Location of a new seafood restaurant in Aarhus

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Introduction

A customer of mine would like to open a Seafood Restaurant in Arhus, Denmark. He work in the seafood business in the Faroe Islands and want to sell their best products seafood to Denmark. As young, I studied in Aarhus and like the atmosphere of the town centre, so I have recommended that my customer finds a location in Aarhus, Denmark.

I will try to find a spot for his seafood restaurant from several criteria:

1. That is there must be some interesting venues close to it. That is, it must be located in an area belonging to the right cluster.

2. It should be far away from other seafood restaurants

3. It should be in an area without many other food venues

I will make visualize all food venues and all seafood restaurants and find spots that fulfil criteria 2. and 3.

To obtain criteria 1, I will separate Aarhus centre in a mesh of neighbourhoods around 300 metres wide. I will look at the different neighbourhoods to see which ones are similar in order to find a suitable location. Specifically I will make a clustering of the neighbourhoods based on venues. For instance if there are clusters with theatres or cinemas in them. I will make a k-means clustering analysis using Foursquare API.

Data

In order to make our analysis we need to obtain some data:

- We need to construct a mesh of areas covering the centre of Aarhus, Denmark

- From these locations we obtain Foursquare venue data of food venues and seafood restaurant venues, and visualize them.

- We make a k-means clustering of all venues.

Data sources

The analysis uses Foursquare venue data on a set of neighbourhoods.

We want a set of small neighbourhoods, and are there no data available to this end. Therefor we make a set of neighbourhoods by using the shapely package. We construct a hexagonal shaped mesh of neighbourhoods, where the centres are 300 meters apart. See the mesh below. Therefor the radius of each neighbourhood is 150 meters.

We set the Cathedral as the center of Aarhus - see the pin on the picture. The mesh is going 1.800 metres from the center. The most eastern neighbourhoods were cut of.

We use Foursquare API to find venues to the neighbourhoods above. We find three set of venues:

1. Food venues
2. Seafood venues
3. All venues

The food venues and seafood venues are used to visualize where (not) to place the new seafood restaurant. The set of all venues are used in a k-means clustering.

The food venues (blue) and the seafood venues (red) can be seen on the picture below.
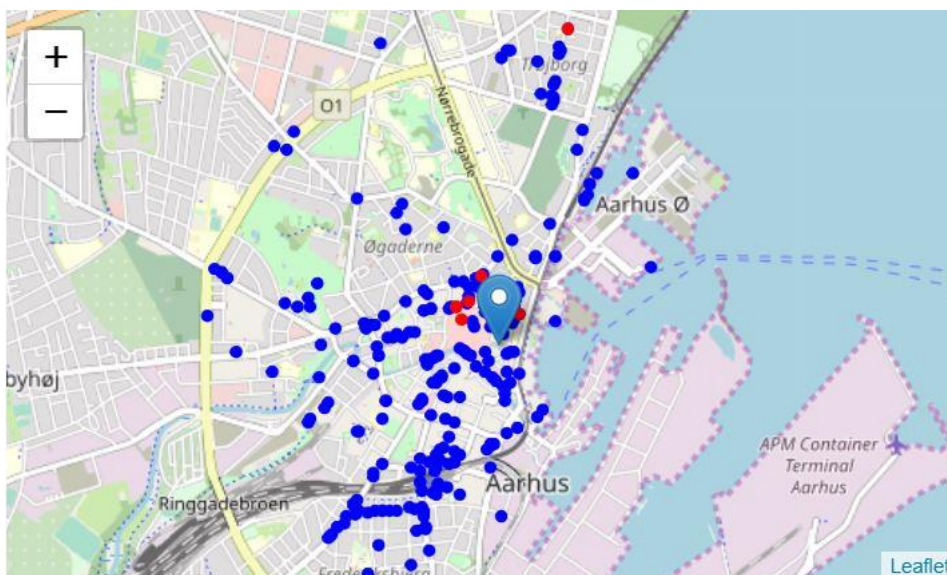
Methodology

We will follow these steps in our analysis:

- Make a k-means analysis. We analyse the clusters, in order to find a suitable cluster to locate a new seafood restaurant.

- Find spots not crowded with food venues.

- Find a spot away from other seafood restaurants.

For each neighbourhood we find the top ten venues. A k-means analysis is made from the frequencies of these venues.

The sum of squares was found for k's between 1 and 30. It was not possible to find an 'elbow' in order to set the 'k' to a certain number. Therefore the analysis was made with 10 clusters. I looked at the clusters with 5 and 13 clusters also, but it would not av made any difference in the outcome.

