CAPSTONE PROJECT: BATTLE OF THE NEIGHBORHOODS

Frankfurt visitors venue recommendation

Problem description

I work for a global company. One of our targets in 2019 is to reduce travel spend. Many colleagues from different countries come to Frankfurt every day, because the headquarters are placed there. Frankfurt is the leader in our location spend overview.

Now our colleagues stay in hotels located in the city centre, because of the nearness to the headquarter and great opportunities to go out in the evening.

Unfortunately, are the prices per night in Frankfurt city centre Borough Innenstadt I very high, but there are very good hotels near the Innenstadt I, e.g. Innenstadt II. Furthermore, some departments are located in Frankfurt neighbourhood Eschborn, were the hotels are lower-priced as they do in Frankfurt, but there are only few colleagues, who stay in hotels in Eschborn.

I would like analyse Innenstadt II venues and neighbourhoods venues to show, that there are a great opportunities to stay in the hotels outside of Innenstadt I, but still stay in the nearness to the our firm headquarter.

Data

I will use FourSquare API to explore neighbourhoods in Frankfurt. The Foursquare explore function will be used to get the most common venue categories in each neighbourhood, and then use this feature to group the neighbourhoods into clusters.

For example, there is a venue in one of the neighbourhoods. As basic information, we can obtain its precise latitude and longitude.

- The following information are retrieved on the first query:
- Venue ID
- Venue Name
- Coordinates : Latitude and Longitude
- Category Name

But we are looking for advanced information such as the category of that venue, how popular one is this venue in its. Additional information I will use for clustering:

- Venue summary
- Venue Category

Methodology

After import of all libraries, I will use for this data analysis, I upload the data, I created manually, because there is no properly structured data for Frankfurt in internet.

As soon as the list of neighbourhoods is created, we then connect to the Foursquare API to gather information about venues inside each neighbourhood. For each neighbourhood, we have chosen the radius to be 1000 meter. It means that we have asked Foursquare to find venues that are at most 1000 meter far from the centre of the neighbourhood.

Then I retrieve the data and create a data frame for all venues inside Innenstadt II.

	name	categories	lat	lng
0	M-Steakhouse	Steakhouse	50.114782	8.662611
1	Westendplatz	Plaza	50.112916	8.661763
2	Das Nudel Ding	Chinese Restaurant	50.115797	8.663362
3	La Scuderia	Italian Restaurant	50.115464	8.662881
4	Ramen Jun	Ramen Restaurant	50.113201	8.655861
5	Saverio's Florian	Italian Restaurant	50.115767	8.664076
6	l'unico	Italian Restaurant	50.118159	8.659280
7	Moriki	Japanese Restaurant	50.113863	8.669530
8	The Ivory Club	Indian Restaurant	50.114309	8.669109
9	Prime Time Fitness	Gym	50.117589	8.666662

After the data is retrieved, we will perform processing on that raw data to find our desirable features for each venue.

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Westend-Süd	50.115245	8.66227	M-Steakhouse	50.114782	8.662611	Steakhouse
1	Westend-Süd	50.115245	8.66227	Westendplatz	50.112916	8.661763	Plaza
2	Westend-Süd	50.115245	8.66227	Das Nudel Ding	50.115797	8.663362	Chinese Restaurant
3	Westend-Süd	50.115245	8.66227	La Scuderia	50.115464	8.662881	Italian Restaurant
4	Westend-Süd	50.115245	8.66227	Ramen Jun	50.113201	8.655861	Ramen Restaurant
5	Westend-Süd	50.115245	8.66227	Saverio's Florian	50.115767	8.664076	Italian Restaurant
6	Westend-Süd	50.115245	8.66227	l'unico	50.118159	8.659280	Italian Restaurant
7	Westend-Süd	50.115245	8.66227	Moriki	50.113863	8.669530	Japanese Restaurant
8	Westend-Süd	50.115245	8.66227	The Ivory Club	50.114309	8.669109	Indian Restaurant
9	Westend-Süd	50.115245	8.66227	Prime Time Fitness	50.117589	8.666662	Gym
10	Westend-Süd	50.115245	8.66227	ZENZAKAN - Pan Asian Supperclub	50.114867	8.669458	Asian Restaurant
11	Westend-Süd	50.115245	8.66227	Matsuri	50.113050	8.665334	Japanese Restaurant
12	Westend-Süd	50.115245	8.66227	Block House	50.118216	8.663224	Steakhouse
13	Westend-Süd	50.115245	8.66227	Mon Amie Maxi	50.116503	8.667199	French Restaurant
14	Westend-Süd	50.115245	8.66227	Manufactum brot&butter	50.115958	8.670772	Food & Drink Shop

Our main feature is the category of that venue. After this stage, the column "venue's category" will be one-hot encoded and different venues will have different feature-columns.

