Capstone Project

Final Report

Introduction / Business Problem

The company Clinton is specializing in selling clothes in the region Germany, Austria and Switzerland and currently operates more then 200 stores in the given countries. The expansion department is planning to leverage the low rent prices due to corona crisis and open additional stores.

In order to make a better decision on the particular locations, the expansion department needs additional analysis of the existing stores based on the venues which are located in close proximity to the stores. That is why they asked for a separate classification of the existing stores in order to be implemented into their normal store classification system (store type, store size, rent, brand protfolio, etc.).

Data Description

For creating of additional classification, the locations of the existing stores will be used. The addresses of the stores will be scraped at the official website of the company in the section „Storefinder“ https://www.campdavid-soccx.de/storefinder/

Afterwards the store addresses will be translated into geographical coordinates in order to be used for foursquare queries enabling getting the venues which are placed in close proximity to the stores.

Having the data on the close venues from foursqure, a further analysis will be done using K-Means in order to cluster the existing stores according to the wishes of the expansion department.

Methodology

First we scrape the addresses of the existing stores at the official website of the company in the section „Storefinder“ https://www.campdavid-soccx.de/storefinder/ and import them into our Notebook as a dataframe.

```
df_data_0 = pd.read_excel(body)
df_data_0.head()
```

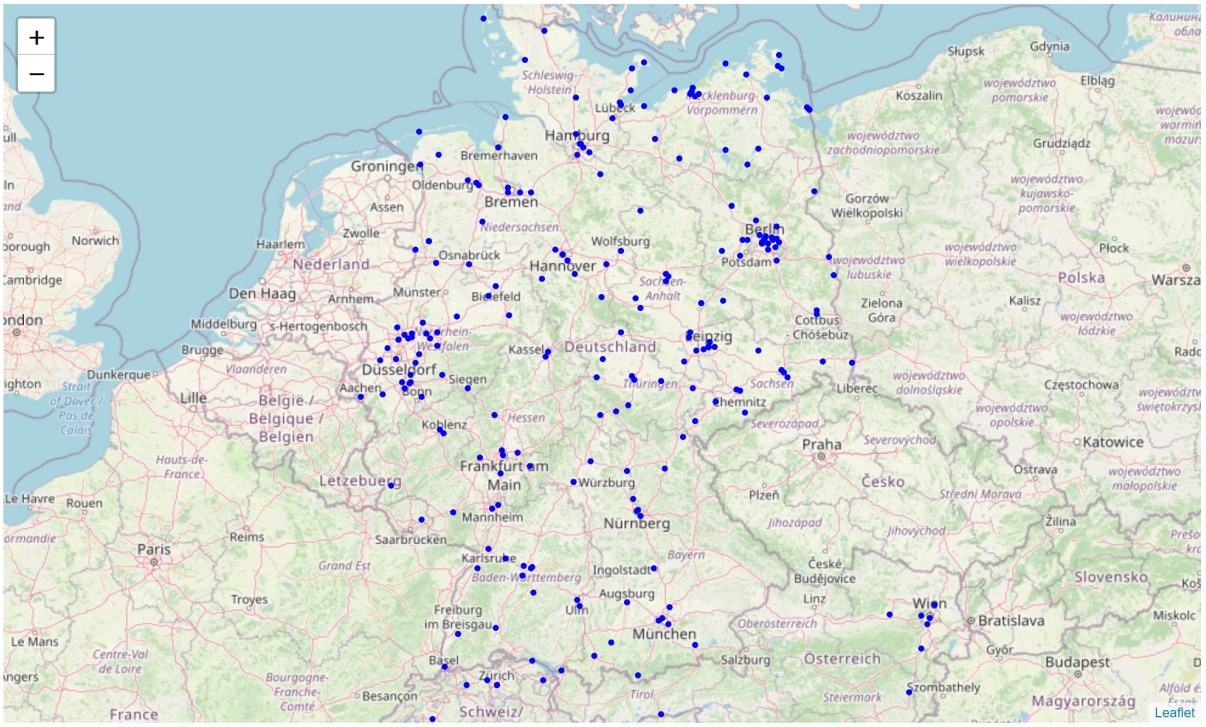
	Name	Adresse	Stadt	Adresse Voll
0	CAMP DAVID | SOCCX Köln Rhein-Center	Aachener Straße 1253	50858 Köln	Aachener Straße 1253, 50858 Köln
1	THE STORE - CAMP DAVID | SOCCX Oldenburg	Achternstrasse 15-16	26122 Oldenburg	Achternstrasse 15-16, 26122 Oldenburg
2	CAMP DAVID | SOCCX Kurplatz Norderney	Adolfsreihe 6	26548 Norderney	Adolfsreihe 6, 26548 Norderney
3	CAMP DAVID | SOCCX Bremen Waterfront	AG-Weser-Str. 3	28237 Bremen	AG-Weser-Str. 3, 28237 Bremen
4	CAMP DAVID | SOCCX Auhof Center	Albert-Schweitzer-Gasse 6	1140 Wien	Albert-Schweitzer-Gasse 6, 1140 Wien

