Best Location for a New Restaurant in Clermont-Ferrand City, France

Coursera_Final_Project by Nina P. Bekono

INTRODUCTION / BUSINESS PROBLEM

- Location of a new restaurant.
 - well located : a positive impact in terms of affluence.
 - badly located : negatively impact the restaurant's attendance, then the business recipes.
- Where is the best place in the city to install my new restaurant?.
- A descriptive model.
 - Exploration of the venues
 - Exploration of the existing restaurants (number, location, etc)
- Audience of this project: the people interested in starting a business such as opening a restaurant
- The city we choose to treat is Clermont-Ferrand and any type of the restaurant.

Data Acquisition and Cleaning

- We use Data of the Clermont-Ferrand around the city center using the Foursquare API and Google maps API
- ❖ Radius = 600
- ❖ The limit of the venues = 300
- « Restaurant » category selected

Out[9]:		name	categories	address	CC	city	country	cross Street	distance	formatted Address	labeledLatLngs	lat	Ing	postalCode	state	
	0	Place de Jaude	Plaza	Place de Jaude	FR	Clermont- Ferrand	France	NaN	90	[Place de Jaude, 63000 Clermont- Ferrand, France]	[{'label': 'display', 'lat': 45.77681306296083	45.776813	3.082093	63000	Auvergne- Rhône- Alpes	
	1	Le Faisan Doré	French Restaurant	1 Rue Blatin	FR	Clermont- Ferrand	France	14 Place de Jaude	54	[1 Rue Blatin (14 Place de Jaude), 63000 Clerm	[{'label': 'display', 'lat': 45.77698454161444	45.776985	3.081626	63000	Auvergne	4
	2	Le Bistrot d'à Côté	Bistro	Rue Des Minimes	FR	Clermont- Ferrand	France	NaN	258	[Rue Des Minimes, 63000 Clermont- Ferrand, France]	[{'label': 'display', 'lat': 45.77874923383751	45.778749	3.084074	63000	Auvergne	51
	3	Le Bouchon de Jaude	French Restaurant	NaN	FR	Clermont- Ferrand	France	NaN	31	[Clermont-Ferrand, France]	[{'label': 'display', 'lat': 45.77767578339747	45.777676	3.081120	NaN	Auvergne	4e
	4	McDonald's	Fast Food Restaurant	51-53 Avenue des Etats-Unis	FR	Clermont- Ferrand	France	NaN	69	[51-53 Avenue des Etats-Unis, 63000 Clermont-F	[{'label': 'display', 'lat': 45.77798357612858	45.777984	3.081738	63000	Auvergne	4k
		8.61	0 0	AI_AI		NI-NI		NI-NI	۸۲	<i>(</i> -)	[{'label': 'display', 'lat':	45 777004	2,002,422	N-M	NI-NI	

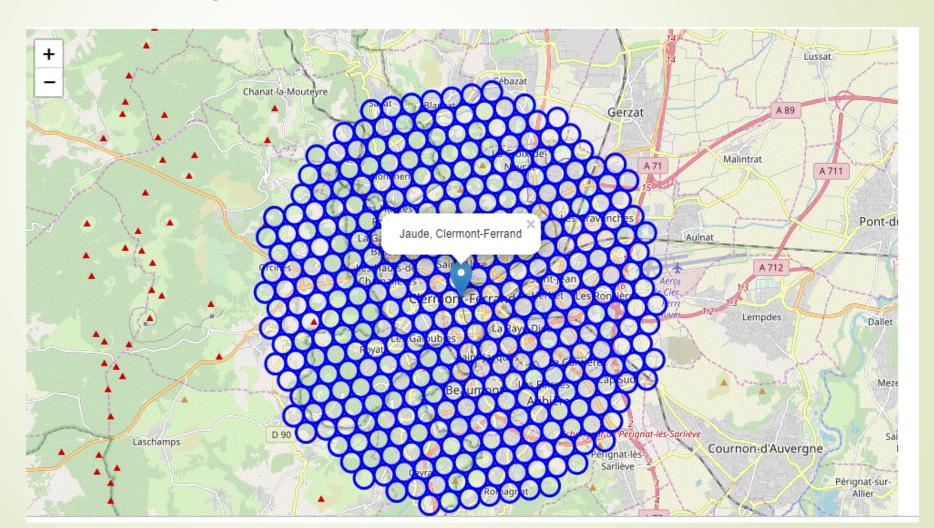
Methodology 1/2 (Description)

