

# IBM DATA SCIENCE PROFESSIONAL CERTIFICATE

## - CAPSTONE PROJECT -

“THE BATTLE OF NEIGHBORHOODS”

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COPENHAGEN, DENMARK



# - OPENING A CAFÉ IN COPENHAGEN -

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## 1. Introduction

### 1.1 Background

**Copenhagen** (Danish: *København*) is the capital and most populous city of Denmark. As of 1 January 2021, the city had a population of 799,033. It forms the core of the wider urban area of Copenhagen (population 1,336,982) and Copenhagen metropolitan area (population 2,057,142). Copenhagen is situated on the eastern coast of the island of Zealand, and it is separated from Malmö, Sweden, by the strait of Øresund.

For a number of years, Copenhagen has ranked high in international surveys for its quality of life. Its stable economy together with its education services and level of social safety make it attractive for locals and visitors alike. Although it is one of the world's most expensive cities, it is also one of the most liveable with its public transport, facilities for cyclists and its environmental policies.

### 1.2 Business problem

There are coffee spots everywhere in Copenhagen, people could not survive without them. Copenhageners simply love cafés. That is the Scandinavian "coffee culture". Cafés are obviously not only a place where you drink a coffee, but they are also a great place to meet friends and chat, or even do some project, work on something. Nowadays, we're seeing more and more people working in the cafés, it became some sort of a trend to go to such place with your laptop.

Now, let's look at the business side, what if someone wanted to open a café in Copenhagen? There's already so many... does it even make any sense? Are there any places in the city where such a business could potentially bring profit? Let's find some places, where it could be feasible with minimum competition around. I am going to perform the analysis which will help me better understand which parts of the city potentially lack cafés. I am going to use metro stations in Copenhagen as a reference point. Metro stations are the "centers" of the city and their nearby areas are key places when it comes to venues like restaurants or cafés.

### 1.3 Interest

Anyone who would like to open a café in the Copenhagen area may be interested in this project. The analysis can help small businesses to determine possibly the best place to open a café business in the capital of Denmark.

## 2. Data

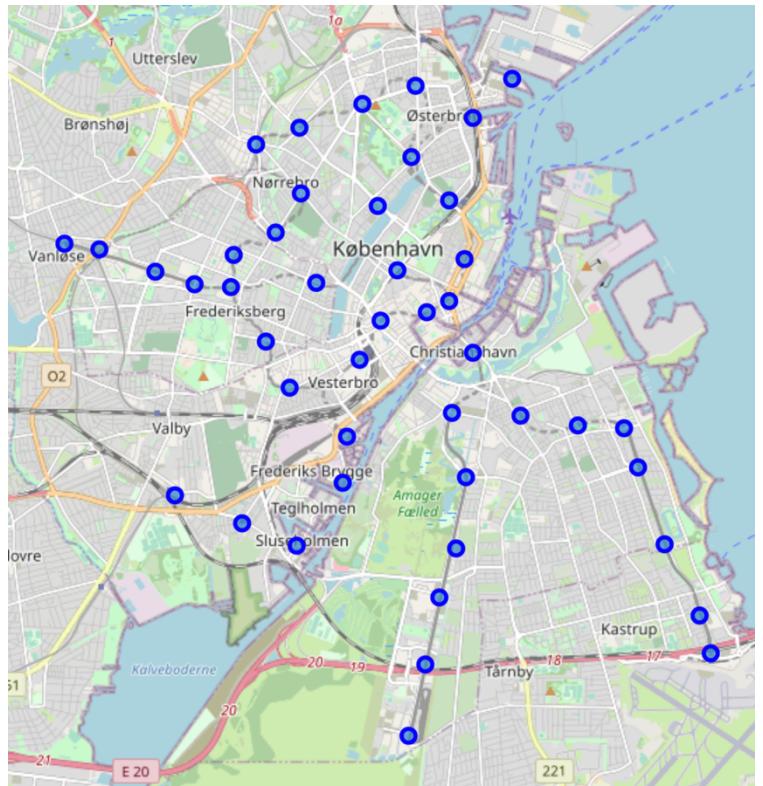
### 2.1 Data sources

- Copenhagen districts data – Wikipedia [1]
- Metro stations data – Wikipedia [2]
- Geographical coordinates of districts/metro stations – Geocoder Python Library [3]
- Venues by given districts/metro stations – Foursquare API venues method [4]

### 2.2 Data selection and usage

- I have used Copenhagen metro stations as reference points to analyze the restaurants and cafés that are nearby. At first, I have performed the exact same analysis but with the city districts data. Unfortunately, it wasn't too accurate, and some important parts of the city have been skipped. Therefore, I have decided to use the metro stations and their coordinates. I have also used Python Folium library to draw maps based on the latitude and longitude of each station.

