1. Introduction and Business Problem

Project Background

London is an ever-growing city, the most populated in the United Kingdom. It has a wide diversity being made up of many groups of different cultures; as well as being the financial capital of the UK. It is a global hub of business and commerce. The city is a major center for banking and finance, retailing, world trade, transportation, tourism, real estate, new media, traditional media, advertising, legal services, accountancy, insurance, theatre, fashion, and the arts in the UK.

Project Description

This project aims to find a suitable hotel based on location, price and venues. In order to make a comparison and evaluation of the hotel options in London, I have set a basis, therefore the apartment in London must meet the following requirements:
The hotel will have 2 beds in 1 room for 2 adults and 1 child. The price of rent not exceed £1,000 during the stay. It must be desirable to have venues such as cafés/coffeeshops, a restaurant, and a theatre.

Target Audience

The target audience for this will be aimed at those (either internal or external migrants) visiting London briefly, wanting to stay close to its many types of venues. In this particular project it focuses on a family of three.

2. Data Section

Description of the data and its sources that will be used to solve the problem.

How the data will be used to solve the problem:
Data was extracted from Wikipedia's table on London boroughs using the beautiful soup library: https://en.wikipedia.org/wiki/London_boroughs
Due to the many boroughs, these were be segmented and explored, with a dataset created to demonstrate that.
Geocoder was be used to obtain a list of latitudes and longitudes for each borough. As well as a list of hotels in London area with their addresses and price acquired from Expedia:
https://www.expedia.ie/Hotel-Search?GOTO=HOTSEARCH&SearchArea=City&SearchType=Place&adults=2&children=1_13&destinat

ion=London%20%28and%20vicinity%29%2C%20England%2C%20United%20Kingdom&endDate=2021-08-13&lang=2057&latLong=&needUTF8Decode=true&regionId=178279&rfrr=hotel.search&selected=&semdtl=&sort=RECOMMENDED&startDate=2021-08-10&theme=&useRewards=false&userIntent=

Then after modifications, information gathered will be input through FourSquare API and geopy data to retrieve information on London's most common venues of selected boroughs. As well as map the location of hotels, in some form, linked to the cluster of venues. Postcodes from hotel locations will be converted to geodata(lat, long) using Geopy-distance and Nominatim.

3. Methodology

3.1 Boroughs and venues

Firstly the borough's venues were obtained before the research on hotels.
The boroughs, latitude and longitude were obtained using BeautifulSoup with data provided by Wikipedia. And from there the dataframe was cleaned to give a cleaner view.

	BoroughName	Latitude	Longitude
0	Barking and Dagenham	51.5607	0.1557
1	Barnet	51.6252	-0.1517
2	Bexley	51.4549	0.1505
3	Brent	51.5588	-0.2817
4	Bromley	51.4039	0.0198

