In London, if someone is looking to open a restaurant, where should it be?

Description of problem:

A client is asking to recommend an area to open a luxury Asian restaurant in London. They want their restaurant to be in an area with higher asian population, that area's household income to adjust price, area access to public transport.

Interests:

1. Asian restaurants owner/entrepreneurs
2. Franchising asian restaurants

Description of data:

1. Demographics of different areas in London, top 3 area with highest asian population %

https://en.wikipedia.org/wiki/Demography_of_London

2. Average household income in those area of London

https://data.london.gov.uk/download/earnings-place-residence-borough/1686ef1c-b169-442d-8877-e7e49788f668/earnings-residence-borough.xlsx

3. Amount of asian restaurants in those area competition,

Using foursquare

4. Locations that can be chosen as potential restaurant locations;

Methodology and results

1. **Demographics of different areas in London, top 3 area with highest asian population %**

The method starts by scraping data from the web and converting into dataframe.

```
In [1]: #Scraping data from web, converting in dataframe
        import pandas as pd
        import numpy as np

        demograph_dfs = pd.read_html('https://en.wikipedia.org/wiki/Demography_of_London')
        demograph_df = demograph_dfs[4]
        demograph_df.head()
```

Out[1]:

	Local authority	White	Mixed	Asian	Black	Other
0	Barnet	64.1	4.8	18.5	7.7	4.8
1	Barking and Dagenham	58.3	4.2	15.9	20.0	1.6
2	Bexley	81.9	2.3	6.6	8.5	0.8
3	Brent	36.3	5.1	34.1	18.8	5.8
4	Bromley	84.3	3.5	5.2	6.0	0.9

```
In [2]: #Dataframe cleaning
        demograph_df.drop(['White','Mixed','Black','Other'], axis=1,inplace=True)
```

```
In [3]: #Finding the top 3 boroughs with highest asian population %
        demograph_df.rename(columns={'Local authority': 'Borough','Asian':'Asian'}).sort_values('Asian', ascending=False).head(3)
```

Out[3]:

	Borough	Asian
24	Newham	43.5
13	Harrow	42.6
25	Redbridge	41.8

The London boroughs with highest asian population % is Newham, Harrow, Redbridge.

2. **Average income in these boroughs of London.**

Extracting data from xlsx.

```
In [4]: #Extract data from xlsx
        url_earn = 'https://data.london.gov.uk/download/earnings-place-residence-borough/1686ef1c-b169-442d-8877-e7e49788f668/earnings-re
        earn_per_borough_dfs = pd.read_excel(url_earn, sheet_name=1)
        earn_per_borough_dfs.head()
```

Out[4]:

	Code	Area	2002	Unnamed: 3	2003	Unnamed: 5	2004	Unnamed: 7	2005	Unnamed: 9	...	2016	Unnamed: 31	2017	Unnamed: 33	2018	Unnamed: 35	2019
0	NaN	NaN	Pay (£)	conf %	Pay (£)	conf %	Pay (£)	conf %	Pay (£)	conf %	...	Pay (£)	conf %	Pay (£)	conf %	Pay (£)	conf %	Pay (£)
1	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	...	NaN	NaN	NaN	NaN	NaN	NaN	NaN
2	00AA	City of London	!	!	!	!	#	#	#	#	...	#	#	#	#	909.4	19	#
3	00AB	Barking and Dagenham	383.3	5.5	354.9	6.5	360.1	5.2	375.1	5.1	...	462.2	4.5	461	5.1	479.1	4.9	471
4	00AC	Barnet	427.4	5.1	450.1	5	453.3	5.6	442.3	5.3	...	485.6	5.4	522.6	4.5	536.6	4.6	536.4

5 rows × 40 columns

```
In [5]: #Looking at only 2020 results
        epb2020_df = earn_per_borough_dfs[['Area',2020]]
        epb2020_df.head()
```

Out[5]:

	Area	2020
0	NaN	Pay (£)
1	NaN	NaN
2	City of London	#
3	Barking and Dagenham	500.4
4	Barnet	520.2

```
In [6]: epb2020_df=epb2020_df.rename(columns={'Area': 'Borough', 2020:'2020'})
        epb2020_df.loc[epb2020_df['Borough'].isin(['Newham', 'Redbridge','Harrow'])]
```

Out[6]:

	Borough	2020
16	Harrow	566.7
26	Newham	519.4
27	Redbridge	581.4

The London borough with highest asian population % and highest income is Redbridge>Harrow>Newham.

