBORHOODS IN TREPTOW-KÖPENICK

MODELLING

- Using the final data set containing the neighborhoods in Treptow-Köpenick along with the latitude and longitude, we can find all the venues within a 500 meter radius of each neighborhood by connecting to the Foursquare API.
- We will use a cluster size of 5 for this project that will cluster the 16 neighborhoods into 3 clusters.

	Neighborhood	Neighborhood_Latitude	Neighborhood_Longitude	Venue	Venue_Latitude	Venue_Longitude	Venue_Category
0	Alt-Treptow	52.492563	13.459874	Der Holländer	52.491981	13.459416	Garden Center
1	Alt-Treptow	52.492563	13.459874	ELSE	52.495205	13.462637	Nightclub
2	Alt-Treptow	52.492563	13.459874	Tapas No. 6	52.490133	13.456732	Tapas Restaurant
3	Alt-Treptow	52.492563	13.459874	Molecule Man	52.497000	13.459093	Outdoor Sculpture
4	Alt-Treptow	52.492563	13.459874	Hafenräucherei Treptow "Löcknitz"	52.493991	13.463445	Seafood Restaurant



Each cluster is color coded for the ease of presentation, we can see that majority of the neighborhood falls in the red cluster which is the first cluster. Three neighborhoods have their own cluster (Blue, Purple and Yellow), these are clusters two three and five. The green cluster consists of two neighborhoods which is the 4th cluster.

4. RESULTS

CLUSTER 1: LOOKING INTO THE NEIGHBORHOODS IN THE FIRST CLUSTER

	Borough	Neighborhood	Latitude	Longitude	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	Treptow-Köpenick	Alt-Treptow	52.492563	13.459874	0	Bakery	Café	Warehouse Store	Platform	Gym / Fitness Center	Vietnamese Restaurant	Electronics Store	Drugstore	Italian Restaurant	Light Rail Station
2	Treptow-Köpenick	Baumschulenweg	52.461694	13.481548	0	Asian Restaurant	Supermarket	Ice Cream Shop	Drugstore	Warehouse Store	Flower Shop	Doner Restaurant	Electronics Store	Falafel Restaurant	Farmers Market
3	Treptow-Köpenick	Johannisthal	52.445911	13.504547	0	Park	Tram Station	Taverna	Pizza Place	Sushi Restaurant	Movie Theater	Dessert Shop	Pub	Electronics Store	Convenience Store
4	Treptow-Köpenick	Oberschöneeweide	52.462456	13.523476	0	Supermarket	Café	Burger Joint	Pizza Place	German Restaurant	Falafel Restaurant	History Museum	Asian Restaurant	Tram Station	Bank
5	Treptow-Köpenick	Niederschöneeweide	52.454820	13.517877	0	Beach	Motel	Restaurant	Fast Food Restaurant	Italian Restaurant	Indian Restaurant	Ice Cream Shop	Miscellaneous Shop	Greek Restaurant	Convenience Store
6	Treptow-Köpenick	Adlershof	52.437893	13.547550	0	Trattoria/Osteria	Greek Restaurant	Bank	Supermarket	Steakhouse	Drugstore	Plaza	Italian Restaurant	Warehouse Store	Farmers Market
8	Treptow-Köpenick	Bohnsdorf	52.402243	13.570665	0	Ice Cream Shop	Electronics Store	Insurance Office	Italian Restaurant	Warehouse Store	Flower Shop	Doner Restaurant	Drugstore	Falafel Restaurant	Farmers Market
9	Treptow-Köpenick	Grünau	52.415427	13.580563	0	Dessert Shop	Boat or Ferry	Tram Station	Historic Site	Café	Restaurant	Doner Restaurant	Drugstore	Electronics Store	Falafel Restaurant
11	Treptow-Köpenick	Allende-Viertel	52.439869	13.602320	0	ATM	Café	Bus Stop	Food Court	Fast Food Restaurant	Doner Restaurant	Drugstore	Electronics Store	Falafel Restaurant	Farmers Market
12	Treptow-Köpenick	Altstadt-Kietz	52.443296	13.577312	0	Café	German Restaurant	Plaza	Greek Restaurant	Cocktail Bar	Palace	Ice Cream Shop	Sushi Restaurant	Bar	Park
13	Treptow-Köpenick	Müggelheim	52.412165	13.661954	0	American Restaurant	IT Services	Harbor / Marina	German Restaurant	Café	Warehouse Store	Fast Food Restaurant	Drugstore	Electronics Store	Falafel Restaurant
14	Treptow-Köpenick	Friedrichshagen	52.449380	13.626272	0	Café	Ice Cream Shop	Park	Brewery	German Restaurant	Flower Shop	Italian Restaurant	Drugstore	Organic Grocery	Cajun / Creole Restaurant
15	Treptow-Köpenick	Rahnsdorf/Hessenwinkel	52.438882	13.718101	0	Post Office	Café	Light Rail Station	Warehouse Store	Fast Food Restaurant	Doner Restaurant	Drugstore	Electronics Store	Falafel Restaurant	Farmers Market
16	Treptow-Köpenick	Dammvorstadt	52.454932	13.576645	0	Clothing Store	Electronics Store	Drugstore	Café	Shoe Store	Gym / Fitness Center	German Restaurant	Indian Restaurant	Doner Restaurant	Burger Joint

