

**IBM Data Science Professional Certificate**  
**IBM Capstone Project: Applied Data Science Capstone**  
**Final report**

**The Battle of the Neighborhoods**

**1. Introduction/Business Problem section**

***1.1. Background and description:***

A company would like to open a Russian restaurant in Greater London.

There are a lot of immigrants from former USSR in London that like Russian Food. Many Russians like the UK and London is one the favorites cities for tourism. Also some native citizens are interested in Russian Food. It's quite exotic for them.

It means Greater London has good conditions for opening a Russian restaurant potentially.

Greater London is organized into 33 government districts:

- 32 boroughs;
- the City of London.

It's a huge region covers about 1600 square km and has population about 9 million people. All boroughs are very different.

Therefore, it's very important to understand what place is the best to develop a new branch of business (to open Russian restaurant).

***1.2. Target Audience:***

Customer is a company, that want to start a Russian restaurant. We should help to make the best choice, to recommend the correct borough and explain why this place is better than others.

***1.3. Success Criteria:***

The success criteria of the project will be a good recommendation of borough for a restaurant.

## 2. Data section

We will use the next data sources:

- Foursquare API.

<https://ru.foursquare.com/>

This service is used to collect Foursquare location data, explore each borough of London and acquire information about venues, especially restaurants, café, bars, pubs, etc. We will use this data to understand better how many restaurants in boroughs. Also it will help us to create maps.

- The London Datastore

<https://data.london.gov.uk/>

The London Datastore has been created by the Greater London Authority. It has a lot of free data for every year about boroughs, populations, squares, etc. in Greater London. The most useful for us are a list of borough names and borough population for 2020 year:

<https://data.london.gov.uk/dataset/land-area-and-population-density-ward-and-borough>

- TripAdvisor

<https://www.tripadvisor.com/>

Unfortunately, Foursquare does not have information about all Russian restaurants and Russian Food, therefore we need to collect and check some information manually, particularly on TripAdvisor.

## 3. Methodology section

### 3.1. Business Understanding:

Our main goal is to find optimum borough for a new restaurant.

### 3.2. Analytic approach:

We are going to use two approaches (high-level view):

1<sup>st</sup> Approach:

Our goal is to find boroughs where there are a lot of restaurants. We want to use them as “a center of attraction”. At the same time, we have to exclude places where there are Russian restaurants. We don’t want to compete with

Russian Restaurant but we believe we can attract a part of clients where there are a lot of restaurants with others kind of dishes:

- Find Top 5 boroughs where are located maximum of restaurants, café, pubs, etc;
- Find boroughs with Russian restaurants;
- Delete from Top 5 boroughs with Russian restaurants.

2<sup>nd</sup> Approach:

Our goal is to select clusters similar to boroughs with Russian restaurant. If in one of boroughs there is a Russian restaurant, that continues to work and has a lot of good reviews, then we should find borough with similar infrastructure.

Therefore, we will use k-means algo to cluster boroughs.

### 3.3. Exploratory Data Analysis:

1. Download csv-file from <https://data.london.gov.uk/dataset/land-area-and-population-density-ward-and-borough> and Convert csv-file to DataFrame by pandas.
2. Choose data for 2020 year only and choose useful columns for us.

	Code	Borough	Population	Square_km
0	E09000001	City of London	8046	2.9
1	E09000002	Barking and Dagenham	218367	36.1
2	E09000003	Barnet	407148	86.7
3	E09000004	Bexley	254970	60.6
4	E09000005	Brent	343853	43.2
5	E09000006	Bromley	336395	150.1
6	E09000007	Camden	257384	21.8
7	E09000008	Croydon	400272	86.5
8	E09000009	Ealing	361833	55.5
9	E09000010	Enfield	342993	80.8
10	E09000011	Greenwich	292466	47.3
11	E09000012	Hackney	289488	19.0
12	E09000013	Hammersmith and Fulham	190721	16.4