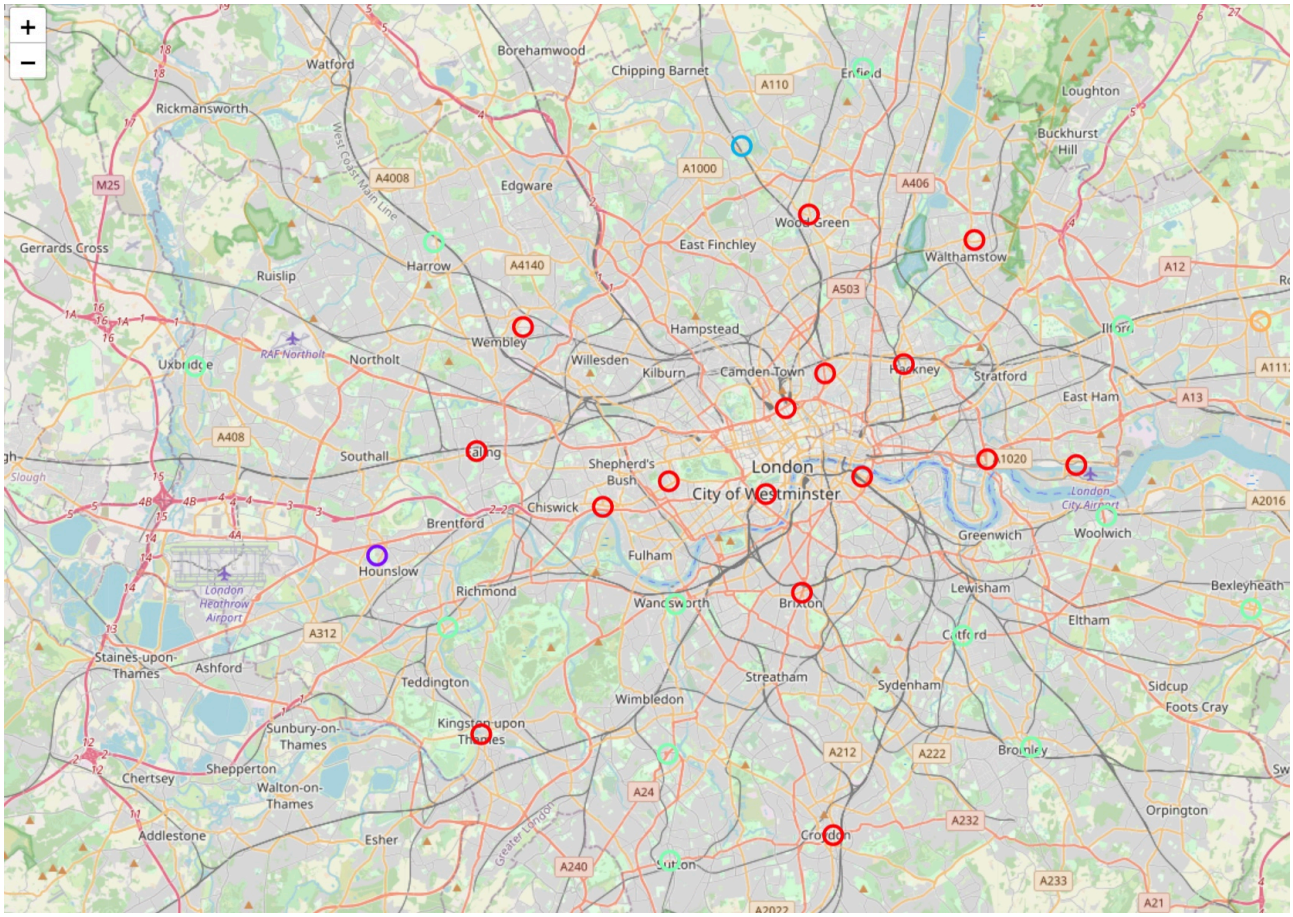
Then using Foursquare API, I created a function to explore all boroughs, obtaining the top 50 venues in terms of popularity within a 500m radius of each borough.

	BoroughName	Borough Latitude	Borough Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Barking and Dagenham	51.5607	0.1557	Central Park	51.559560	0.161981	Park
1	Barking and Dagenham	51.5607	0.1557	Morrisons	51.559774	0.148752	Supermarket
2	Barking and Dagenham	51.5607	0.1557	Crowlands Heath Golf Course	51.562457	0.155818	Golf Course
3	Barking and Dagenham	51.5607	0.1557	Robert Clack Leisure Centre	51.560808	0.152704	Martial Arts School
4	Barking and Dagenham	51.5607	0.1557	Beacontree Heath Leisure Centre	51.560997	0.148932	Gym / Fitness Center
5	Barking and Dagenham	51.5607	0.1557	Becontree Heath Bus Station	51.561065	0.150998	Bus Station
6	Barking and Dagenham	51.5607	0.1557	Dagenham Swimming Pool	51.560946	0.150054	Pool
7	Barnet	51.6252	-0.1517	JusDrive LTD	51.625863	-0.151502	Rental Car Location
8	Barnet	51.6252	-0.1517	The Atrium	51.624726	-0.151933	Café
9	Barnet	51.6252	-0.1517	Premium Electrical	51.623175	-0.153420	Business Service

One hot encoding was used to analyse each borough. Then a dataframe was created to display the top 10 venues per borough.