3. Amount of Asian restaurants in boroughs.

Using Foursquare API, finding the clusters of 'Asian restaurant' (as search query within radius:1000).

Redbridge: None found.

Harrow: Data cleaning by reformatting df['categories'].

Filtering anything without the word 'restaurant','cuisine' in the df['name'] and df['categories'].

```
In [88]: #filtered anything without the word restaurant, cuisine

dataframe_catfil = dataframe_filtered[dataframe_filtered["categories"].str.contains('Restaurant', na=False) | dataframe_filtered[
dataframe_catfil
```

Out[88]:

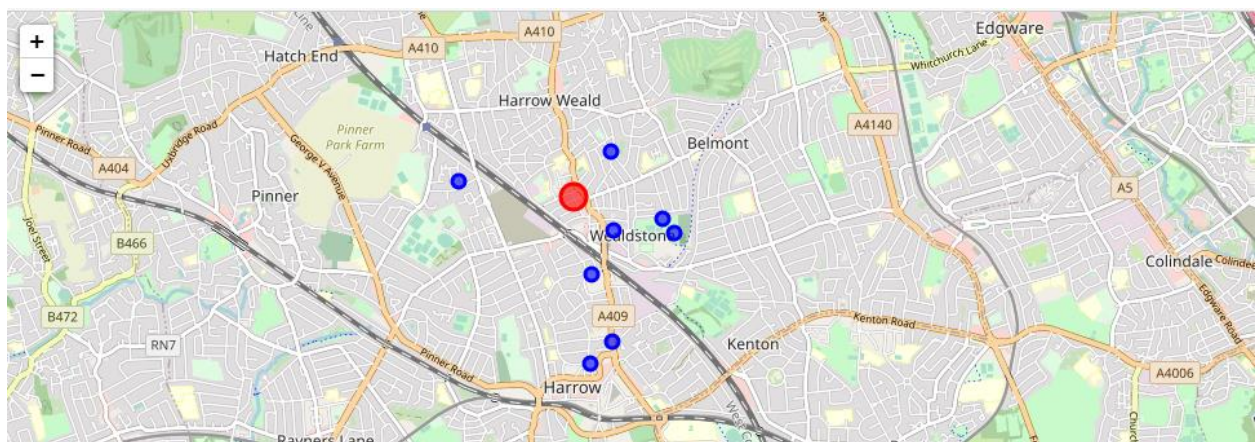|	name	categories	lat	lng	labeledLatLngs	distance	cc	country	address	city	state	formattedAddress	postalCode	cros
0	Pan Asian Restaurant	Asian Restaurant	51.594970	-0.325541	[{'label': 'display', 'lat': 51.59496983472834...	840	GB	United Kingdom	NaN	NaN	NaN	NaN	NaN	
1	Punjab Restaurant	Indian Restaurant	51.600531	-0.332319	[{'label': 'display', 'lat': 51.60053146401169...	537	GB	United Kingdom	27 Station Rd	Harrow on the Hill	Greater London	[27 Station Rd, Harrow on the Hill, Greater Lo...	NaN	
2	Everest Restaurant and Bar	Restaurant	51.594078	-0.331908	[{'label': 'display', 'lat': 51.59407750710088...	483	GB	United Kingdom	NaN	Edgware	NaN	[Edgware]	NaN	
3	Koreana Restaurant	Korean Restaurant	51.590434	-0.334949	[{'label': 'display', 'lat': 51.59043361097029...	730	GB	United Kingdom	32 Headstone Drive	Harrow on the Hill	Greater London	[32 Headstone Drive, Harrow on the Hill, Great...	HA3 5QH	
4	The Ruby Lounge	Indian Restaurant	51.598125	-0.352550	[{'label': 'display', 'lat': 51.598125, 'lng':...	1063	GB	United Kingdom	Broadwalk	Harrow on the Hill	Greater London	[Broadwalk (Pinner Road), Harrow on the Hill, ...	HA 2 6	Pinn
5	Chennai Srilalitha Veg Restaurant	Sri Lankan Restaurant	51.593775	-0.323904	[{'label': 'display', 'lat': 51.59377536430263...	987	GB	United Kingdom	196 Kenton Road	Harrow	NaN	[196 Kenton Road, Harrow, HA3 8BX]	HA3 8BX	
6	Saras Restaurant & Bar	Indian Restaurant	51.583043	-0.335083	[{'label': 'display', 'lat': 51.58304327584647...	1542	GB	United Kingdom	28 The Broadwalk, Pinner Road, North Harrow	London	Greater London	[28 The Broadwalk, Pinner Road, North Harrow, ...	HA2 6ED	
7	Vintage Restaurant	Indian Restaurant	51.584882	-0.332240	[{'label': 'display', 'lat': 51.584882, 'lng':...	1375	GB	United Kingdom	207 Station Road	Harrow	NaN	[207 Station Road, Harrow, 2TP]	2TP	