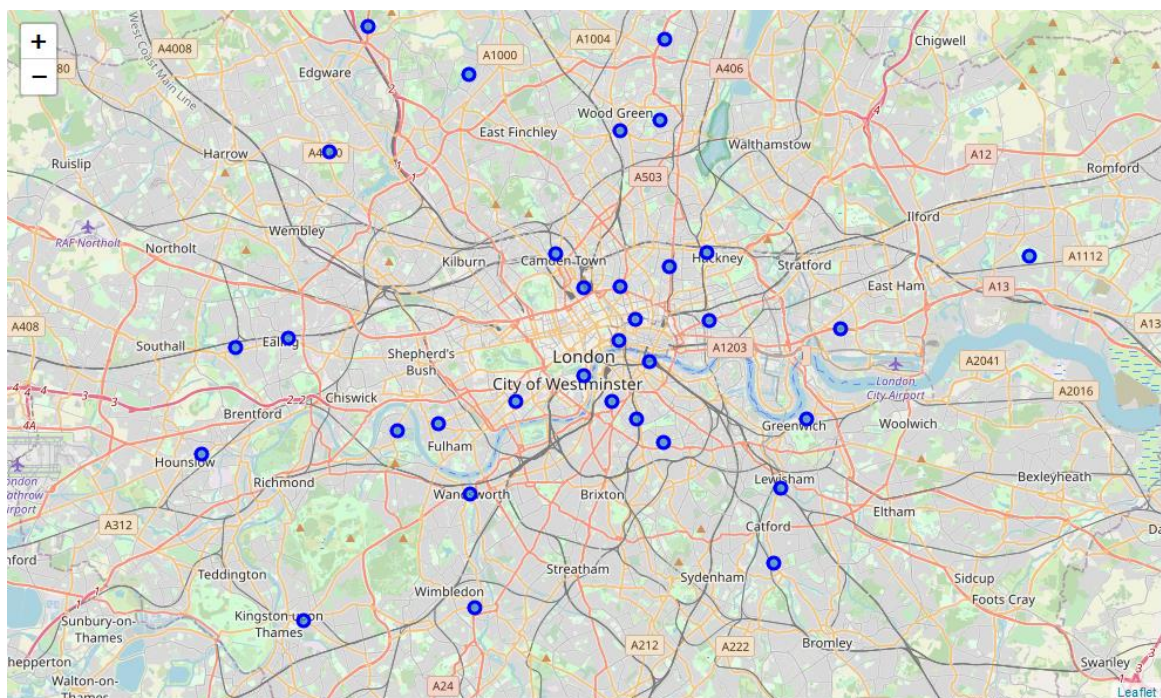
*Fig. 1. A part of clear borough list from The London Datastore.*

3. Use python geocoder library, find Latitude and Longitude, and add data to list of boroughs.

	Code	Borough	Population	Square_km	Latitude	Longitude
0	E09000001	City of London	8046	2.9	51.520500	-0.097430
1	E09000002	Barking and Dagenham	218367	36.1	51.543932	0.133157
2	E09000003	Barnet	407148	86.7	51.627294	-0.253759
3	E09000004	Bexley	254970	60.6	51.622832	-0.080656
4	E09000005	Brent	343853	43.2	51.609776	-0.194679
5	E09000006	Bromley	336395	150.1	51.431820	-0.016566
6	E09000007	Camden	257384	21.8	51.532360	-0.127960
7	E09000008	Croydon	400272	86.5	51.593209	-0.083390
8	E09000009	Ealing	361833	55.5	51.514060	-0.300730
9	E09000010	Enfield	342993	80.8	51.540021	-0.077501
10	E09000011	Greenwich	292466	47.3	51.484540	0.002750
11	E09000012	Hackney	289488	19.0	51.545050	-0.055320
12	E09000013	Hammersmith and Fulham	190721	16.4	51.482690	-0.212910

*Fig. 2. A borough table with Latitude and Longitude.*

4. Create a map of all boroughs by folium.



*Fig. 3. A map of boroughs of Greater London*

We can see from Fig. 3 some boroughs really are far from center. It's obvious some parts of Greater London are not the best place for any restaurant.