I will cluster neighbourhoods via K-means clustering method. I tried with 5 clusters, but k-means found out only 3, so I cluster data in 3 segments. After clustering I will update dataset and create a column representing the group for each neighbourhood.

Results

The Foursquare API has been used to collect the information about the different venues present in the different sections of the Innenstadt II. Every section is assigned a vector that summarizes its characteristics which contains the 10 most important venues of the area. Different section of Innenstadt II have been clustered based on the most important venues.

Cluster 1

```
Frankfurt_merged.loc[Frankfurt_merged['Cluster Labels'] == 0, Frankfurt_merged.columns[[1] + list(range(5, Frankfurt_merged.shape[1]))]]
```

	Neighbourhood	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
4	Bockenheim	Café	Asian Restaurant	Ice Cream Shop	Platform	Bar	Bus Stop	Cocktail Bar	Convenience Store	Department Store	Greek Restaurant

Cluster 2

```
Frankfurt_merged.loc[Frankfurt_merged['Cluster Labels'] == 1, Frankfurt_merged.columns[[1] + list(range(5, Frankfurt_merged.shape[1]))]]
```

	Neighbourhood	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	Westend-Süd	Italian Restaurant	Hotel	Steakhouse	Japanese Restaurant	Café	Bakery	Supermarket	Gym	French Restaurant	Convenience Store
1	Westend-Süd	Italian Restaurant	Hotel	Steakhouse	Japanese Restaurant	Café	Bakery	Supermarket	Gym	French Restaurant	Convenience Store
3	Westend-Süd	Italian Restaurant	Hotel	Steakhouse	Japanese Restaurant	Café	Bakery	Supermarket	Gym	French Restaurant	Convenience Store

Cluster 3

```
Frankfurt_merged.loc[Frankfurt_merged['Cluster Labels'] == 2, Frankfurt_merged.columns[[1] + list(range(5, Frankfurt_merged.shape[1]))]]
```

	Neighbourhood	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
2	Westend-Nord	Hotel	Park	Japanese Restaurant	Café	Steakhouse	Coffee Shop	Mexican Restaurant	Italian Restaurant	Gym	Ice Cream Shop

Cluster 1:

Cluster 1 shows that in neighbourhood Bockenheim most common venues are Caffes, Restaurants and Bars. There are also some stores.

Cluster 2:

Here we can see that in all Westend-Süd neighbourhood different kitchens restaurants are most common venues. But Hotel is also common venue. There is also supermarket and gym.

Cluster 3.

Here we see that Westend-Nord is like Westend-Süd, but here is also park listed as 2nd common venue, but not a supermarket.

Discussion

On this notebook, Analysis of best neighbourhood to stay has been presented. Using Foursquare API, I collected a good amount of venue recommendations in Innenstadt II. Sourcing from the venue

recommendations from FourSquare has its limitation, The list of venues is not exhaustive list of all the available venues is the area. Furthermore, not all the venues found in the the area has a stored ratings.

The generated clusters from our results shows that there are very good and interesting places located in Innenstadt II. This kind of results may be very interesting for colleagues who are also on time constraints.

Conclusion

Bockenheim is probably the best neighbourhood to go out, but there are not so many good Hotels and it's also furthest located from our firm headquarter.

I would recommend our colleagues to stay in hotels in Westend-Süd or Westend-Nord neighbourhood, because there is a white range of hotels to choose and these both neighbourhoods are closer to our firm headquarter.

There are also possibilities to choose between different kitchens: like Japanese or Italian restaurant.

We can also find other activities expect of eating, like Parks and Gym.

In my opinion Westend-Süd and Westend-Nord offer better opportunities to go out.