Map to visual the cluster of restaurants:

Fig.1: Asian restaurants in borough of Harrow within radius 1000. Red=Centroid of Harrow, blue = restaurants.

The dataframe above had showed that there were several Asian restaurants in London Borough of Harrow, indicating that this could be a potential area for an Asian restaurant. This area will have competition with 7 other restaurants. However, this area is still far from the center of London where traffic is a key component. This will not attract that many customers.

Conclusion: Harrow can be considered for Asian restaurant.

Newham: Same procedure as Harrow.

	name	categories	lat	lng	labeledLatLngs	distance	cc	country	formattedAddress	address	postalCode	city	state	crossS
0	Kabayan Cafe & Restaurant	Filipino Restaurant	51.532243	0.036029	[{'label': 'display', 'lat': 51.532243, 'lng':...	527	GB	United Kingdom	[United Kingdom]	NaN	NaN	NaN	NaN	
1	Bar & Restaurant Bela-Vista	Portuguese Restaurant	51.526296	0.030122	[{'label': 'display', 'lat': 51.526296, 'lng':...	416	GB	United Kingdom	[564 Barking Road, London, Greater London, E13...	564 Barking Road	E13 9JU	London	Greater London	
2	Aasai Dosai Indian Restaurant	Indian Restaurant	51.530068	0.038234	[{'label': 'display', 'lat': 51.530068, 'lng':...	617	GB	United Kingdom	[3 - 5 Barking Road, East Ham, Greater London,...	3 - 5 Barking Road	E9 1PW	East Ham	Greater London	
3	Jolsagor restaurant	None	51.534684	0.033435	[{'label': 'display', 'lat': 51.53468418263492...	594	GB	United Kingdom	[261 barking road, London, Greater London, Uni...	261 barking road	NaN	London	Greater London	
4	Thai-thai restaurant	Arepa Restaurant	51.535871	0.029502	[{'label': 'display', 'lat': 51.5358714083186,...	653	GB	United Kingdom	[250 barking road, east ham, London, Greater L...	250 barking road, east ham	NaN	London	Greater London	
5	Stratford's Restaurant	French Restaurant	51.532562	0.018352	[{'label': 'display', 'lat': 51.53256175478631...	811	GB	United Kingdom	[7 Stratford Road, London, Greater London, W8 ...	7 Stratford Road	W8 6RF	London	Greater London	
6	Men's Cafe & Restaurant	Breakfast Spot	51.532475	0.015021	[{'label': 'display', 'lat': 51.532475, 'lng':...	1027	GB	United Kingdom	[235 Plaistow Road, London, Greater London, E1...	235 Plaistow Road	E15 3EU	London	Greater London	
7	Samrat	Indian Restaurant	51.521297	0.020402	[{'label': 'display', 'lat': 51.52129702405322...	1148	GB	United Kingdom	[320-322 Barking Rd., London, Greater London, ...	320-322 Barking Rd.	E13 8HL	London	Greater London	
8	Himalaya Restaurant and Take Away	Pakistani Restaurant	51.538575	0.033431	[{'label': 'display', 'lat': 51.53857477456405...	996	GB	United Kingdom	[9-10 Carlton terrace (Green st), Upton Park, ...	9-10 Carlton terrace	E7 8LH	Upton Park	Greater London	Gre
9	Restaurant	Cafeteria	51.522710	0.035540	[{'label': 'display', 'lat': 51.52271, 'lng': ...	918	GB	United Kingdom	[London, Greater London, E13 8RU, United Kingdom]	NaN	E13 8RU	London	Greater London	
10	Taris African Restaurant	African Restaurant	51.521676	0.021096	[{'label': 'display', 'lat': 51.52167596277876...	1087	GB	United Kingdom	[East Ham, Greater London, United Kingdom]	NaN	NaN	East Ham	Greater London	