Using geopy we export the geographic coordinates for every address of the store and add them to the given dataframe.

	Name	Adresse	Stadt	Adresse Voll	Koordinaten	Latitude	Longitude
0	CAMP DAVID | SOCCX Köln Rhein-Center	Aachener Straße 1253	50858 Köln	Aachener Straße 1253, 50858 Köln	(50.9379663, 6.8356055)	50.937966	6.835605
1	THE STORE - CAMP DAVID | SOCCX Oldenburg	Achternstrasse 15-16	26122 Oldenburg	Achternstrasse 15-16, 26122 Oldenburg	(53.1398992, 8.214873)	53.139899	8.214873
2	CAMP DAVID | SOCCX Kurplatz Norderney	Adolfsreihe 6	26548 Norderney	Adolfsreihe 6, 26548 Norderney	(53.7053468, 7.1449215)	53.705347	7.144921
3	CAMP DAVID | SOCCX Bremen Waterfront	AG-Weser-Str. 3	28237 Bremen	AG-Weser-Str. 3, 28237 Bremen	(53.112409, 8.7475121)	53.112409	8.747512
4	CAMP DAVID | SOCCX Auhof Center	Albert-Schweitzer-Gasse 6	1140 Wien	Albert-Schweitzer-Gasse 6, 1140 Wien	(48.2080377, 16.2169543)	48.208038	16.216954
5	CAMP DAVID Wuppertal City Arkaden	Alte Freiheit 9	42103 Wuppertal	Alte Freiheit 9, 42103 Wuppertal	(51.257386249999996, 7.150247967143873)	51.257386	7.150248
6	CAMP DAVID Allee-Center	Altenessener Straße 411	45329 Essen	Altenessener Straße 411, 45329 Essen	(51.49694615, 7.007080447458477)	51.496946	7.007080
7	CAMP DAVID | SOCCX Roland-Center Bremen	Alter Dorfweg 30-50	28259 Bremen	Alter Dorfweg 30-50, 28259 Bremen	(53.0483493, 8.7444784)	53.048349	8.744478
8	CAMP DAVID | SOCCX Fashion Outlet Wustermark	Alter Spandauer Weg 6B	14641 Wustermark	Alter Spandauer Weg 6B, 14641 Wustermark	(52.54051975, 12.9791788)	52.540520	12.979179
9	CHELSEA Dresden Altmarkt Galerie	Altmarkt 25	01067 Dresden	Altmarkt 25, 01067 Dresden	(51.0499255, 13.7365697)	51.049926	13.736570
10	CAMP DAVID | SOCCX Hof	Altstadt 35	95028 Hof	Altstadt 35, 95028 Hof	(50.3171734, 11.9156464)	50.317173	11.915646
11	CAMP DAVID City-Galerie	Am Bahnhof 40	57072 Siegen	Am Bahnhof 40, 57072 Siegen	(50.87445245, 8.015223594857346)	50.874452	8.015224
12	CHELSEA Hallen Am Borsigturm	Am Borsigturm 2	13507 Berlin	Am Borsigturm 2, 13507 Berlin	(52.584566550000005, 13.28577223538729)	52.584567	13.285772
13	CAMP DAVID Bochum Ruhr-Park	Am Einkaufszentrum 1	44791 Bochum	Am Einkaufszentrum 1, 44791 Bochum	(51.4942742, 7.2813139)	51.494274	7.281314

