IBM Capstone Final Project
DARIO LEONARDO BALACCO

As a part of the final IBM Capstone Project, we have the opportunity to come up with an idea to leverage the Foursquare location data to explore or compare neighborhoods or cities of our choice or to come up with a problem that can use the Foursquare location data to solve. I'll go through problem designing, data preparation and final analysis.

1. Discussion and Background of the Business Problem:

Problem Statement: Prospects of a Luxury Restaurant, in the wealthiest boroughs of London.

London is the capital and biggest city of England and the United Kingdom. It is one of the world's most important global cities and has been called the world's most powerful, most desirable, most influential, most visited, most expensive, sustainable, most investment-friendly, and most-popular-for-work city. London is definitely one of the best places to start up a new business. However, London is highly competitive having the best restaurant in the world and therefore, the need of a specific customers target for a restaurant it is really important. The customer intends open a luxury restaurant in a wealthy borough of London. I will firstly assess which are the 10 most populated borough by calculating the ratio between the estimated population and the borough's area. I then assessed the top 5 wealthiest and populated borough of London by looking at average properties value. I then will identify which are the ones have more restaurants and what are the top trending venues. This will indicate which borough is the best to open a luxury restaurant where people tend to go out for eating and which ones are the ones with more competition.

Target Audience

1. Business people who wants to invest or open a luxury restaurant in London.
2. Freelancer who loves to have their own restaurant as a side business. This analysis will give an idea, how beneficial it is to open a restaurant and what are the pros and cons of this business..
3. Budding Data Scientists, who want to implement some of the most used Exploratory Data Analysis techniques to obtain necessary data and analyse it.

2. Data description

Boroughs of London Data

Firstly, I need to look at what data are available online describing the boroughs of London. The wikipedia page ("London boroughs") contains a table describing the 32 boroughs.