A graph of the different k's can be seen below. As we can see there is no 'elbow'.
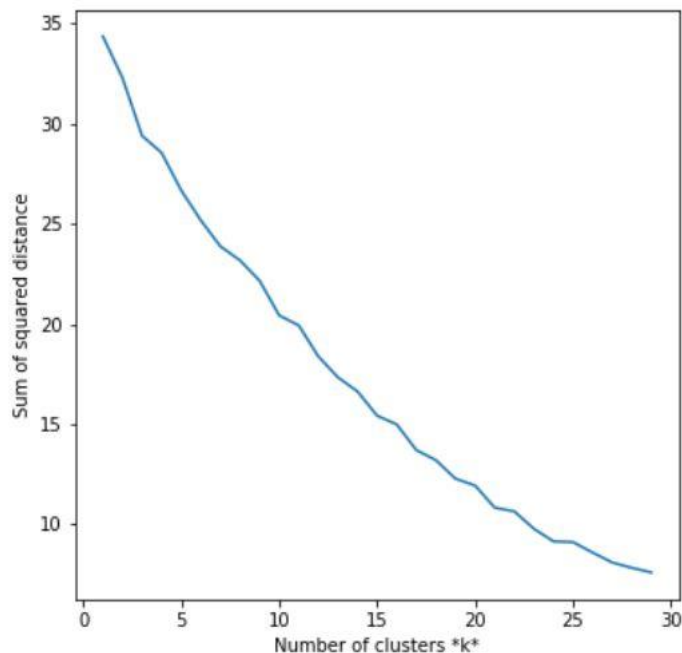
The k-means analysis was made and the clusters can be seen in the picture below.
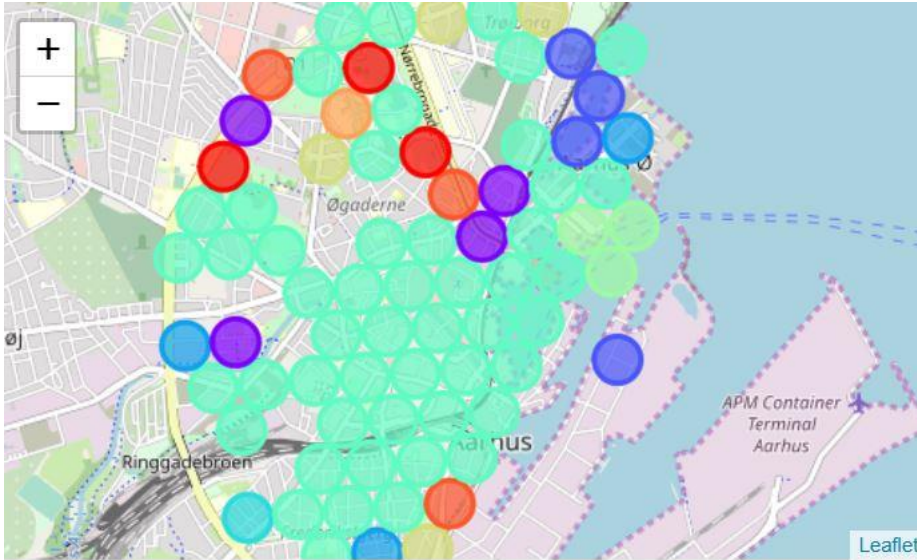
The clusters was analysed from their top ten venues. The clusters in the periphery was considered unfit for a seafood restaurant. Therefore, only the largest cluster was feasible. In the feasible cluster we found the neighbourhoods with fewest food venues.