- Generation of a grid of candidates of locations
- Exploration of the distribution of restaurants around the city center
- Visualizations with differents maps
- Identification of recommended locations with the clustering technique using K-means algoithm

Generation of a grid of candidates of locations

	Latitude	Longitude	X	Y	Distance from center
0	45.724696	3.069564	-428167.930747	5.133149e+06	5992.495307
1	45.725495	3.077108	-427567.930747	5.133149e+06	5840.376700
2	45.726294	3.084652	-426967.930747	5.133149e+06	5747.173218
3	45.727092	3.092196	-426367.930747	5.133149e+06	5715.767665
4	45.727890	3.099741	-425767.930747	5.133149e+06	5747.173218
5	45.728687	3.107286	-425167.930747	5.133149e+06	5840.376700
6	45.729483	3.114832	-424567.930747	5.133149e+06	5992.495307
7	45.728072	3.057259	-429067.930747	5.133669e+06	5855.766389
8	45.728872	3.064803	-428467.930747	5.133669e+06	5604.462508
9	45.729671	3.072348	-427867.930747	5.133669e+06	5408.326913

Generation of a grid of candidates of locations



Exploration of the distribution of restaurants around the city center

```
import numpy as np

print('Total number of restaurants:', len(restaurants))
print('Total number of african restaurants:', len(african_restaurants))
print('Percentage of african restaurants: {:.2f}%'.format(len(african_restaurants) / len(restaurants) * 100))
print('Average number of restaurants in neighborhood:', np.array([len(r) for r in location_restaurants]).mean())
```