Wikipedia table of London boroughs

Borough	Inner	Status	Local authority	Political control	Headquarters	Area (sq mi)	Population (2013 est)[1]	Co-ordinates	Nr. in map
Barking and Dagenham [note 1]			Barking and Dagenham London Borough Council	Labour	Town Hall, 1 Town Square	13.93	194,352	51.5607°N 0.1557°E	25
Barnet			Barnet London Borough Council	Conservative	Barnet House, 2 Bristol Avenue, Colindale	33.49	369,088	51.6252°N 0.1517°W	31
Bexley			Bexley London Borough Council	Conservative	Civic Offices, 2 Watling Street	23.38	236,687	51.4549°N 0.1505°E	23
Brent			Brent London Borough Council	Labour	Brent Civic Centre, Engineers Way	16.70	317,264	51.5588°N 0.2817°W	12
Bromley			Bromley London Borough Council	Conservative	Civic Centre, Stockwell Close	57.97	317,899	51.4039°N 0.0198°E	20
Camden	✓		Camden London Borough Council	Labour	Camden Town Hall, Judd Street	8.40	229,719	51.5290°N 0.1255°W	11
Croydon			Croydon London Borough Council	Labour	Bernard Weatherill House, Mint Walk	33.41	372,752	51.3714°N 0.0977°W	19
Ealing			Ealing London Borough Council	Labour	Perceval House, 14-16 Uxbridge Road	21.44	342,494	51.5130°N 0.3089°W	13
Enfield			Enfield London Borough Council	Labour	Civic Centre, Silver Street	31.74	320,524	51.6538°N 0.0799°W	30
Greenwich [note 2]	✓ [note 3]	Royal	Greenwich London Borough Council	Labour	Woolwich Town Hall, Wellington Street	18.28	264,008	51.4892°N 0.0648°E	22
Hackney	✓		Hackney London Borough Council	Labour	Hackney Town Hall, Mare Street	7.36	257,379	51.5450°N 0.0553°W	9
Hammersmith and Fulham [note 4]	✓		Hammersmith and Fulham London Borough Council	Labour	Town Hall, King Street	6.33	178,685	51.4927°N 0.2339°W	4
Haringey	[note 3]		Haringey London Borough Council	Labour	Civic Centre, High Road	11.42	263,386	51.6000°N 0.1119°W	29
Harrow			Harrow London Borough Council	Labour	Civic Centre, Station Road	19.49	243,372	51.5898°N 0.3346°W	32
Havering			Havering London Borough Council	Conservative (council NOC)	Town Hall, Main Road	43.35	242,080	51.5812°N 0.1837°E	24
Hillingdon			Hillingdon London Borough Council	Conservative	Civic Centre, High Street	44.67	286,806	51.5441°N 0.4760°W	33
Hounslow			Hounslow London Borough Council	Labour	Hounslow House, 7 Bath Road	21.61	262,407	51.4746°N 0.3680°W	14
Islington	✓		Islington London Borough Council	Labour	Customer Centre, 222 Upper Street	5.74	215,667	51.5416°N 0.1022°W	10
Kensington and Chelsea	✓	Royal	Kensington and Chelsea London Borough Council	Conservative	The Town Hall, Hornton Street	4.68	155,594	51.5020°N 0.1947°W	3
Kingston upon Thames		Royal	Kingston upon Thames London Borough Council	Liberal Democrat	Guildhall, High Street	14.38	166,793	51.4085°N 0.3064°W	16
Lambeth	✓		Lambeth London Borough Council	Labour	Lambeth Town Hall, Brixton Hill	10.36	314,242	51.4607°N 0.1163°W	6
Lewisham	✓		Lewisham London Borough Council	Labour	Town Hall, 1 Catford Road	13.57	286,180	51.4452°N 0.0209°W	21
Merton			Merton London Borough Council	Labour	Civic Centre, London Road	14.52	203,223	51.4014°N 0.1958°W	17
Newham	[note 3]		Newham London Borough Council	Labour	Newham Dockside, 1000 Dockside Road	13.98	318,227	51.5077°N 0.0469°E	27
Redbridge			Redbridge London Borough Council	Labour	Town Hall, 128-142 High Road	21.78	288,272	51.5590°N 0.0741°E	26
Richmond upon Thames			Richmond upon Thames London Borough Council	Liberal Democrat	Civic Centre, 44 York Street	22.17	191,365	51.4479°N 0.3260°W	15
Southwark	✓		Southwark London Borough Council	Labour	160 Tooley Street	11.14	298,464	51.5035°N 0.0804°W	7
Sutton			Sutton London Borough Council	Liberal Democrat	Civic Offices, St Nicholas Way	16.93	195,914	51.3618°N 0.1945°W	18
Tower Hamlets	✓		Tower Hamlets London Borough Council	Labour	Town Hall, Mulberry Place, 5 Clove Crescent	7.63	272,890	51.5099°N 0.0059°W	8
Waltham Forest			Waltham Forest London Borough Council	Labour	Waltham Forest Town Hall, Forest Road	14.99	265,797	51.5908°N 0.0134°W	28
Wandsworth	✓		Wandsworth London Borough Council	Conservative	The Town Hall, Wandsworth High Street	13.23	310,516	51.4567°N 0.1910°W	5
Westminster	✓	City	Westminster City Council	Conservative	Westminster City Hall, 64 Victoria Street	8.29	226,841	51.4973°N 0.1372°W	2

For each borough, the table contains information about inner (description of what this means is not reported), status, Local autority, Political control, Headquarters, Area (sq mt), Population (est 2013), Co-ordinates, and the number on the Wikipedia map.

I will use this table to determine the most populated boroughs by calculating the ratio between the Area (sq mt) and Population (est 2013).

Properties values Data

I also will need to check what is the prperties average values of the boroughs. I will use the table "London property value" from the government website (https://data.london.gov.uk/download/average-house-prices/b1b0079e-698c-4c0b-b8c7-aa6189590ca4/land-registry-house-prices-borough.csv).

The table contains information about area code, name of the borough, the year, the measure (Mean, median, sales) and the Value. I will be focusing on mean Values from the year ending in December 2017.

Geographical and Venues Data

I will get the geographical information of the borough using geolocator.geocode. I will then use foursquare to look at which boroughs have the highest number of restaurants and what are the top 5 trending venues. This will indicate the best borough where to open a luxury restaurant based on population, wealth, and trending venues.

Metodology

The aim of the project is to find an optimal location for opening a luxury restaurant in one of the wealthiest and most populated boroughs of London.

Firstly, the data used for the analysis was collected from publicly available sources. The obtained information comprises of the names, geolocation, population and average value for each of the borough of London.