Then using Folium Library we create a visual representation of the geographical data to get the first impression of the dataset and check ist reliability and correctness.

```
map_germany
```



Afterwards we put in the notebook our foursquare credentials in order to connect with the foursquare database. We generate a request to the foursquare database containing the first store address and exporting up to 100 venues which are located 200 meters from it.

```
results = requests.get(url).json()
results
```

```
ut[10]: {'meta': {'code': 200, 'requestId': '5eee9429fb34b5001bf45d81'},
         'response': {'headerLocation': 'Weiden',
          'headerFullLocation': 'Weiden, Cologne',
          'headerLocationGranularity': 'neighborhood',
          'totalResults': 30,
          'suggestedBounds': {'ne': {'lat': 50.9397663018, 'lng': 6.838456580531849},
           'sw': {'lat': 50.9361662982, 'lng': 6.83275441946815}},
          'groups': [{'type': 'Recommended Places',
            'name': 'recommended',
            'items': [{'reasons': {'count': 0,
               'items': [{'summary': 'This spot is popular',
                 'type': 'general',
                 'reasonName': 'globalInteractionReason'}]},
              'venue': {'id': '4cc1b4f5f82ebfb7cc6c7091',
               'name': 'FC-FanShop',
               'location': {'address': 'Aachener Str. 1253',
                'lat': 50.937859782259345,
                'lng': 6.835595071906055,
```

We group the venues and their categories in a new dataframe „nearby_venues“.

	name	categories	lat	lng
0	FC-FanShop	Sporting Goods Shop	50.937860	6.835595
1	Apple Rhein-Center	Electronics Store	50.937148	6.835336
2	Hollister	Clothing Store	50.937880	6.835327
3	Food Lounge Rhein-Center	Food Court	50.937214	6.836101
4	Starbucks	Coffee Shop	50.937892	6.835435
5	Nespresso	Coffee Shop	50.937690	6.835441
6	Rhein-Center	Shopping Mall	50.937579	6.835213
7	H&M	Clothing Store	50.937848	6.834950
8	Manju	Indian Restaurant	50.937213	6.836090

Afterwards we create a sequence of requests to the foursquare database in order to export the venues for the rest addresses in our initial dataframe and append the list of nearby venues with the rest of foursquare data

```
print(cad_venues.shape)
cad_venues.head()
```

```
(2789, 7)
```

ut[18]:

	Adresse Voll	Latitude	Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Aachener Straße 1253, 50858 Köln	50.937966	6.835605	FC-FanShop	50.937860	6.835595	Sporting Goods Shop
1	Aachener Straße 1253, 50858 Köln	50.937966	6.835605	Apple Rhein-Center	50.937148	6.835336	Electronics Store
2	Aachener Straße 1253, 50858 Köln	50.937966	6.835605	Hollister	50.937880	6.835327	Clothing Store
3	Aachener Straße 1253, 50858 Köln	50.937966	6.835605	Food Lounge Rhein-Center	50.937214	6.836101	Food Court
4	Aachener Straße 1253, 50858 Köln	50.937966	6.835605	Starbucks	50.937892	6.835435	Coffee Shop

We count the number of venues for each store in order to have a better impression of the new dataset as well as to check if our limitations at the requests where not to high.

```
cad_venues.groupby('Adresse Voll').count()
```

ut[19]:

Adresse Voll	Latitude	Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
AG-Weser-Str. 3, 28237 Bremen	11	11	11	11	11	11
Aachener Straße 1253, 50858 Köln	31	31	31	31	31	31
Achternstrasse 15-16, 26122 Oldenburg	32	32	32	32	32	32
Adolfsreihe 6, 26548 Norderney	12	12	12	12	12	12
Albert-Schweitzer-Gasse 6, 1140 Wien	17	17	17	17	17	17
Alte Freiheit 9, 42103 Wuppertal	11	11	11	11	11	11
Altenessener Straße 411, 45329 Essen	8	8	8	8	8	8
Alter Dorfweg 30-50, 28259 Bremen	8	8	8	8	8	8
Alter Spandauer Weg 6B, 14641 Wustermark	19	19	19	19	19	19

