The Battle of Neighbourhoods

Harsh Shah

1. Problem

- In London, there are numerous boroughs. The city is famous for its many touristic spots and is one of the most visited cities on the planet. In addition to tourists, many students come to London in order to study at university. As well as this, many people come for short term stays for e.g. internships, as well as for graduate programs.
- Finding a good place to stay is very important, somewhere that has local access to shops and supermarkets, as well as restaurants, bars and a number of other facilities.
- HS is moving to London in order to study at University College London. In addition to university life, HS also wants to get a feel of the city's culture, food etc. He's looking to live in a neighbourhood that is culturally vibrant but not too touristy, as he feels that he can visit tourist sites in his spare time, therefore the proximity of tourist attractions is not something that matters to him
- From the perspective of students, many factors are involved when searching for the best accommodation, which includes distance and rent. However, this project will focus on the general atmosphere of different areas of London as well as safety.
- The research carried out is expected to be of benefit to international students looking to live in London, because despite the opportunity to explore the local culture, they would very likely want to feel at home at the same time.

2 Data

- In the project, I will be using the following datasets to produce an outcome – Borough Level Crime, List of London boroughs and Foursquare API. After using legitimate resources to acquire them, they will be cleansed into more useful forms so that they can be analysed further.

(1) Borough Level Crime

- Description: London crime records classified by borough and crime type over the last 24 months
- Size: 1569 observations x 27 columns
- Source: London Datastore, https://data.london.gov.uk/dataset/recorded_crime_summary

	MajorText	MinorText	LookUp_BoroughName	201807	201808	201809	201810	201811	201812	201901	...	201909	201910	201911
0	Arson and Criminal Damage	Arson	Barking and Dagenham	6	5	3	8	5	1	5	...	6	9	8
1	Arson and Criminal Damage	Criminal Damage	Barking and Dagenham	127	101	107	132	105	88	97	...	109	109	97
2	Burglary	Burglary - Business and Community	Barking and Dagenham	30	18	33	32	39	33	45	...	37	30	30
3	Burglary	Burglary - Residential	Barking and Dagenham	94	84	99	94	106	164	114	...	80	97	114
4	Drug Offences	Drug Trafficking	Barking and Dagenham	8	7	10	7	7	4	5	...	7	8	13

2. Data

(2) List of London Boroughs

- Description: Information 32 London boroughs, of which the variables 'Population' and 'Co-ordinates' will be used for the purpose of the project.
- Source: "List of London Boroughs", Wikipedia
- URL: https://en.wikipedia.org/wiki/List_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

2 Data

(3) Foursquare API

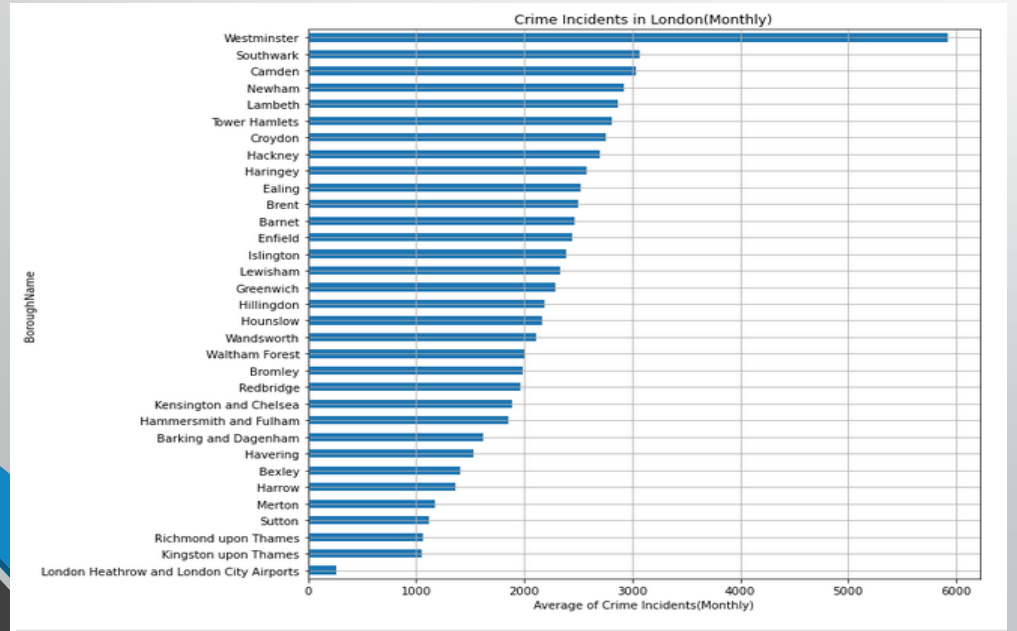
- Description: List of the 50 most popular places in each borough. However, it's possible that some boroughs may have less than 50 registered on Foursquare
- Source: Foursquare API
- URL: https://api.foursquare.com