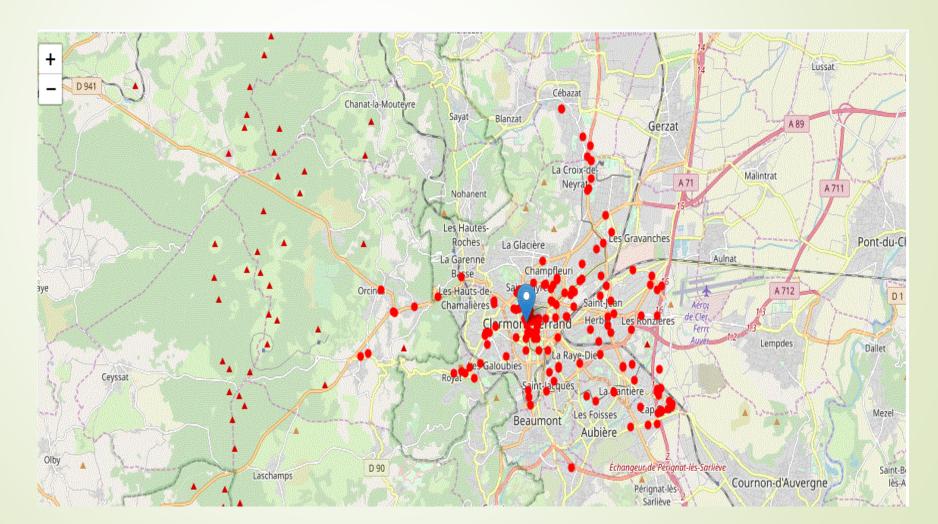
Total number of restaurants: 152

Total number of african restaurants: 0

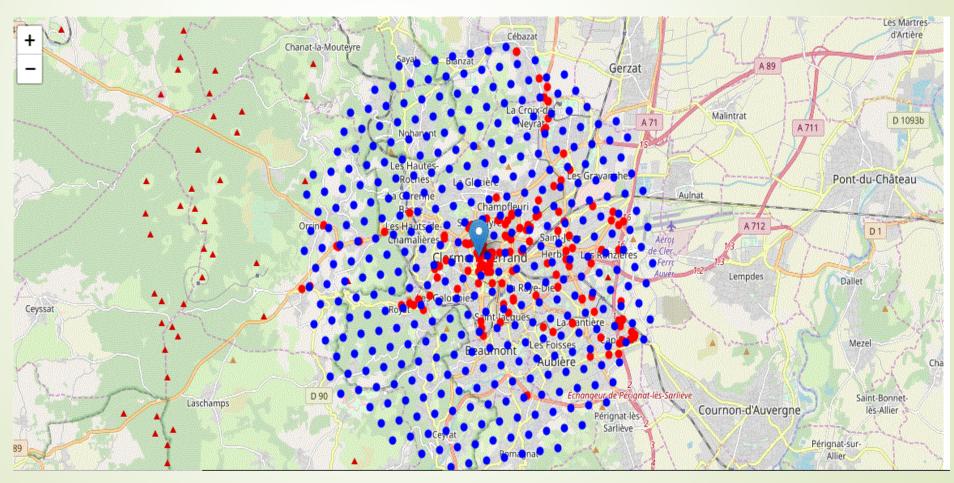
Percentage of african restaurants: 0.00%

Average number of restaurants in neighborhood: 0.3543956043956044

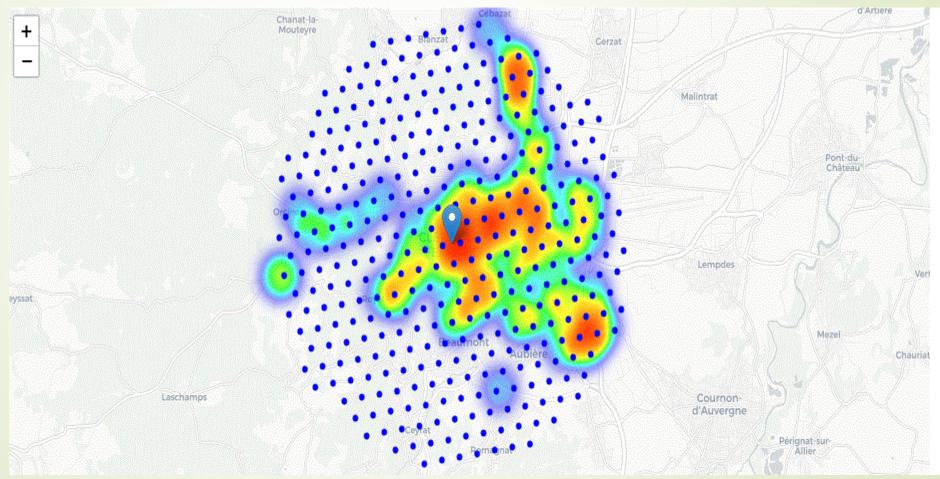
Exploration of the distribution of restaurants around the city center



Exploration of the distribution of restaurants around the city center (visualization of both locations and nearby restaurants)



 Exploration of the distribution of restaurants around the city center (visualization of both locations and nearby restaurants with heatmap)



Identification of recommended locations with the clustering technique using K-means algoithm: counting of restaurants in each location area