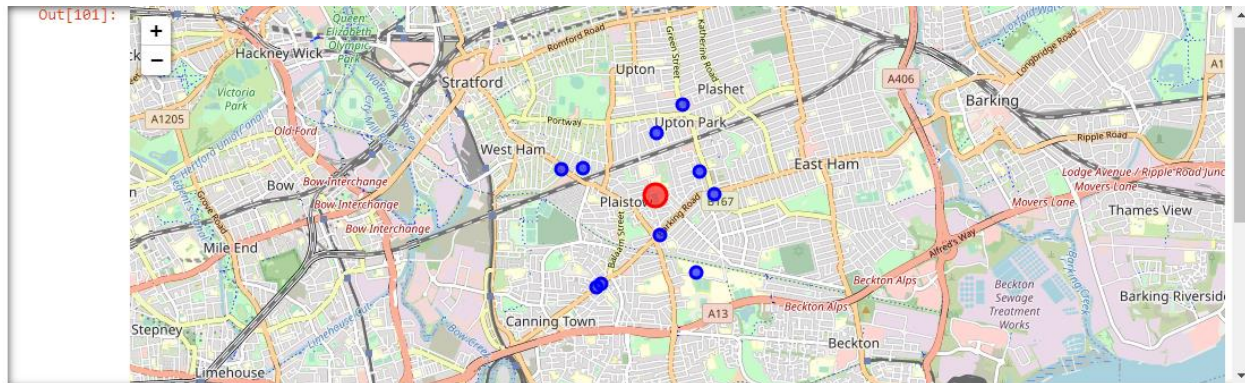Map to visual the cluster of restaurants:

Fig.2: Asian restaurants in borough of Newham within radius 1000. Red=Centroid of Newham, blue = restaurants.