	Metro	Latitude	Longitude
0	Aksel Møllers Have Metro Station	55.685676	12.532425
1	Amager Strand Metro Station	55.656220	12.631530
2	Amagerbro Metro Station	55.663540	12.602700
3	Bella Center Metro Station	55.638270	12.582750
4	Christianshavn Metro Station	55.672160	12.590960
5	DR Byen Metro Station	55.654970	12.589270
6	Enghave Plads Metro Station	55.667410	12.546090
7	Fasanvej Metro Station	55.681560	12.522830
8	Femøren Metro Station	55.645670	12.638070
9	Flintholm Metro Station	55.686580	12.499360
10	Forum Metro Station	55.681821	12.552431
11	Frederiksberg Metro Station	55.681223	12.531719
12	Frederiksberg Allé Metro Station	55.673790	12.540350
13	Gammel Strand Metro Station	55.677760	12.579600
14	Islands Brygge Metro Station	55.663930	12.585740
15	Kastrup Metro Station	55.635780	12.646520
16	København H Metro Station	55.671120	12.563240
17	Kongens Nytorv Metro Station	55.679420	12.585140
18	Lergravsparken Metro Station	55.662170	12.616670
19	Lindevang Metro Station	55.683471	12.513120



### References:

- [1] [Category: Districts of Copenhagen](#)
- [2] [Copenhagen Metro Stations](#)
- [3] [Python Geocoder Library](#)
- [4] [Foursquare API](#)

### **3. Methodology**

- As I have mentioned before, I have decided to use metro stations as reference points. In my opinion, stations are a good measure of where the city life is and so where the restaurants, cafés and bars are. I retrieved 38 metro stations that exist in real life. I have added 5 more, that will be opened by 2024. What is more, I have added one that does not exist and is not in plan. The reason behind that is that there was a small circle in a map that did not include any venues and that is because it was too far from the stations. I do live in Copenhagen myself and so I'm convinced that this place is essential when it comes to city life.
  - I have used Foursquare API venues methods in order to get venues that are situated nearby. That means that I have obtained every venue within the distance of 700 meters of each station.
  - I have used the venues data in various ways, the main goal was to get the number of certain venues nearby each station in order to notice the possible lack of cafés, comparing for example with the number of restaurants nearby.