Using One hot encoding we transform the new dataset into dummy values using binary outputs (zeros and ones).

```
cad_onehot.head()
```

Out[21]:

	Adresse Voll	ATM	Accessories Store	American Restaurant	Art Gallery	Art Museum	Asian Restaurant	Athletics & Sports	Austrian Restaurant	Auto Dealership	BBQ Joint	Baby Store	Bagel Shop	Bakery	Bank	Bar	Bavarian Restaurant	Beach	Beer Bar	Beer Garden	Beer Store	Belgian Restaurant	Big Box Store	Bike Shop	Bistro	Board Shop	Bookstore	Border Crossing	Boutique	Bo
0	Aachener Straße 1253, 50858 Köln	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	Aachener Straße 1253, 50858 Köln	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Aachener Straße 1253, 50858	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

We group the one-hot formed data by their means in order to weight the venues for each location.

```
cad_grouped = cad_onehot.groupby('Adresse Voll').mean().reset_index()
cad_grouped
```

ut[23]:

	Adresse Voll	ATM	Accessories Store	American Restaurant	Art Gallery	Art Museum	Asian Restaurant	Athletics & Sports	Austrian Restaurant	Auto Dealership	BBQ Joint	Baby Store	Bagel Shop	Bakery	Bank	Bar	Bavarian Restaurant	Beach	Beer Bar	Beer Garden	Beer Store	Belgian Restaurant	Big Box Store	B Sh
0	AG-Weser-Str. 3, 28237 Bremen	0.000000	0.000000	0.090909	0.000000	0.000000	0.090909	0.000	0.000000	0.000000	0.000000	0.000000	0.00000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000
1	Aachener Straße 1253, 50858 Köln	0.000000	0.000000	0.000000	0.000000	0.000000	0.032258	0.000	0.000000	0.000000	0.000000	0.000000	0.00000	0.064516	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000
2	Achternstrasse 15-16, 26122 Oldenburg	0.000000	0.000000	0.000000	0.000000	0.000000	0.031250	0.000	0.000000	0.000000	0.000000	0.000000	0.00000	0.000000	0.000000	0.031250	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000
3	Adolfsreihe 6, 26548 Norderney	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000	0.000000	0.000000	0.000000	0.000000	0.00000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000
4	Albert-Schweitzer-Gasse 6, 1140 Wien	0.000000	0.000000	0.000000	0.000000	0.000000	0.058824	0.000	0.000000	0.000000	0.000000	0.000000	0.00000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000

Afterwards we calculate top 5 venue groups for each location.

```
----AG-Weser-Str. 3, 28237 Bremen----
              venue  freq
0          Drugstore  0.18
1     Clothing Store  0.09
2  Electronics Store  0.09
3      Shopping Mall  0.09
4        Coffee Shop  0.09


----Aachener Straße 1253, 50858 Köln----
              venue  freq
0     Clothing Store  0.16
1  Mobile Phone Shop  0.06
2  Electronics Store  0.06
3        Coffee Shop  0.06
4             Bakery  0.06
```

We sort the top 5 venue groups into a final dataframe that we will use for our clustering analysis.

```
cad_venues_sorted.head()
```