The dataframe above had showed that there were several Asian restaurants in London Borough of Newham, indicating that this could be a potential area for an Asian restaurant. This area will have competition with 10 other restaurants. This area is closer to the city center of London and will be a achieve a higher traffic. However, this area is the least profitable as the average income in this area is the lowest of 3.
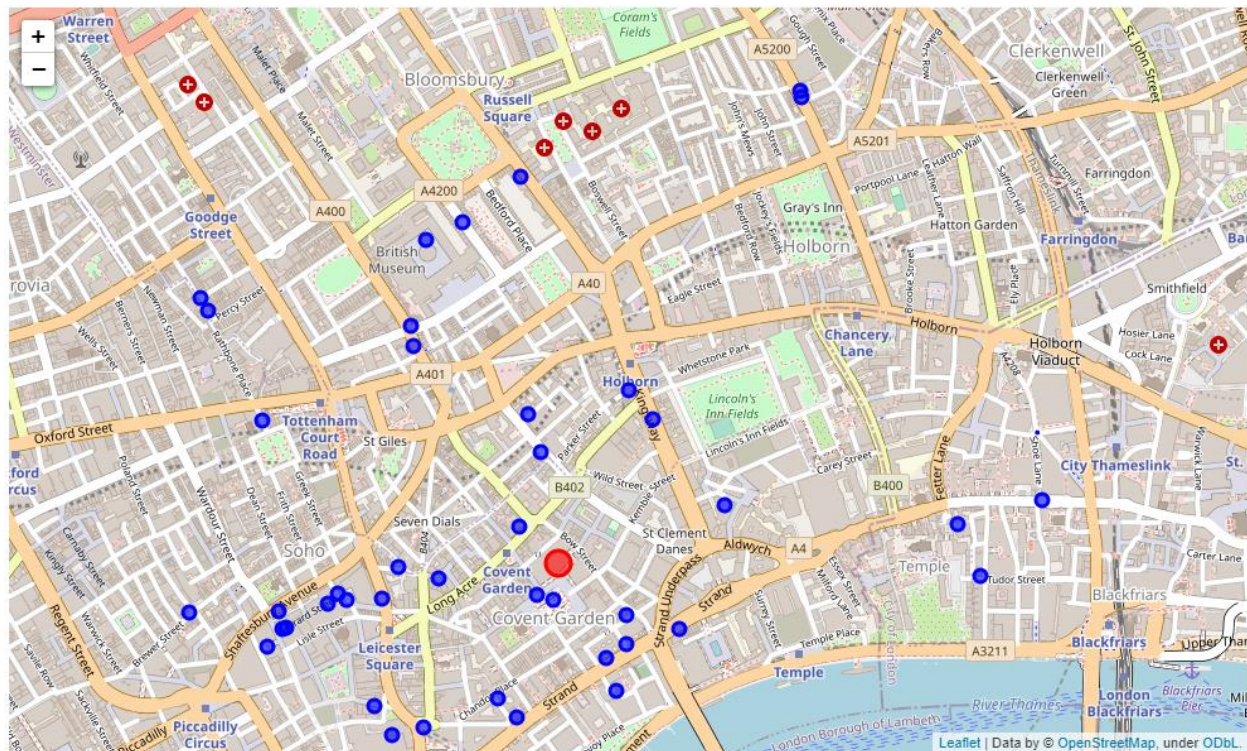
Extra: Covent Garden

Fig.3: Asian restaurants in Covent garden within radius 1000. Red=Centroid of covent garden, blue = restaurants.

Ideal location for luxurious restaurant. However, stiff competition between 20+ asian restaurants. However higher traffic but at the same time higher costs of rent.¶

Conclusion: London Borough of Harrow is the best area for opening an Asian restaurants with least competition in a high asian population area with moderate average income. However, the location will exhibit less traffic as it is far from London busy city center. The second choice will be London Borough of Newham which is by far closest to the London city center amongst the 3 areas. However, client will need to reconsider if the restaurant is best for luxurious customers because Newham has the lowest average amongst the three. Redbridge is not recommended for an Asian restaurants as the search did not show a confident amount of restaurants, indicating that other asian restaurants chose not to open in Redbridge.

Extra studies on London's busiest area, covent garden has shown 20+ asian restaurants. The competition will be stiff and the running cost is estimated to be high as well. However, it will attract the luxury customers. More analysis will have to be done.

Future work: The investigation neglected a lot of factors that might affect the decision of opening a restaurant in London, for example: pedestrian traffic, type of area(i.e. residential or commercial or business), running costs(i.e. rent in higher traffic areas).

Therefore, in order to get a better grasp of whether it is a good decision to open an asian restaurant, more specialized data is needed.

One big factor is that this analysis is formed on the basis of Foursquare API accurately providing a full picture of the area. There is possibility that the API did not show all the restaurants available in the area.