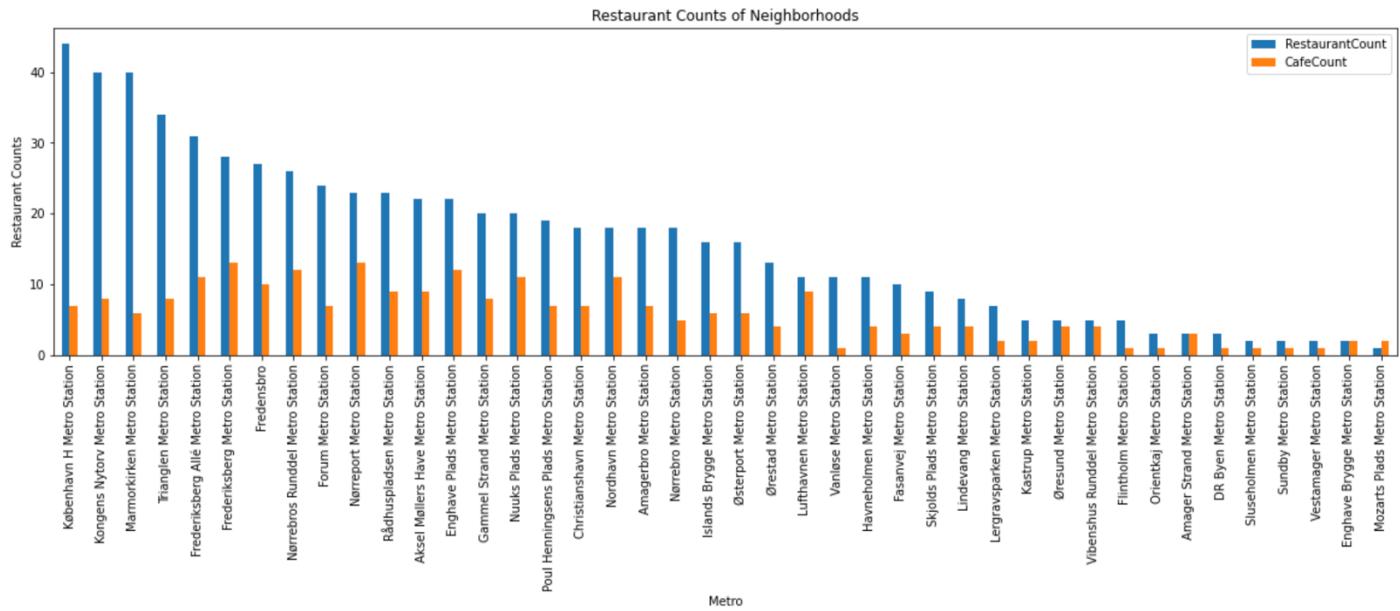
	Metro	Latitude	Longitude	VenueName			VenueId	VenueLatitude	VenueLongitude	VenueDistance	VenueCategory					
0	Aksel Møllers Have Metro Station	55.685676	12.532425	The Coffee Collective	4fd89c20e4b04c778275e9f7		55.686960	12.533222	151	Coffee Shop						
1	Aksel Møllers Have Metro Station	55.685676	12.532425	Mad & Kaffe	5b0eb642646e38002ca932b0		55.686826	12.531717	135	Café						
2	Aksel Møllers Have Metro Station	55.685676	12.532425	Da Claudio	4bc0a819920eb713a340192c		55.686901	12.532269	136	Italian Restaurant						
3	Aksel Møllers Have Metro Station	55.685676	12.532425	Gastronomia Candido	4be2f38f1dd22d7f604095bd		55.687325	12.530107	234	Pizza Place						
4	Aksel Møllers Have Metro Station	55.685676	12.532425	Emmerys Godthåbsvej	536ba331498efec3da567aa3		55.686362	12.534116	130	Bakery						
...	...	...	...	...	...	...	...	...	...	...						
	Metro	Coffee Shop	Café	Italian Restaurant	Pizza Place	Bakery	Pool	Ramen Restaurant	French Restaurant	Library	Fried Chicken Joint	Lawyer	Beach Bar	Bowling Alley	Buffet	Frozen Yogurt Shop
0	Aksel Møllers Have Metro Station	2	7	3	2	6	1	1	2	1	...	0	0	0	0	0
1	Amager Strand Metro Station	1	2	0	0	1	0	0	0	0	...	0	0	0	0	0
2	Amagerbro Metro Station	6	1	0	3	6	1	0	0	0	...	0	0	0	0	0
3	Bella Center Metro Station	0	0	0	2	0	0	0	0	0	...	0	0	0	0	0
4	Christianshavn Metro Station	2	5	2	0	3	0	0	0	1	...	0	0	0	0	0
5	DR Byen Metro Station	0	1	0	2	0	0	0	0	0	...	0	0	0	0	0
6	Enghave Brygge Metro Station	0	2	1	0	1	0	0	0	0	...	0	0	1	1	0
7	Enghave Plads Metro Station	5	7	2	4	4	0	1	1	0	...	0	0	0	0	0
8	Fasanvej Metro Station	2	1	1	2	0	1	1	1	1	...	0	0	0	0	0
9	Femøren Metro Station	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0

- There are 234 unique categories, and the top 10 venue counts are listed below...first and second place do not surprise. If you're looking into opening a café in Copenhagen, don't leave yet! It's not the end... with my analysis, I will try to help you find a place with a minimum competition around and believe me, there are such places... even in Copenhagen.