	BoroughName	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	Pool	Golf Course	Bus Station	Supermarket	Park	Gym / Fitness Center	Martial Arts School	Fish Market	Fish & Chips Shop	Fast Food Restaurant
1	Barnet	Café	Business Service	Rental Car Location	Yoga Studio	Escape Room	Food Court	Flea Market	Fish Market	Fish & Chips Shop	Fast Food Restaurant
2	Bexley	Coffee Shop	Pub	Clothing Store	Fast Food Restaurant	Pharmacy	Supermarket	Bakery	Italian Restaurant	Furniture / Home Store	Department Store
3	Brent	Hotel	Coffee Shop	Sporting Goods Shop	Clothing Store	Grocery Store	American Restaurant	Sandwich Place	Bar	Outdoor Sculpture	Plaza
4	Bromley	Clothing Store	Coffee Shop	Bar	Pizza Place	Burger Joint	Furniture / Home Store	Fast Food Restaurant	Electronics Store	Noodle House	Donut Shop

Then the dataframe was divided into 5 clusters, then mapped out with folium. The first cluster provides the boroughs in the vicinity of the inner-city



This first cluster provided the most accurate requirements for what we are looking for: coffee shops, theatres, and restaurants. Particularly within Westminster, Southwark, and Lambeth.

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london_merged.loc[london_merged['Cluster Labels'] == 0, london_merged.columns[[0] + list(range(4, london_merged.shape[1]))]]
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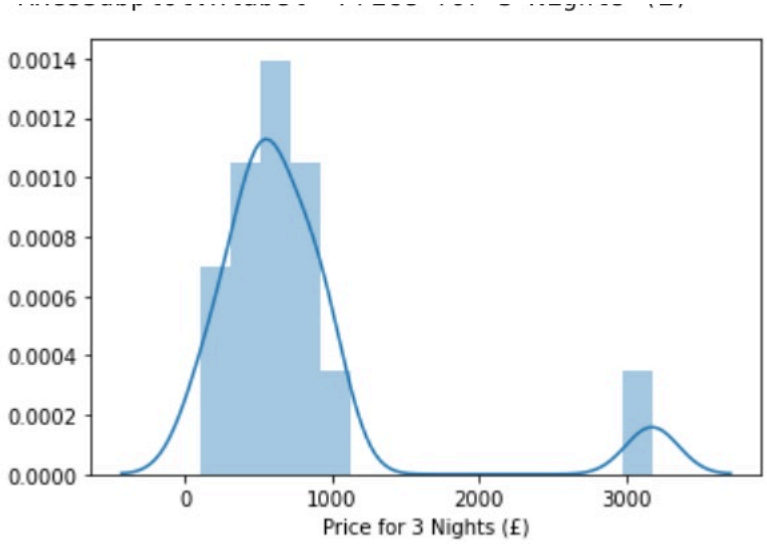
	BoroughName	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
3	Brent	Hotel	Coffee Shop	Sporting Goods Shop	Clothing Store	Grocery Store	American Restaurant	Sandwich Place	Bar	Outdoor Sculpture	Plaza
5	Camden	Hotel	Café	Coffee Shop	Breakfast Spot	Pizza Place	Bakery	Train Station	Pub	Market	Burger Joint
6	Croydon	Pub	Coffee Shop	Korean Restaurant	Portuguese Restaurant	Asian Restaurant	Spanish Restaurant	Bus Stop	Malay Restaurant	Gaming Cafe	Burger Joint
7	Ealing	Coffee Shop	Park	Italian Restaurant	Pub	Pizza Place	Clothing Store	Burger Joint	Hotel	Vietnamese Restaurant	Organic Grocery