	Latitude	Longitude	x	Y	Distance from center	Restaurants in area
0	45.724696	3.069564	-428167.930747	5.133149e+06	5992.495307	C
1	45.725495	3.077108	-427567.930747	5.133149e+06	5840.376700	0
2	45.726294	3.084652	-426967.930747	5.133149e+06	5747.173218	0
3	45.727092	3.092196	-426367.930747	5.133149e+06	5715.767665	C
4	45.727890	3.099741	-425767.930747	5.133149e+06	5747.173218	c
5	45.728687	3.107286	-425167.930747	5.133149e+06	5840.376700	C
6	45.729483	3.114832	-424567.930747	5.133149e+06	5992.495307	C
7	45.728072	3.057259	-429067.930747	5.133669e+06	5855.766389	C
8	45.728872	3.064803	-428467.930747	5.133669e+06	5604.462508	C
9	45.729671	3.072348	-427867.930747	5.133669e+06	5408.326913	C
10	45.730470	3.079892	-427267.930747	5.133669e+06	5273.518749	C
11	45.731269	3.087437	-426667.930747	5.133669e+06	5204.805472	(
12	45.732067	3.094982	-426067.930747	5.133669e+06	5204.805472	C
13	45.732865	3.102528	-425467.930747	5.133669e+06	5273.518749	(
14	45.733662	3.110074	-424867.930747	5.133669e+06	5408.326913	C
15	45.734458	3.117620	-424267.930747	5.133669e+06	5604.462508	C

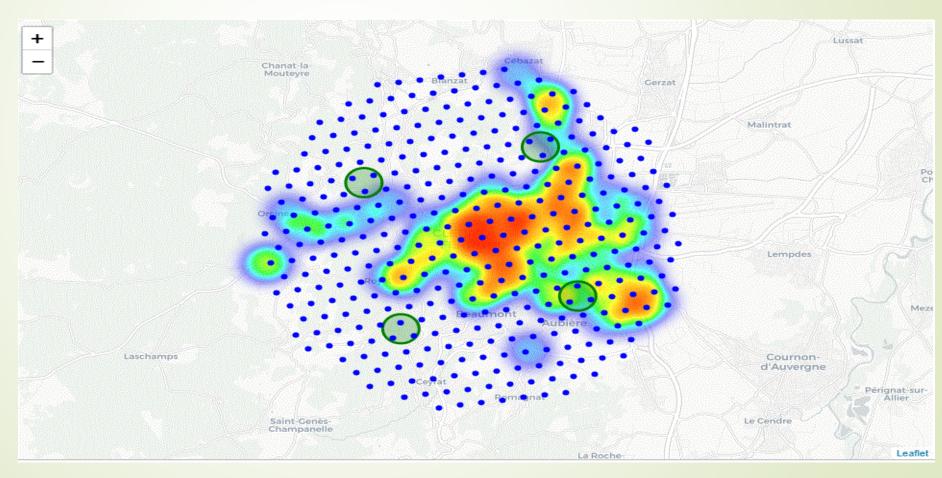
Identification of recommended locations with the clustering technique using K-means algoithm: locations with more than 2 restaurants in the vicinity

	Latitude	Longitude	x	Y	Distance from center	Restaurants in area
75	45.755948	3.143876	-421867.930747	5.135748e+06	5474.486277	6
93	45.760127	3.139118	-422167.930747	5.136267e+06	4938.623290	4
104	45.758725	3.081510	-426667.930747	5.136787e+06	2100.000000	3
139	45.765477	3.056884	-428467.930747	5.137826e+06	2343.074903	3
162	45.772852	3.082318	-426367.930747	5.138346e+06	519.615242	6
167	45.776842	3.120075	-423367.930747	5.138346e+06	3044.667470	3
179	45.775428	3.062452	-427867.930747	5.138865e+06	1500.000000	3
182	45.777828	3.085105	-426067.930747	5.138865e+06	300.000000	12
201	45.782004	3.080340	-426367.930747	5.139385e+06	519.615242	3
203	45.783602	3.095444	-425167.930747	5.139385e+06	1307.669683	3
204	45.784400	3.102996	-424567.930747	5.139385e+06	1873.499400	3
209	45.788384	3.140764	-421567.930747	5.139385e+06	4828.043082	3
222	45.787779	3.090679	-425467.930747	5.139904e+06	1374.772708	4
331	45.817631	3.107412	-423667.930747	5.143022e+06	4956.813493	3

Identification of recommended locations with the clustering technique using K-means algoithm: locations with less than 3 restaurants in the vicinity