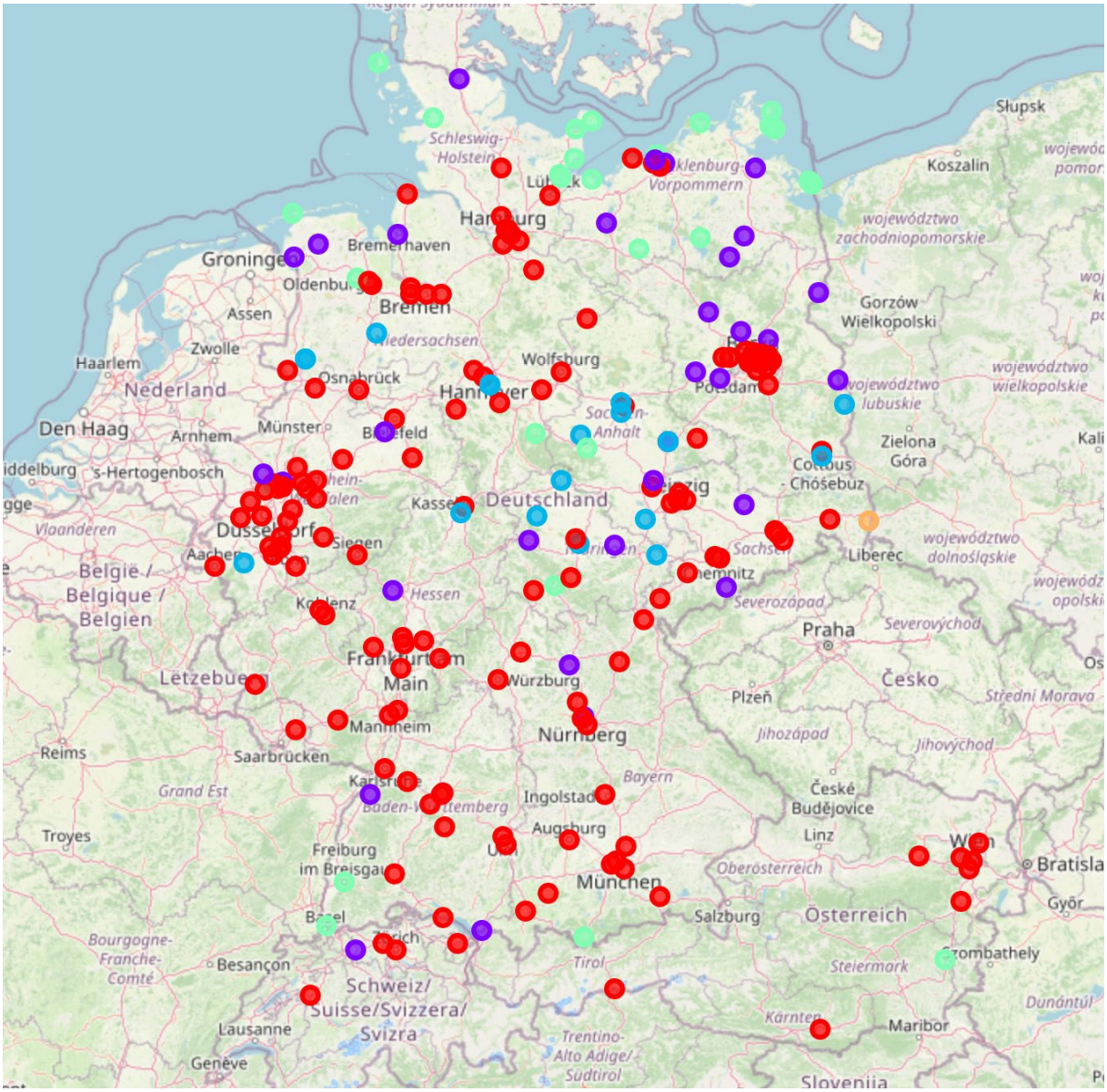
27]:

	Adresse Voll	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	AG-Weser-Str. 3, 28237 Bremen	Drugstore	Coffee Shop	Multiplex	American Restaurant	Snack Place
1	Aachener Straße 1253, 50858 Köln	Clothing Store	Coffee Shop	Mobile Phone Shop	Electronics Store	Bakery
2	Achternstrasse 15-16, 26122 Oldenburg	Café	Nightclub	Clothing Store	Italian Restaurant	Drugstore
3	Adolfsreihe 6, 26548 Norderney	Café	Italian Restaurant	Tourist Information Center	Hotel	Drugstore
4	Albert-Schweitzer-Gasse 6, 1140 Wien	Italian Restaurant	Clothing Store	Café	Men's Store	Drugstore

Using K-Means we cluster our dataframe into 5 clusters and merge the results with inital dataframe of the store locations.