10	Hackney	Pub	Coffee Shop	Cocktail Bar	Brewery	Bakery	Grocery Store	Modern European Restaurant	Organic Grocery	Café	Vegetarian / Vegan Restaurant
11	Hammersmith and Fulham	Pub	Indian Restaurant	Italian Restaurant	Gastropub	Café	Vietnamese Restaurant	Japanese Restaurant	Garden Center	Furniture / Home Store	French Restaurant
12	Haringey	Turkish Restaurant	Pub	Convenience Store	Supermarket	Indian Restaurant	Italian Restaurant	Gym / Fitness Center	Grocery Store	Light Rail Station	Gaming Cafe
17	Islington	Pub	Bakery	Theater	Ice Cream Shop	Burger Joint	Café	Boutique	Cocktail Bar	Music Venue	Record Shop
18	Kensington and Chelsea	Café	Juice Bar	Clothing Store	Restaurant	Bakery	French Restaurant	Gym / Fitness Center	Burger Joint	Modern European Restaurant	Mediterranean Restaurant
19	Kingston upon Thames	Coffee Shop	Department Store	Burger Joint	Pub	Café	Sushi Restaurant	Thai Restaurant	Cajun / Creole Restaurant	Latin American Restaurant	Market
20	Lambeth	Caribbean Restaurant	Pub	Market	Coffee Shop	BBQ Joint	Beer Bar	Tapas Restaurant	Pizza Place	Restaurant	Cocktail Bar
23	Newham	Hotel	Sandwich Place	Light Rail Station	Rafting	Italian Restaurant	Currency Exchange	Pharmacy	Airport Service	Airport Lounge	Chinese Restaurant
26	Southwark	Coffee Shop	Hotel	Pub	Hotel Bar	English Restaurant	Cocktail Bar	Pizza Place	Theater	Bar	Art Gallery
28	Tower Hamlets	Coffee Shop	Hotel	Italian Restaurant	Sandwich Place	Pub	Café	Pizza Place	Chinese Restaurant	Outdoor Sculpture	Grocery Store
29	Waltham Forest	Pub	Coffee Shop	Pizza Place	Furniture / Home Store	Beer Store	Tea Room	Grocery Store	Gym / Fitness Center	Social Club	Vegetarian / Vegan Restaurant
31	Westminster	Hotel	Coffee Shop	Theater	Sporting Goods Shop	Hotel Bar	Sushi Restaurant	Juice Bar	Pub	Sandwich Place	Fast Food Restaurant

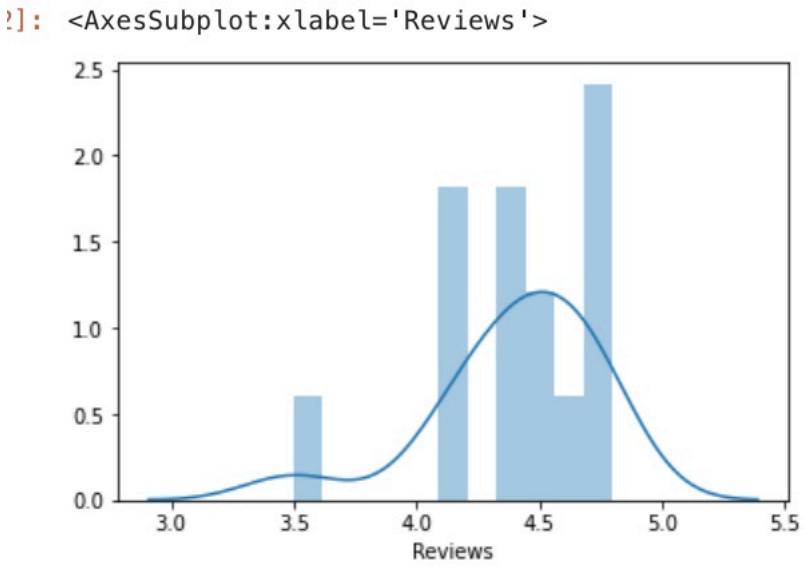
With that in mind a csv file was created with London hotels mostly in this area. The file contained the name, address, borough, price for three nights, and postcode for each hotel, however the latitude and longitude were still needed. Using geotag and Nominatim each individual hotel's coordinates was acquired.