After borough data was scraped from Wikipedia, I put them into a data frame and then further transformed, so that unnecessary columns and rows are dropped and column headers have a name that is easy to work with. Final data frame contained informed about each of the borough, along with the respective population, area. The table contained the coordinates in

the wrong format from the Wikipedia table, so they needed to be converted in the right one using geolocator.geocode. The ratio between Population/Area was calculated to identify the highest densely populated boroughs.

To find the housing price for each borough, official data from the government were used. The table provided data for each borough with the year and the value. However, different methods were used to calculate the value. I extracted the data concerning Mean values relative to the most recent year (year ending in 2017).
The Geopy geocoders library was then utsed to gather the coordinates of each borough and this information was also put into a data frame.

Fourspace API was utilized to find restaurants in a radius of 1000m from the coordinates of each borough.

Then I performed is to cluster the districts with an unsupervised learning K-means algorithm. Finally, based on the obtained clusters, outcomes can be discussed and a conclusion can be drawn.

Results

Identification of the wealthiest boroughs of London

In order to identify the wealthiest borough of London I inspected the mean property values (Figure 1). The top 10 wealthiest boroughs resulted to be Kensington and Chelsea, Westminster, Camden, Hammersmith and Fulham, Wandsworth, Richmond Upon Thames, Islington, Southwark, Barnet, and Haringey.

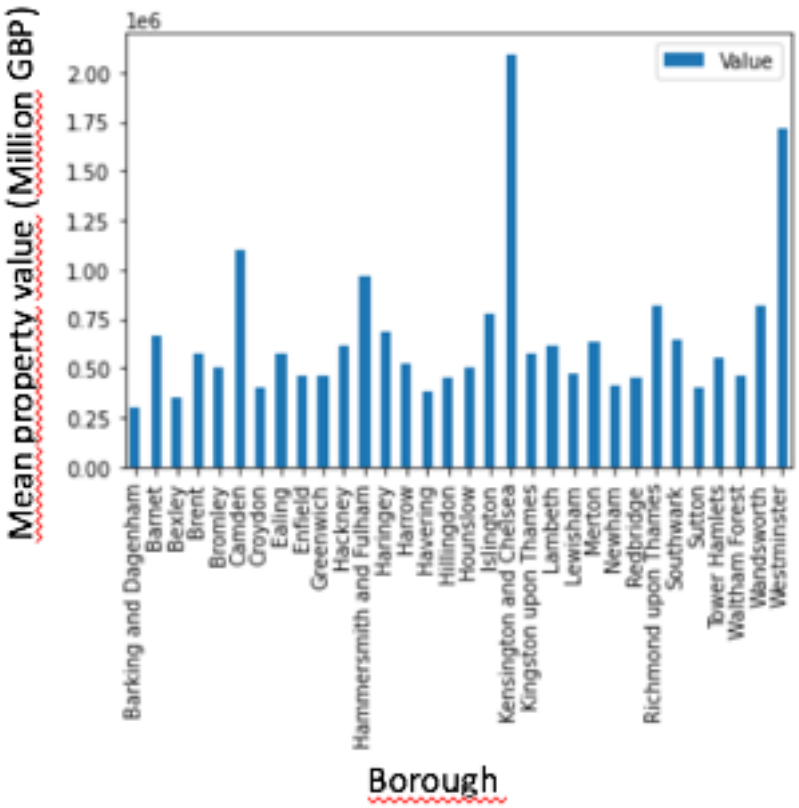


Figure 1: Mean property value in the London Boroughs.

Identification of the most densely populated and wealthiest boroughs of London

In order to identify the most densely populated and wealthiest borough of London I calculated the ratio population/area (mt sq) (Figure 2). The top 5 wealthiest boroughs resulted to be Kensington and Chelsea, Westminster, Camden, Hammersmith and Fulham, and Islington.