	Name	Adresse	Stadt	Adresse Voll	Koordinaten	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	CAMP DAVID | SOCCX Köln Rhein-Center	Aachener Straße 1253	50858 Köln	Aachener Straße 1253, 50858 Köln	(50.9379663, 6.8356055)	50.937966	6.835605	0.0	Clothing Store	Coffee Shop	Mobile Phone Shop	Electronics Store	Bakery
1	THE STORE - CAMP DAVID | SOCCX Oldenburg	Achternstrasse 15-16	26122 Oldenburg	Achternstrasse 15-16, 26122 Oldenburg	(53.1398992, 8.214873)	53.139899	8.214873	0.0	Café	Nightclub	Clothing Store	Italian Restaurant	Drugstore
2	CAMP DAVID | SOCCX Kurplatz Norderney	Adolfsreihe 6	26548 Norderney	Adolfsreihe 6, 26548 Norderney	(53.7053468, 7.1449215)	53.705347	7.144921	3.0	Café	Italian Restaurant	Tourist Information Center	Hotel	Drugstore
3	CAMP DAVID | SOCCX Bremen Waterfront	AG-Weser-Str. 3	28237 Bremen	AG-Weser-Str. 3, 28237 Bremen	(53.112409, 8.7475121)	53.112409	8.747512	0.0	Drugstore	Coffee Shop	Multiplex	American Restaurant	Snack Place
4	CAMP DAVID | SOCCX Auhof Center	Albert-Schweitzer-Gasse 6	1140 Wien	Albert-Schweitzer-Gasse 6, 1140 Wien	(48.2080377, 16.2169543)	48.208038	16.216954	0.0	Italian Restaurant	Clothing Store	Café	Men's Store	Drugstore

We use Folium in order to visualize the output clusters on the map.



Afterwards we list the stores of each cluster for better understanding in which groups and under which criteria the stores where clustered.

Results

We clustered the existing stores in 5 groups according tot he venues that are placed in the close proximity to them. That is exactly what the expansion team asked us to do, so that they can use the clusters as an additional factor for their store performance analysis.

Cluster 0

	Adresse	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Aachener Straße 1253	50.937966	6.835605	0.0	Clothing Store	Coffee Shop	Mobile Phone Shop	Electronics Store	Bakery
1	Achternstrasse 15-16	53.139899	8.214873	0.0	Café	Nightclub	Clothing Store	Italian Restaurant	Drugstore
3	AG-Weser-Str. 3	53.112409	8.747512	0.0	Drugstore	Coffee Shop	Multiplex	American Restaurant	Snack Place
4	Albert-Schweitzer-Gasse 6	48.208038	16.216954	0.0	Italian Restaurant	Clothing Store	Café	Men's Store	Drugstore
5	Alte Freiheit 9	51.257386	7.150248	0.0	Ice Cream Shop	Mobile Phone Shop	Shopping Mall	Supermarket	Drugstore
7	Alter Dorfweg 30-50	53.048349	8.744478	0.0	Clothing Store	Ice Cream Shop	Bus Stop	Juice Bar	Bakery
8	Alter Spandauer Weg 6B	52.540520	12.979179	0.0	Clothing Store	Sporting Goods Shop	Men's Store	Lingerie Store	Belgian Restaurant
9	Altmarkt 25	51.049926	13.736570	0.0	Italian Restaurant	Café	Sporting Goods Shop	Burger Joint	Shopping Mall
10	Altstadt 35	50.317173	11.915646	0.0	Bar	Clothing Store	German Restaurant	Movie Theater	Café
11	Am Bahnhof 40	50.874452	8.015224	0.0	Café	Clothing Store	Supermarket	Bakery	Electronics Store