	Name	Address	Borough	Postcode	Reviews	Price for 3 Nights (£)	Lat	Long
0	DoubleTree by Hilton London Angel Kings Cross	60 Pentonville Road	Islington	N1 9LA	4.2	217	51.532111	-0.109466
1	Ibis Budget London Hounslow	20-28 Staines Road	Hounslow	TW3 3JS	3.5	104	51.467295	-0.366824
2	Bankside Hotel	2 Blackfriars Road, Upper Ground	Southwark	SE1 9JU	4.8	717	51.507693	-0.105322
3	The Resident Soho	10 Carlisle Street	Westminster	W1D 3BR	4.5	478	51.514739	-0.134111
4	Apex Temple Court Hotel	1-2 Serjeants Inn, Fleet Street	City of London	EC4Y 1AG	4.7	3177	51.513816	-0.108900
5	London Marriott Hotel County Hall	London County Hall, Westminster Bridge Road	Southwark	SE1 7PB	4.4	912	51.501905	-0.119047
6	Hilton London Bankside	2-8 Great Suffolk Street	Southwark	SE1 0UG	4.7	745	51.505319	-0.101517
7	W London	10 Wardour Street, Soho	Westminster	W1D 6QF	4.2	984	51.511032	-0.131562
8	The Hoxton Southwark	Blackfriars Road 32- 40	Southwark	SE1 8NY	4.6	564	51.506230	-0.105186
9	Park Plaza County Hall London	1 Addington Street	Lambeth	SE1 7RY	4.4	478	51.501195	-0.115712
10	Staybridge Suites London	100 Vauxhall Walk	Lambeth	SE11 5EL	4.7	560	51.489327	-0.120686
11	SACO Fitzrovia	21 Tottenham Street	Camden	W1T 2AW	4.5	517	51.518978	-0.137582
12	The Piccadilly London West End	65-73 Shaftesbury Avenue, Piccadilly	Westminster	W1D 6EX	4.1	901	51.512222	-0.131908
13	Hampton by Hilton London Waterloo	157 Waterloo Road, Waterloo	Lambeth	SE1 8XA	4.4	346	51.500923	-0.108168

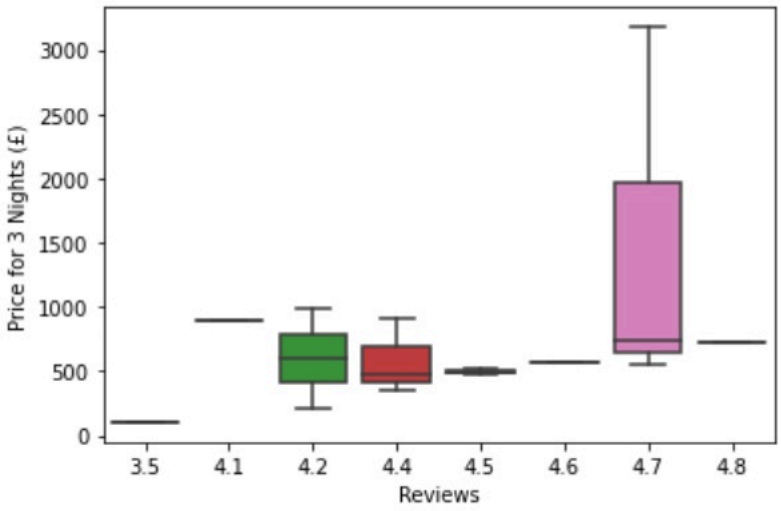
Through a distribution plot, we can see that most hotels lie within the £300+ -£1000 range.