5. Find near by venues for every borough by Foursquare API (radius 1000 m) and create a sorted list of boroughs with places similar to restaurants, cafes, etc.

`Boroughs with restaurants and cafés:`

<code>Borough</code>	
<code>Enfield</code>	<code>48</code>
<code>Hammersmith and Fulham</code>	<code>47</code>
<code>Lambeth</code>	<code>46</code>
<code>Ealing</code>	<code>43</code>
<code>Islington</code>	<code>43</code>
<code>Merton</code>	<code>43</code>
<code>Tower Hamlets</code>	<code>42</code>
<code>Southwark</code>	<code>40</code>
<code>Greenwich</code>	<code>38</code>
<code>Kingston upon Thames</code>	<code>38</code>
<code>Harrow</code>	<code>38</code>
<code>Havering</code>	<code>38</code>
<code>City of London</code>	<code>38</code>
<code>Redbridge</code>	<code>36</code>
<code>Camden</code>	<code>33</code>
<code>Hillingdon</code>	<code>32</code>
<code>Sutton</code>	<code>31</code>
<code>Westminster</code>	<code>26</code>
<code>Haringey</code>	<code>25</code>
<code>Wandsworth</code>	<code>24</code>
<code>Hackney</code>	<code>23</code>
<code>Brent</code>	<code>20</code>
<code>Croydon</code>	<code>18</code>
<code>Hounslow</code>	<code>15</code>
<code>Newham</code>	<code>15</code>
<code>Kensington and Chelsea</code>	<code>14</code>
<code>Richmond upon Thames</code>	<code>13</code>
<code>Lewisham</code>	<code>12</code>
<code>Waltham Forest</code>	<code>7</code>
<code>Barnet</code>	<code>3</code>
<code>Bromley</code>	<code>2</code>
<code>Bexley</code>	<code>2</code>

As we supposed earlier boroughs at the end of the list are bad places to open restaurant.

6. Find Russian restaurants. Unfortunately, Foursquare can't find all information about Russian restaurants therefore we collect information from TripAdvisor:

	Name	Borough	Rating
0	ZIMA	Kensington and Chelsea	8
1	Mari Vanna	Kensington and Chelsea	8
2	Aeda London	Kensington and Chelsea	10
3	Bob Bob Ricard	Westminster	9
4	Borshtch N Tears	Westminster	8
5	Stolle	Islington	8

Fig. 4. A table of Russian restaurants in Greater London

We can see:

- Only 6 well-known Russian restaurants in Greater London;
- 3 of them are located in Kensington and Chelsea borough, 2 in Westminster and 1 in Islington.
- All restaurants have good rating (equals or more than 8) and reviews.

7. One of our goals as we described above to find boroughs where there are a lot of restaurants except Russian restaurants.

Use data from 5 and 6 steps and create a short list of good boroughs for us:

Borough	
Enfield	48
Hammersmith and Fulham	47
Lambeth	46
Ealing	43
Merton	43

8. Find each borough from short list along with the top 5 most common venues:

----Enfield----			----Hammersmith and Fulham----		
	venue	freq		venue	freq
0	Café	0.10	0	Café	0.11
1	Pub	0.10	1	Italian Restaurant	0.09
2	Coffee Shop	0.06	2	Coffee Shop	0.07
3	Restaurant	0.05	3	Pub	0.07
4	Cocktail Bar	0.03	4	Grocery Store	0.06
----Lambeth----			----Ealing----		
	venue	freq		venue	freq
0	Pub	0.16	0	Coffee Shop	0.11
1	Café	0.08	1	Pub	0.11
2	Hotel	0.07	2	Hotel	0.05
3	Coffee Shop	0.06	3	Park	0.04
4	Park	0.05	4	Italian Restaurant	0.04
----Merton----					
	venue	freq			
0	Grocery Store	0.06			
1	Coffee Shop	0.06			
2	Italian Restaurant	0.05			
3	Pub	0.05			
4	Thai Restaurant	0.04			

We can see again these boroughs have good infrastructure if we want to use them as “a center of attraction”.