Cluster 1

	Adresse	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
6	Altenessener Straße 411	51.496946	7.007080	1.0	Seafood Restaurant	Shopping Mall	Supermarket	Big Box Store	Drugstore
14	Am Forum 1	50.564749	8.505414	1.0	Italian Restaurant	Train Station	Hookah Bar	Mobile Phone Shop	Electronics Store
16	Am Längengrad 12	53.541979	8.575865	1.0	Shopping Mall	Trattoria/Osteria	Seafood Restaurant	Scenic Lookout	Fast Food Restaurant
24	An der Bundesstraße 1	52.409799	12.607456	1.0	Supermarket	Big Box Store	Shopping Mall	Yoga Studio	Farmers Market
27	Anklamer Landstraße 1	54.076396	13.430395	1.0	Hardware Store	Big Box Store	Shopping Mall	Drugstore	Electronics Store
30	Auf dem Strengfeld 6	52.363706	12.933867	1.0	Italian Restaurant	Home Service	Supermarket	Shopping Mall	Lottery Retailer
32	Äußere Bayreuther Straße 80	49.469479	11.101830	1.0	Café	Big Box Store	Clothing Store	Sandwich Place	Drugstore
39	Berliner Straße 29 - 31	51.916242	8.392153	1.0	Lounge	Auto Dealership	Electronics Store	Yoga Studio	Fried Chicken Joint
42	Börnicker Chaussee 1-2	52.677570	13.595881	1.0	Supermarket	Shopping Mall	Fast Food Restaurant	Electronics Store	Yoga Studio
61	Fischteichweg 7	53.467218	7.484593	1.0	Multiplex	Shopping Mall	Falafel Restaurant	French Restaurant	Fountain
63	Franzstraße 85	51.830424	12.242888	1.0	Shopping Mall	Electronics Store	Café	Yoga Studio	Farmers Market
64	Friedensstraße 8	52.750662	13.224856	1.0	Big Box Store	Shopping Mall	Office	Electronics Store	Yoga Studio
73	Gewerbepark Cite 7	48.782948	8.193194	1.0	Ice Cream Shop	Shopping Mall	Bakery	Tour Provider	Sandwich Place
74	Gewerbering 2	50.598230	13.020892	1.0	Big Box Store	Shopping Mall	Electronics Store	Hardware Store	Yoga Studio

Cluster 2

	Adresse	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
18	Am Marktwege 2	51.184532	11.927376	2.0	Shopping Mall	Big Box Store	Drugstore	Yoga Studio	Farmers Market
26	Anger 1	50.977699	11.036468	2.0	Drugstore	Hotel	Sandwich Place	Vegetarian / Vegan Restaurant	Public Art
47	Bremer Tor 3	52.731400	8.289397	2.0	Drugstore	Supermarket	Spanish Restaurant	Yoga Studio	Falafel Restaurant
69	Fuldastraße 1-5	51.228764	9.429173	2.0	Electronics Store	Juice Bar	Clothing Store	Shopping Mall	Drugstore
91	Heinrichstraße 30	50.876202	12.079433	2.0	Drugstore	Event Space	Seafood Restaurant	Big Box Store	Clothing Store
98	Holzmarkt 7	51.894947	11.052288	2.0	Drugstore	Ice Cream Shop	Clothing Store	Sandwich Place	Yoga Studio
116	Kavalierstraße 49	51.834080	12.243000	2.0	Shopping Mall	Drugstore	Yoga Studio	Falafel Restaurant	French Restaurant
124	Kuhgasse 8	50.805728	6.480385	2.0	Clothing Store	Drugstore	Electronics Store	Sandwich Place	Shopping Mall
135	Lookenstraße 10	52.519870	7.316905	2.0	Clothing Store	Shopping Mall	Drugstore	Electronics Store	Yoga Studio
136	Lookenstraße 31 - 33	52.519980	7.316872	2.0	Clothing Store	Shopping Mall	Drugstore	Electronics Store	Yoga Studio
138	Madlower Chaussee 4	51.718306	14.320804	2.0	Big Box Store	Shopping Mall	Drugstore	Yoga Studio	Farmers Market
141	Marktplatz 11	52.307625	9.813265	2.0	Drugstore	Ice Cream Shop	Clothing Store	Shopping Mall	Men's Store
155	Nordpassage 1	52.151914	14.638125	2.0	Shopping Mall	Drugstore	Electronics Store	Yoga Studio	Farmers Market