- The cluster one is the biggest cluster with 12 of the 16 neighborhoods in the borough Treptow-Köpenick. Upon closely examining these neighborhoods we can see that the most common venues in these neighborhoods are Restaurants, and bus stop and train station.

CLUSTER 2: LOOKING INTO THE NEIGHBORHOODS IN THE SECOND CLUSTER.

Cluster 2

```
[47]: cluster_2 = df_merge[df_merge['Cluster Labels']==1]
cluster_2
```

	Borough	Neighborhood	Latitude	Longitude	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
1	Treptow-Köpenick	Plänterwald	52.479544	13.478808	1	Bus Stop	Supermarket	Light Rail Station	Warehouse Store	Fast Food Restaurant	Doner Restaurant	Drugstore	Electronics Store	Falafel Restaurant	Farmers Market
10	Treptow-Köpenick	Köpenick-Süd	52.474385	13.592336	1	Tram Station	Bus Stop	Warehouse Store	Flower Shop	Doner Restaurant	Drugstore	Electronics Store	Falafel Restaurant	Farmers Market	Fast Food Restaurant

Cluster 3: Looking into the neighborhoods in the third cluster.

Cluster 3

```
[48]: cluster_3 = df_merge[df_merge['Cluster Labels']==2]
cluster_3.head()
```

	Borough	Neighborhood	Latitude	Longitude	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
7	Treptow-Köpenick	Altglienicke	52.411838	13.542646	2	Shipping Store	Warehouse Store	Fast Food Restaurant	Dessert Shop	Doner Restaurant	Drugstore	Electronics Store	Falafel Restaurant	Farmers Market	Flower Shop

5. DISCUSSION

- The aim of this project is to help people who want to relocate to the safest borough in Berlin, expats can choose the neighborhoods to which they want to relocate based on the most common venues in it.
- For example, if a person is looking for a neighborhood with good connectivity and public transportation, we can see that Cluster 1 has Train stations and Bus stops as the most common venues.
- If a person is looking for a neighborhood with stores and restaurants in a proximity, then the neighborhoods in clusters 2 & 3 are suitable.
- For a family I feel that the neighborhoods in Cluster 2 are more suitable due to the common venues in that cluster, these neighborhoods have common venues such as Parks, Gym/Fitness centers, Restaurants and Electronics Stores which is ideal for a family.

6. CONCLUSION

- This project helps a person get a better understanding of the neighborhoods with respect to the most common venues in that neighborhood. It is always helpful to make use of technology to stay one step ahead i.e. finding out more about places before moving into a neighborhood.
- We have just taken safety as a primary concern to shortlist the safest borough of Berlin. The future of this project includes taking other factors such as cost of living in the areas into consideration to shortlist the borough, such as filtering areas based on a predefined budget.