The neighbourhoods with fewest food venues (blue) is visualized with the seafood restaurants (red dots) on the picture below.
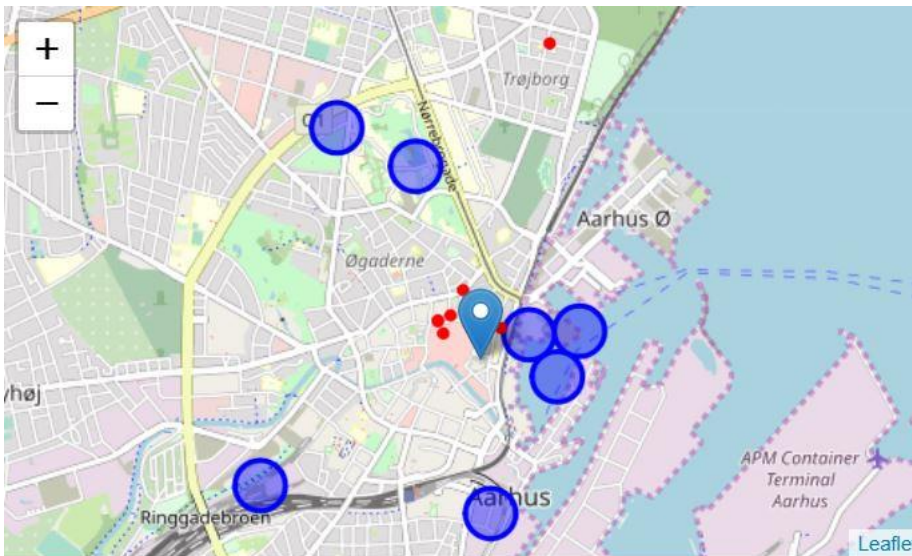
The neighbourhoods to the north are closest to incumbent seafood restaurants and are therefore omitted. The neighbourhood to the south-west is placed on a railway track and is also omitted. Therefore we will recommend to place the seafood restaurant at the southern most neighbourhood.

The best location can be seen in the yellow dot below.
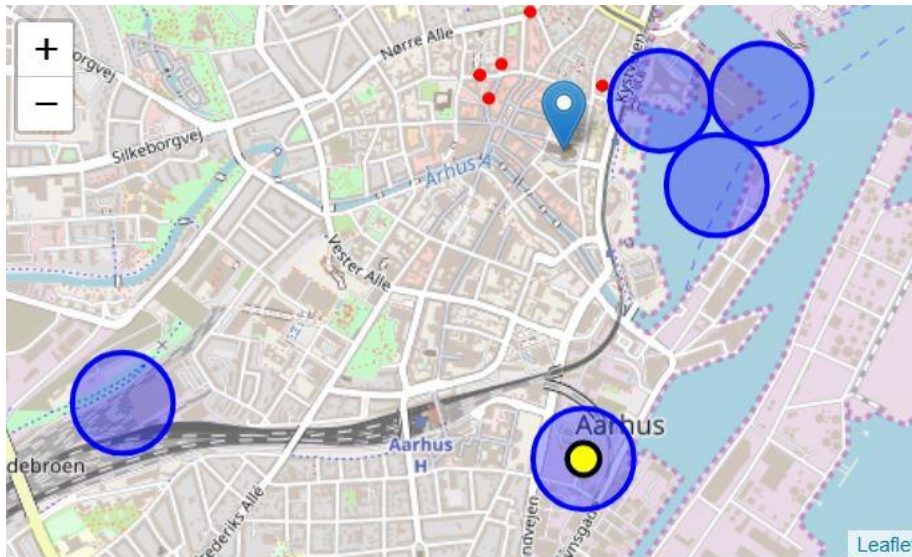
Results

As we could see, most of the food venues were in the centre or just south of the centre of Aarhus. The cluster analysis gave us one big cluster and several smaller clusters. Our analysis of the clusters made it clear that only the largest, most central, cluster was suitable for the location of the seafood restaurant.

Within this cluster, we found the seven neighbourhoods with fewest food venues. Within these seven neighbourhoods, we located the neighbourhood farthest away from other seafood restaurants.

Discussion

To find a suitable location for a new restaurant can be a difficult task. There are many criteria to take into consideration. In this exercise, we simplified the criteria, but with a little more effort it is possible to incorporate more criteria's in order to get a better recommendation. Foursquare API does not have all the venues in Aarhus, so a more thorough analysis must use other data also in order to get a better picture of the situation.

Nonetheless our "mechanical method" solution to the task gave a surprisingly good solution. The area (yellow dot above) is called "kødbyen" or "kulbroen". In the old days, this was a meat marked (kødby in danish) and also the coal to the area was transported on small uplifted railways (therefore the name "kulbroen") This is an area that has been "dead" for several years, but is now re-discovered and the municipality of Aarhus has great plans for the area.

Therefore, this is a very interesting area and "new land" for restaurants.

A description of "kulbroen" can be found at: http://www.kulbroen.com/information.

The area has just won an architectural award:

Conclusion

We set the goal to find a suitable location for a seafood restaurant in Arhus, Denmark.

This was based on three criteria. It should be placed in a suitable neighbourhood, this was done by using a K-means clustering of the neighbourhoods of Aarhus. It should be located in a neighbourhood with few other food venues and last, it should be located far from other seafood restaurants.

We found such a location and recommended that the restaurant owner tried to negotiate a lease in a building near the "kulbroen" area.