9. Create a dataframe and display the top 10 venues for each borough:

	Borough	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	Barking and Dagenham	Metro Station	Convenience Store	Park	Plaza	Gift Shop	Grocery Store	Fast Food Restaurant	Film Studio	Fish & Chips Shop	Fish Market
1	Barnet	Italian Restaurant	Hotel	Pub	Sandwich Place	Coffee Shop	Fast Food Restaurant	Supermarket	Golf Course	Bookstore	Rest Area
2	Bexley	Intersection	Sandwich Place	Park	Performing Arts Venue	Miscellaneous Shop	Grocery Store	Mexican Restaurant	Coffee Shop	Pizza Place	Convenience Store
3	Brent	Café	Indian Restaurant	Japanese Restaurant	Grocery Store	Coffee Shop	Turkish Restaurant	Golf Course	Metro Station	Middle Eastern Restaurant	Supermarket
4	Bromley	Park	Grocery Store	Train Station	Hardware Store	Shipping Store	Event Service	Trail	Fast Food Restaurant	Gym	Supermarket
5	Camden	Café	Coffee Shop	Burger Joint	Park	Italian Restaurant	Breakfast Spot	Pizza Place	Art Gallery	Hotel	Mexican Restaurant
6	City of London	Coffee Shop	Gym / Fitness Center	Hotel	Vietnamese Restaurant	Pub	Food Truck	Bar	Café	Wine Bar	Whisky Bar
7	Croydon	Grocery Store	Café	Pub	Park	Bus Stop	Fast Food Restaurant	Turkish Restaurant	Supermarket	Convenience Store	Middle Eastern Restaurant
8	Ealing	Coffee Shop	Pub	Hotel	Park	Italian Restaurant	Thai Restaurant	Pizza Place	Platform	Burger Joint	Sushi Restaurant
9	Enfield	Pub	Café	Coffee Shop	Restaurant	Bakery	Cocktail Bar	Park	Middle Eastern Restaurant	Grocery Store	Lounge
10	Greenwich	Pub	Grocery Store	Café	Garden	Pizza Place	Coffee Shop	Italian Restaurant	Park	Historic Site	Trail
11	Hackney	Pub	Coffee Shop	Café	Bakery	Cocktail Bar	Restaurant	Garden	Beer Store	Butcher	Wine Shop