Restaurants in area	Distance from center	Y	Х	Longitude	Latitude	
0	5992.495307	5.133149e+06	-428167.930747	3.069564	45.724696	
0	5840.376700	5.133149e+06	-427567.930747	3.077108	45.725495	ı
0	5747.173218	5.133149e+06	-426967.930747	3.084652	45.726294	
0	5715.767665	5.133149e+06	-426367.930747	3.092196	45.727092	}
0	5747.173218	5.133149e+06	-425767.930747	3.099741	45.727890	

Identification of recommended locations with the clustering technique using K-means algoithm (visualizaton map)



Identification of recommended locations with the clustering technique using K-means algoithm (Coordinates of the cluster centers)

```
[(3.042817670315043, 45.794928060853266),
(3.105863098291043, 45.80606883790682),
(3.119188603231289, 45.759568680689846),
(3.0560261375214237, 45.74935328906884)]
```

Names of the clusters

```
(3.042817670315043, 45.794928060853266) = 'Route de Ternant, 63830 Durtol, France'
(3.105863098291043, 45.80606883790682) = 'Fédération PCF 63, 34 Rue des Clos, 63100 Clermont-Ferrand, France'
(3.119188603231289, 45.759568680689846) = '18 Allée du Capitaine Diéderich, 63170 Aubière, France'
(3.0560261375214237, 45.74935328906884) = '39 Avenue du Chorigier, 63122 Ceyrat, France'
```

Results

- We conduct our analysis for the town of Clermont-Ferrand. We fixed to search locations around near the city centercalled Jaude. In terms of affluence, the city center will have more population and transports.
- The analysis of the data shows that if we limit the research of the area of 6km around the city center, we have many candidates of locations (364).
- When directing our attention on the distribution of restaurants in these locations. The map reveal that the density of restaurants is higher in the west part of the vicinity of the city center, than other part of the city center.
- We then decided to look at locations with less or equals number of restaurants in the vicinity to 2. After having the candidates, we clustered them into 4 using the K_means algorithm. The results are 4 clusters centers where the centers are good candidates to be the best place for the new restaurant. The corresponding address of these places are:
 - Route de Ternant, 63830 Durtol, France
 - Fédération PCF 63, 34 Rue des Clos, 63100 Clermont-Ferrand, France
 - □ 18 Allée du Capitaine Diéderich, 63170 Aubière, France
 - 39 Avenue du Chorigier, 63122 Ceyrat, France

Discussion

- Our results list 4 possible locations to where the new restaurant could be installed (Route de Ternant, 63830 Durtol, France Fédération PCF 63, 34 Rue des Clos, 63100 Clermont-Ferrand, France, 18 Allée du Capitaine Diéderich, 63170 Aubière, France, 39 Avenue du Chorigier, 63122 Ceyrat, France).
- An other analysis can focus for example on candidates locations having at most 3 or 4 restaurants nearby and those locations may be clustered into 10 for example.
- Another thing that can be investigated is the type of the restaurants (asian, exotic, italian, african french, ...) depending of the type of the new restaurant to be installed.
- We should also consider recommended zones as a starting point for more detailed analysis. It can be reasons of why the density of restaurants is low for some locations candidates.

Conclusion and future direction

- The aim of this project was to help stakeholders finding optimal location for a new restaurant in the city of Clermont-Ferrand in France.
- Generation of extensive collection of locations which satisfy some basic requirements like being of the vicitiny of the city center (6km).
- The restaurant density distribution around the city center which may be more affluent (citizens, tourists, Transports,..).
- The Clustering of those locations was then performed in order to create major zones of interest (containing greatest number of potential locations with actually low restaurant density), and addresses of those zone centers were created to be used as starting points for final exploration by stakeholders.
- Future direction: take into consideration additional factors like attractiveness of each location (proximity to park or water), levels of noise / proximity to major roads, real estate availability, prices, social and economic dynamics of every neighborhood etc.