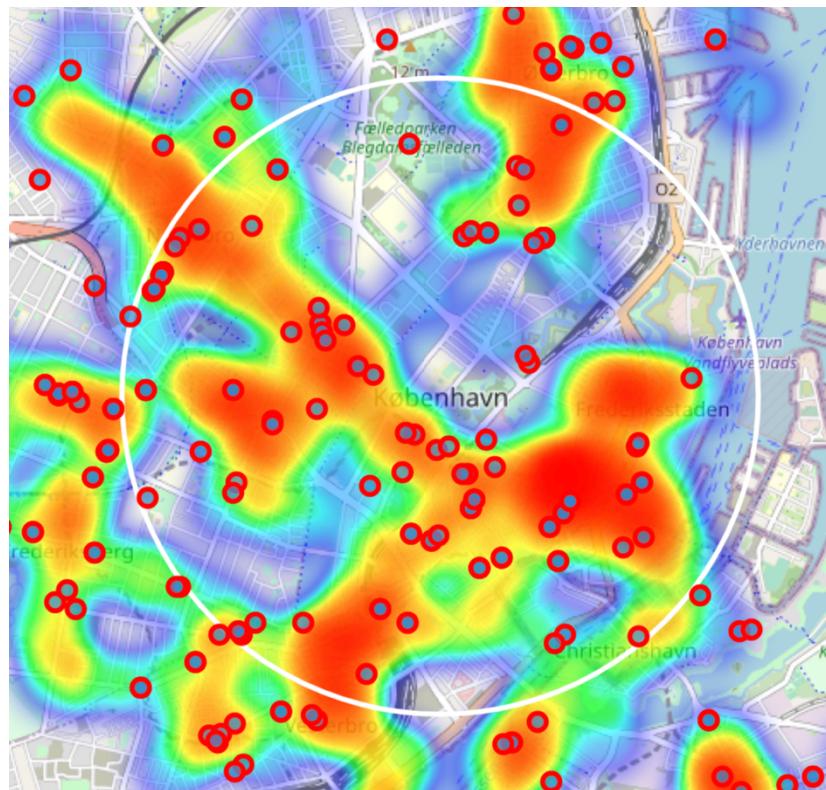
VenueCategory	Count
Café	105
Coffee Shop	72
Bakery	69
Pizza Place	65
Scandinavian Restaurant	64
Bar	42
Grocery Store	38
Sushi Restaurant	35
Gym / Fitness Center	34
Park	34

- Let's now compare the restaurant count and café count by each metro station area.