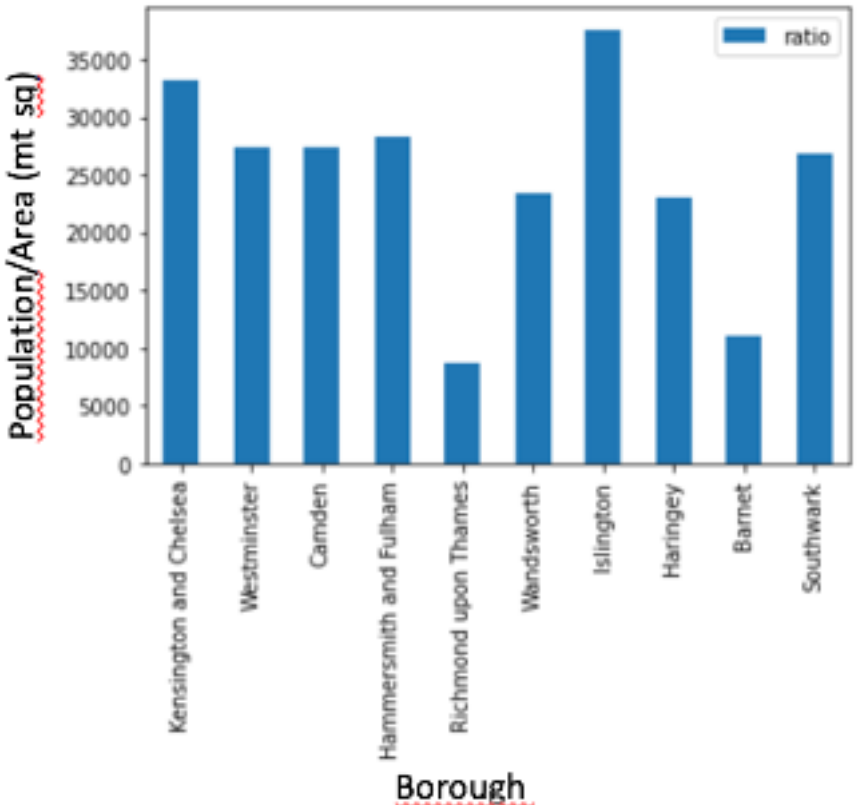


Figure 2: The most densely populated and wealthiest boroughs of London.

Identification of the borough with most restaurant

Inspection of the venues in each borough revealed that the borough with the highest number of restaurant are Kensington and Chelsea and Camden with both 9 restaurants (Figure 3).