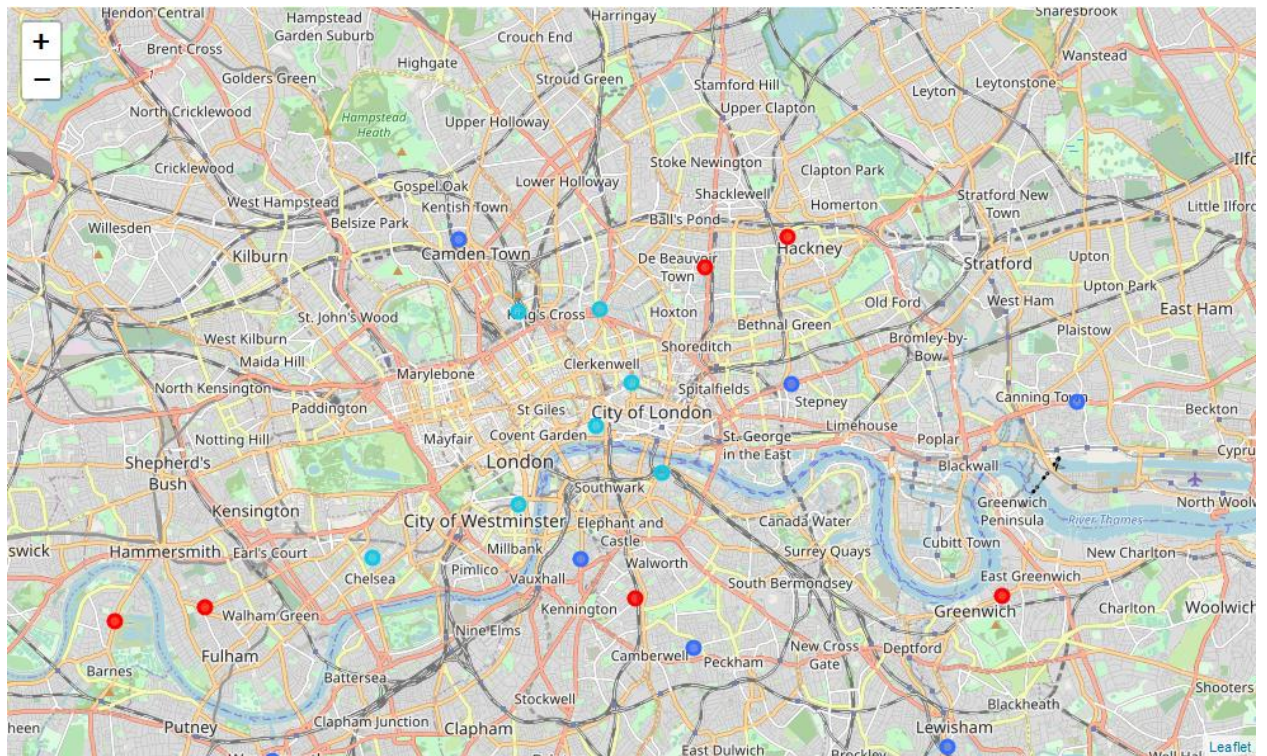
*Fig. 5. A fragment of table the top 10 venues for each borough.*

10. Run k-means clustering, find 4 similar clusters of boroughs and create a map.

Light blue circles are the best places for Russian restaurant. However, we have to remember we want to exclude borough from Fig. 4. (Kensington and Chelsea borough, Westminster and Islington) because we don't want compete with existent Russian restaurant.

If we compare a list from step 5 and Fig. 6 we can see Lambeth and Tower Hamlets are the best boroughs for a Russian restaurant.





*Fig. 6. A map of similar borough clusters in Greater London*

#### 4. Results section

Main research results:

- The best boroughs to open a Russian restaurant are Lambeth and Tower Hamlets;
- Greater London don't have a lot of Russian restaurant;
- Existent Russian restaurants have relatively compact location: Kensington and Chelsea, Westminster and Islington and they have high rating;
- Lambeth and Tower Hamlets boroughs are similar to boroughs where Existent Russian restaurants are located.

#### 5. Discussion section

Main results are described at the previous section. We can recommend Lambeth and Tower Hamlets as the best boroughs to open a Russian restaurant.

These boroughs have a lot restaurants, cafes and entertainments what can be used as 'a center of attraction'. At the same time these boroughs don't have direct competitors (Russian restaurant). It's important for business development.

We should avoid such boroughs as Kensington and Chelsea, Westminster and Islington to run a Russian restaurant because they have Russian restaurants and these restaurants have high rating and good reviews.



## **6. Conclusion section**

Our goal was to find the best borough in Greater London to run a Russian restaurant.

In order to find the best borough, we use such criteria's as

- "a center of attraction";
- minimum Russian restaurants criteria;
- k-means clustering to find similar boroughs to boroughs where Russian restaurants are located now.

As a result, we can recommend are Lambeth and Tower Hamlets boroughs.

In the future, it's a good idea to collect more information about revenue, population, rent payments, crime level, future projects, etc. It'll help to choose some good places inside boroughs.