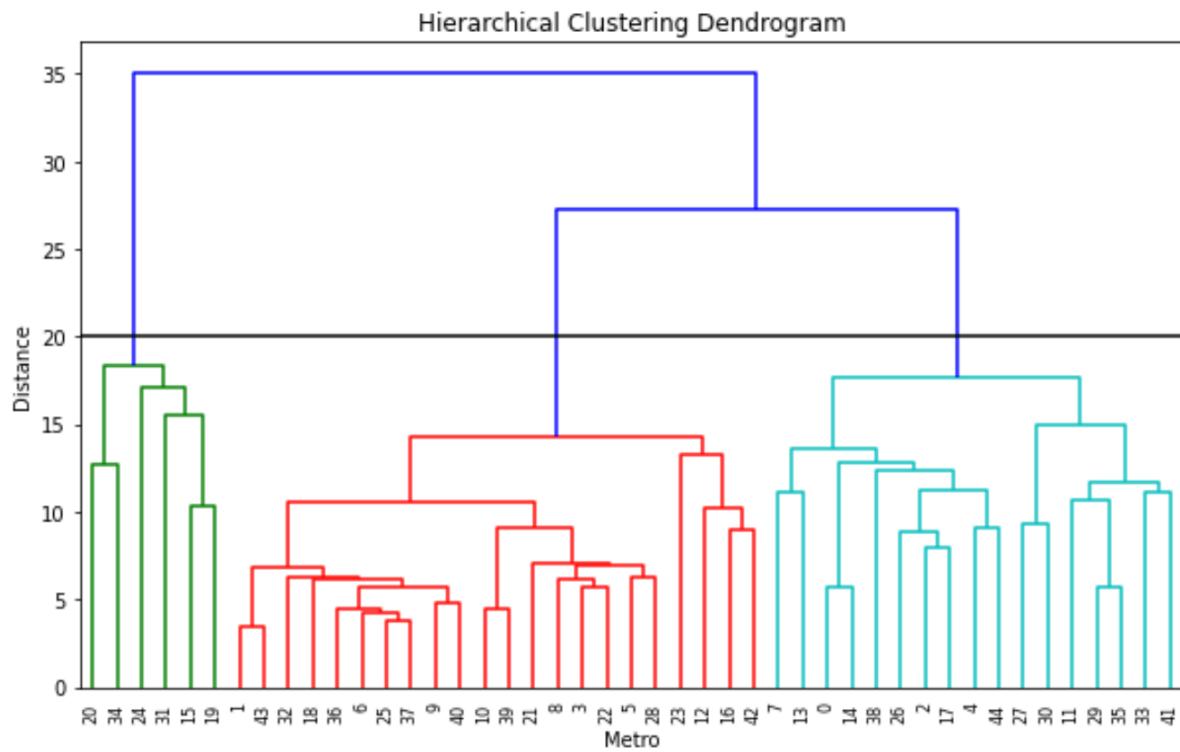
Metro	RestaurantCount	CafeCount
København H Metro Station	44	7
Kongens Nytorv Metro Station	40	8
Marmorkirken Metro Station	40	6
Trianglen Metro Station	34	8
Frederiksberg Allé Metro Station	31	11
Frederiksberg Metro Station	28	13
Fredensbro	27	10
Nørrebro Runddel Metro Station	26	12
Forum Metro Station	24	7
Nørreport Metro Station	23	13
Rådhuspladsen Metro Station	23	9
Aksel Møllers Have Metro Station	22	9
Enghave Plads Metro Station	22	12
Gammel Strand Metro Station	20	8
Nuuks Plads Metro Station	20	11
Poul Henningsens Plads Metro Station	19	7



- The bar chart shown above finally gives us an approximate idea of how the number of restaurants compares to the number of cafés around each metro stations.
- I used a heatmap for counts of restaurants in neighborhoods, using Folium library. The white circle indicates the distance of 2km within the Copenhagen center.
- The cafés are marked with red markers. This helps us understand, where we might potentially lack a café, compared to the number of restaurants.