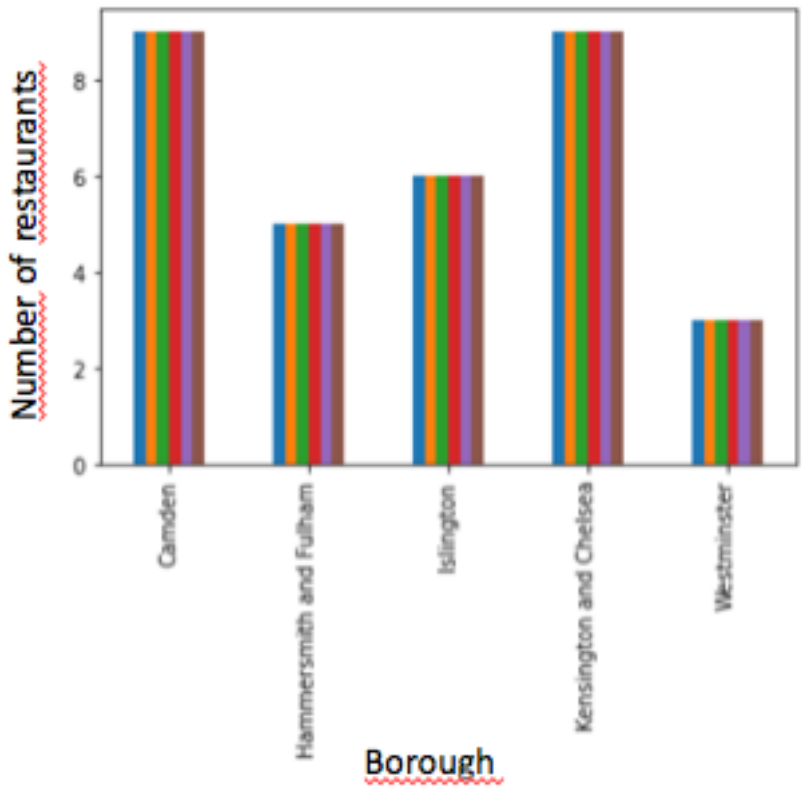
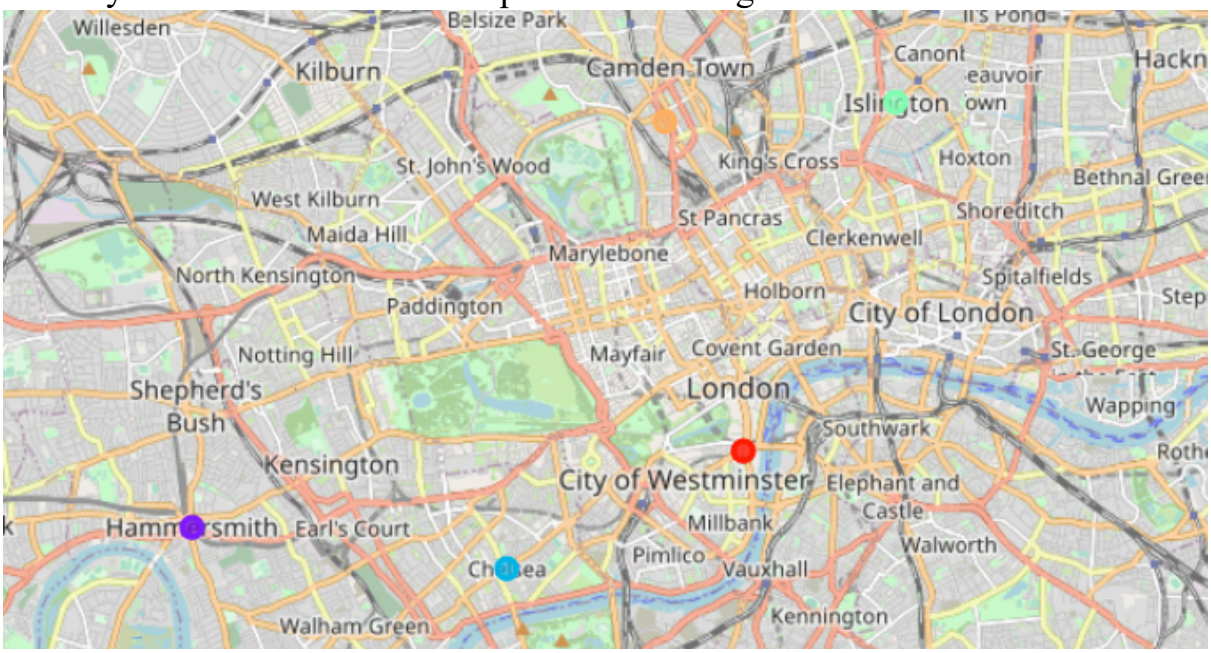


Figure 3: Number of restaurants in the wealthiest boroughs of London.

Clustering of borough according to their venues

Clustering of the borough showed that they are unique in terms of top 10 venues as every cluster resulted to correspond to a borough.



Identification of the trending venues in the Boroughs.

The inspection of most trending venues showed that in Kensington and Chelsea, food and hospitality venues are the top trending venues differently to Camden where also music venues are included (Table 1)

Borough	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
Camden	Coffee Shop	Pub	Greek Restaurant	Tea Room	Music Venue
Hammersmith and Fulham	Pub	Coffee Shop	Hotel	Grocery Store	Food Truck
Islington	Pub	Bakery	Theater	Burger Joint	Yoga Studio
Kensington and Chelsea	French Restaurant	Ice Cream Shop	Bakery	Japanese Restaurant	English Restaurant
Westminster	Hotel	Plaza	Café	Garden	Historic Site

Table 1: Top 5 trending venues in the boroughs of London.

Discussion

Property values indicate 10 boroughs as candidates to open a **luxury restaurant**.
The most **densely populated** area of London are Islington, Kensington & Chealsea, Hammersmith & Fulham, Camden, and Westminster.
Kensington & Chelsea have the **highest** number of restaurants. This could suggest more competitions.
Trending venues analyses showed that in **Kensington & Chelsea** the top 5 **trending** venues are all belonging to the category of **food and hospitality**. This indicates that, despite more competition, the hospitality sector in Kensington & Chelsea is **flourishing**. Wealth assessed on Mean property values also suggests **high profile costumers**.