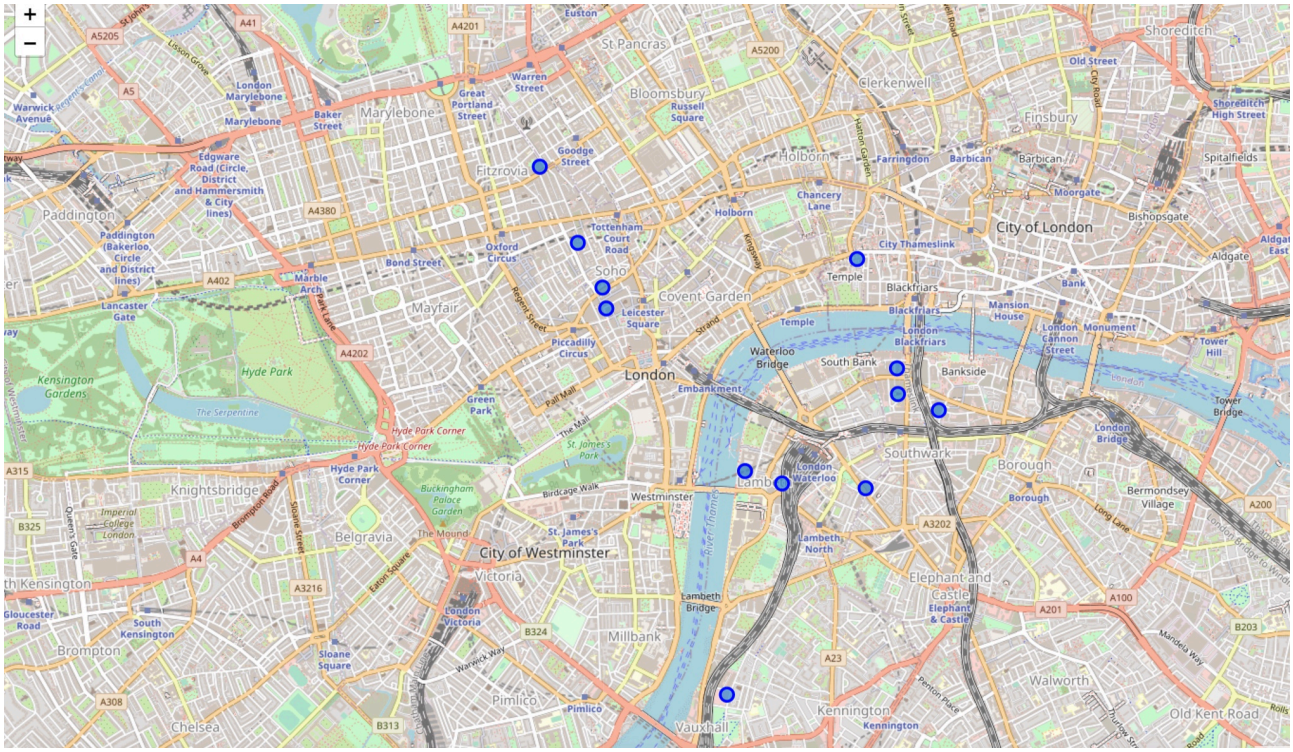
The second distribution plot shows the reviews recorded for the hotels. Almost all lie within 4.0+ to 4.75. These provide an idea of whether they may be good to stay at.



The boxplot shows the reviews and prices, with the mean of most of the reviews lying under the £1000. This may be reasonable for a family of three, as prices for certain hotels recorded can reach at least £3000.