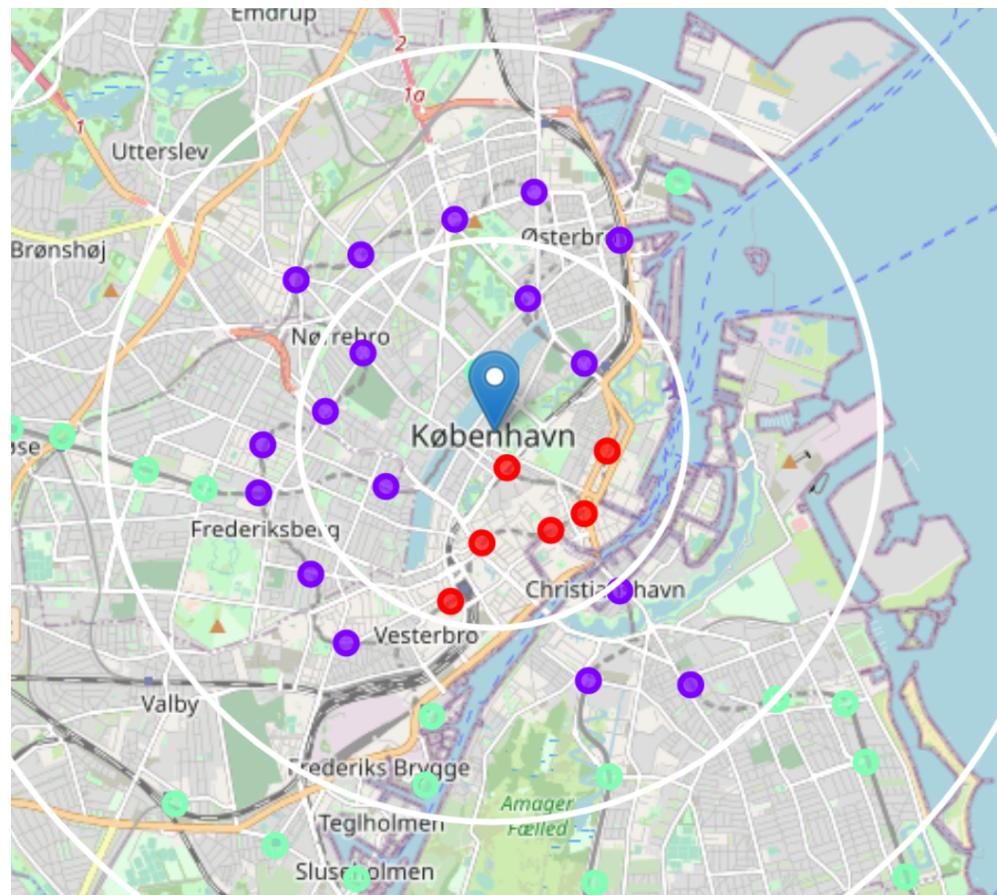


- I used agglomerative clustering to cluster neighborhoods based on the count of venue categories in each one. I decided to separate the neighborhoods into 3 clusters.



	Metro	Latitude	Longitude	MetroCluster	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue
0	Aksel Møllers Have Metro Station	55.685676	12.532425	1	Café	Bakery	Italian Restaurant
1	Amager Strand Metro Station	55.656220	12.631530	2	Café	Beach	Coffee Shop
2	Amagerbro Metro Station	55.663540	12.602700	1	Coffee Shop	Bakery	Pizza Place
3	Bella Center Metro Station	55.638270	12.582750	2	Pizza Place	Golf Course	Breakfast Spot
4	Christianshavn Metro Station	55.672160	12.590960	1	Café	Scandinavian Restaurant	Bar
5	DR Byen Metro Station	55.654970	12.589270	2	Concert Hall	Pizza Place	Bar
6	Enghave Plads Metro Station	55.667410	12.546090	1	Café	Coffee Shop	Park
7	Fasanvej Metro Station	55.681560	12.522830	2	Coffee Shop	Pizza Place	Grocery Store
8	Femøren Metro Station	55.645670	12.638070	2	Beach	Park	Fast Food Restaurant
9	Flintholm Metro Station	55.686580	12.499360	2	Convenience Store	Grocery Store	Bakery
10	Forum Metro Station	55.681821	12.552431	1	Café	Bar	Thai Restaurant
11	Frederiksberg Metro Station	55.681223	12.531719	1	Café	Bakery	Italian Restaurant
12	Frederiksberg Allé Metro Station	55.673790	12.540350	1	Café	Bakery	Scandinavian Restaurant
13	Gammel Strand Metro Station	55.677760	12.579600	0	Clothing Store	Coffee Shop	Scandinavian Restaurant
14	Islands Brygge Metro Station	55.663930	12.585740	1	Bakery	Coffee Shop	Bar

- Cluster 1: Red (Scandinavian Restaurant, Clothing Store, Beer Bar)
- Cluster 2: Purple (Café, Coffee Shop – most common venues in 12 metro stations!)
- Cluster 3: Cyan (Coffee Shop, Pizza Place, Grocery Store)



## **4. Results**

- From the bar chart, I have concluded that many areas have a café count that is close to 40-50% of the restaurant count. There are also some stations (let's say first four in the chart), that have a relatively small percentage of coffee places compared to restaurants. As an example - Marmorkirken station has a very percentage, that is, only 6 cafés with 40 restaurants nearby.
- From heat maps, I have concluded that Fredriksstaden area has a very high density of restaurants but only a few cafes, that is a great place to look into when thinking of opening a café.

## **5. Discussion**

- Purple cluster metros are the ones that dominate in the number of cafés and coffee shops. Those areas are located outside of the city center.
- The red clusters are the ones located in the city center. They have a wide variety of venues and number one, two and three dominant venues are usually restaurants, clothing stores and bars.

## **6. Conclusion**

- I have chosen Fredriksstaden area as a great place to open up a café in Copenhagen. This area is highly populated, visited both by tourists and locals and is very close to the actual city center.
- Fredriksstaden area is densely populated with restaurants. It naturally should be full of cafés, but in fact, it's not. There are very few cafés there and I can see a huge potential of opening up a business.