Cluster 3

	Adresse	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
2	Adolfsreihe 6	53.705347	7.144921	3.0	Café	Italian Restaurant	Tourist Information Center	Hotel	Drugstore
17	Am Leuchtturm 16	54.181060	12.084968	3.0	Hotel	Restaurant	Cocktail Bar	Seafood Restaurant	Café
20	Am Mohrenplatz 7	47.494149	11.087375	3.0	German Restaurant	Café	Italian Restaurant	Thai Restaurant	Hotel
21	Am Strom 98	54.179544	12.086992	3.0	German Restaurant	Italian Restaurant	Fish & Chips Shop	Café	Seafood Restaurant
41	Blutstr. 15	53.427456	11.845918	3.0	Hotel	Brewery	Drugstore	Café	Yoga Studio
44	Breite Str. 2	54.438359	11.197043	3.0	Café	Italian Restaurant	Ice Cream Shop	Hotel	Department Store
45	Breite Straße 1-2	51.909787	10.437605	3.0	Hotel	Historic Site	Greek Restaurant	Yoga Studio	Event Space
66	Friedrich-König-Str. 21	50.610799	10.691042	3.0	Italian Restaurant	Seafood Restaurant	Museum	Hotel	Shopping Mall
67	Friedrichstraße 44	54.907819	8.299026	3.0	Beach	Seafood Restaurant	Restaurant	Pub	Bar
88	Hauptstr. 12	54.400079	13.612315	3.0	Hotel	Italian Restaurant	Gastropub	Seafood Restaurant	Café
89	Hauptstraße 435	47.590772	7.592583	3.0	Hotel	Chinese Restaurant	Clothing Store	Border Crossing	Steakhouse
102	Im Hatric 8	47.282691	15.990532	3.0	Shop & Service	Café	Yoga Studio	Credit Union	French Restaurant
103	In der Horst 18	53.183168	8.011056	3.0	Ice Cream Shop	Hotel	Drugstore	Café	Greek Restaurant
109	Kaiser-Joseph-Str. 256	47.993551	7.848650	3.0	Café	Bar	Dessert Shop	Burger Joint	Vegetarian / Vegan Restaurant
119	Königstraße 48	51.431784	6.773326	3.0	Bakery	Hotel	Hookah Bar	Steakhouse	Drugstore
121	Krämerstr.4	54.476179	9.050625	3.0	Seafood Restaurant	Food	Drugstore	German Restaurant	Mediterranean Restaurant
146	Mittelpromenade 30	53.985656	11.209595	3.0	Hotel	German Restaurant	Mini Golf	Clothing Store	Café

Cluster 4

	Adresse	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
152	Nieskyer Strasse 100	51.168962	14.971576	4.0	Supermarket	Yoga Studio	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant

Recommendations

Taking a closer look at the clusters, the following types of locations can be seen good, which can be used for better understanding of the company business.

Cluster 0 (marked red on the map)

Most of the stores within cluster 2 are placed in close proximity to other clothing stores in the city areas where people normally go to buy clothes or places where you normally like to spend time at: bowling clubs, food courts , etc. You can find there also shopping malls and different types of catering as a normal part of the city surroundings.

Cluster 1 (marked violet on the map)

Most of the stores within cluster 2 are placed close to supermarkerts and big box stores which has less to do with selling clothes, but rather with food products, technical appliances, autos, electronics, etc. The catering industry is presented mostly with fast food / take away restaurants. These areas have a large number of people passing them by each day, but not normally treated as a place to shop clothes or enjoy your tame staying there.

Cluster 2 (marked blue on the map)

Most of the stores within cluster 2 are placed in close proximity to drugstores and sport/yoga studios. The customers passing by will definitely have a large percentage of people having a healthy lifestyle.

Cluster 3 (marked green on the map)

Most of the stores within cluster 3 are placed within popular resort areas at the North Sea and the Baltic Sea as well as mountain resorts in Switzerland and Austria. The nearby venues are mostly hotels, high-end restaurants and recreational areas.

Cluster 4 (marked orange on the map)

The store in cluster 4 is rather an outlier being a mixture of clusters 0, 1 and 2.

Conclusion

We used the Foursquare API and K-Means Clustering for the given Analysis. The output clusters make total sense and will be used for futher analysis by the expansion team as well as for the scenario analysis of the potential locations for the future stores. These clusters can be also used by the assortment and merchandising teams in order to better plan the brand portfolio and product groups presented in the stores.