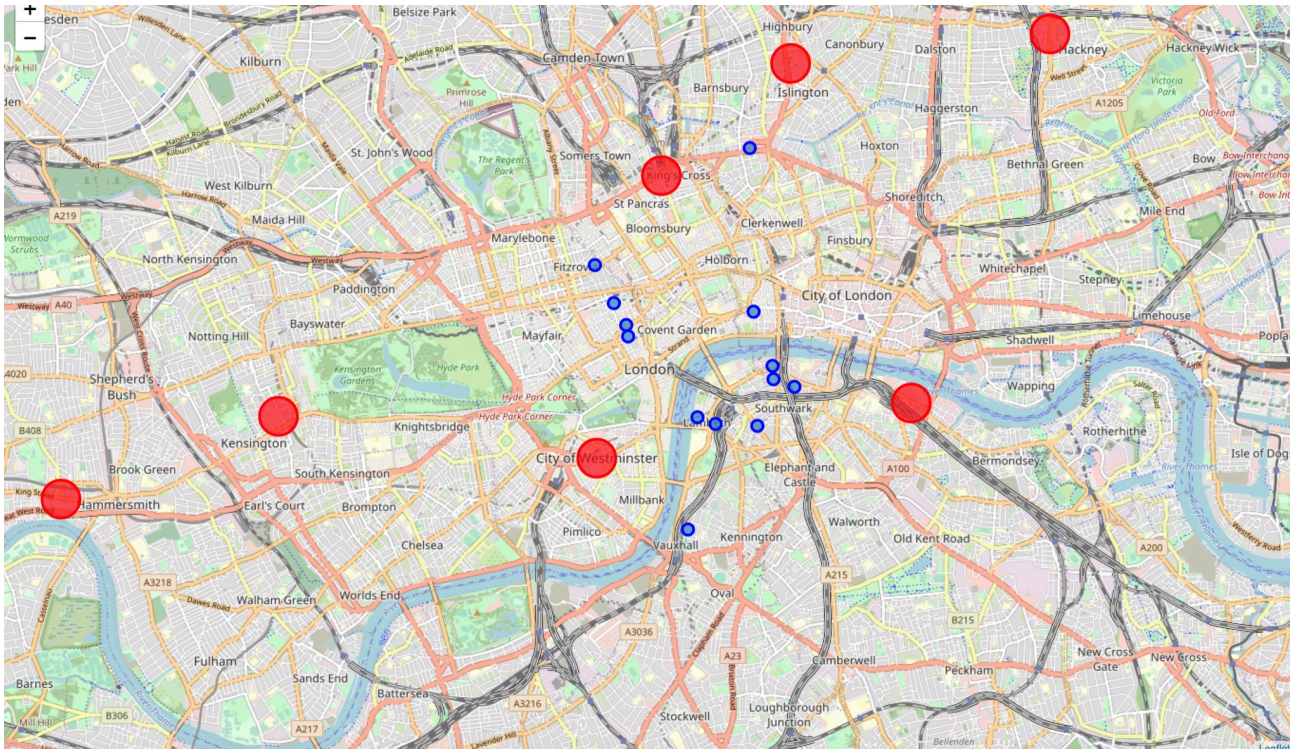


With a good indication of the prices and ratings of the dataset, folium was used to create a map of the hotels. The majority of hotels found in the csv file are also within the inner-city, in particular between Westminster, Lambeth and Southwark.



4. Results & Recommendation

Our key criteria of a location decision was based on venues and price of hotels.
The map of London below shows a combination of hotels (in blue) and the cluster of venues (in red) based on the inner-city as we have already looked at.
Now, one can point to an accommodation for price and address location information while knowing the cluster venues around it.
This is an insightful way to explore suitable and affordable hotels near preferable venues.



5. Conclusion

From our analysis, we have found that boroughs from Cluster 0 such as Westminster, Camden, and Southwark are the best places to visit for theatre, restaurants, and coffeeshops. A predominant amount of hotels lie within this boroughs are under £1,000.