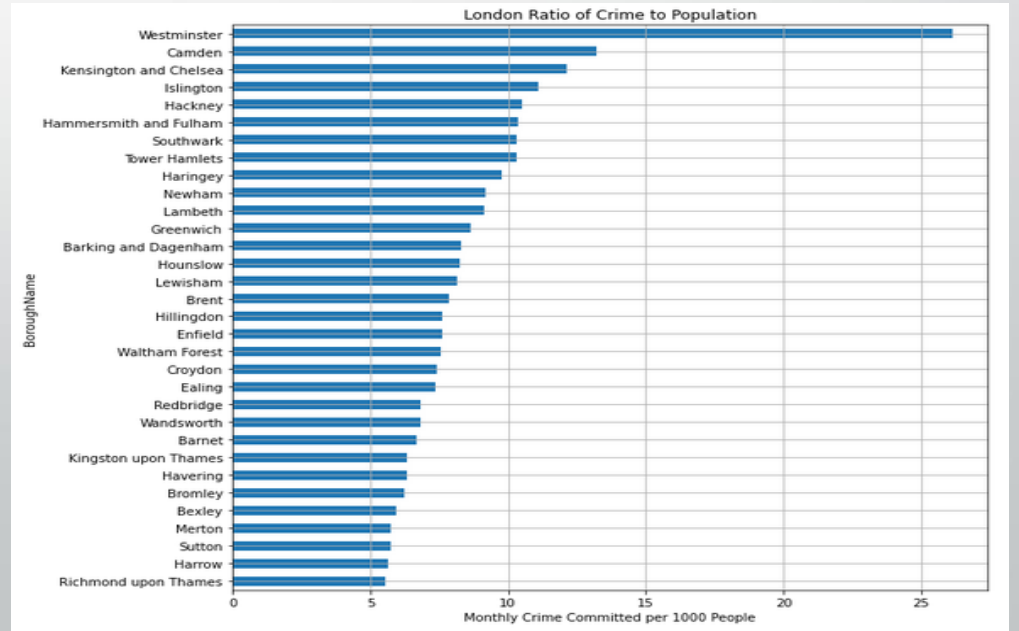
	BoroughName	Borough Latitude	Borough Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Barking and Dagenham	51.5607	0.1557	Central Park	51.559560	0.161981	Park
1	Barking and Dagenham	51.5607	0.1557	Crowlands Heath Golf Course	51.562457	0.155818	Golf Course
2	Barking and Dagenham	51.5607	0.1557	Robert Clack Leisure Centre	51.560808	0.152704	Martial Arts Dojo
3	Barking and Dagenham	51.5607	0.1557	Beacontree Heath Leisure Centre	51.560997	0.148932	Gym / Fitness Center
4	Barking and Dagenham	51.5607	0.1557	Becontree Heath Bus Station	51.561065	0.150998	Bus Station

3. Methodology

(1) Exploratory analysis: Which borough has higher levels of crime?

- To have a better look at the datasets, they were each cleansed into more useful resources.
- By combining the Borough Level Crime data and the List of London Boroughs, the number of crimes per 1000 people was calculated.
- While visualising the boroughs according to total level of crimes and by the ratio of crime per 1000 people, it can be seen that both Westminster and Camden still remain 2 of the most dangerous boroughs to live.





3. Methodology

(2) Exploratory analysis: London Map

- Using the coordinates of each of the London boroughs, I was able to visualise each of the boroughs on a map to be able to get more familiar with London's geography.

3. Methodology

(3) Cluster analysis

- With the 50 most popular venues acquired from Foursquare, I used onehot encoding to find out the most popular venue categories. Venues from the same boroughs were grouped by borough names and the popular categories by frequency.

```
----Barking and Dagenham----
                  venue  freq
0  Gym / Fitness Center  0.14
1                  Pool  0.14
2           Bus Station  0.14
3           Supermarket  0.14
4           Golf Course  0.14


----Barnet----
                      venue  freq
0        Rental Car Location  0.25
1  Construction & Landscaping  0.25
2                   Bus Stop  0.25
3                       Café  0.25
4          African Restaurant  0.00
```

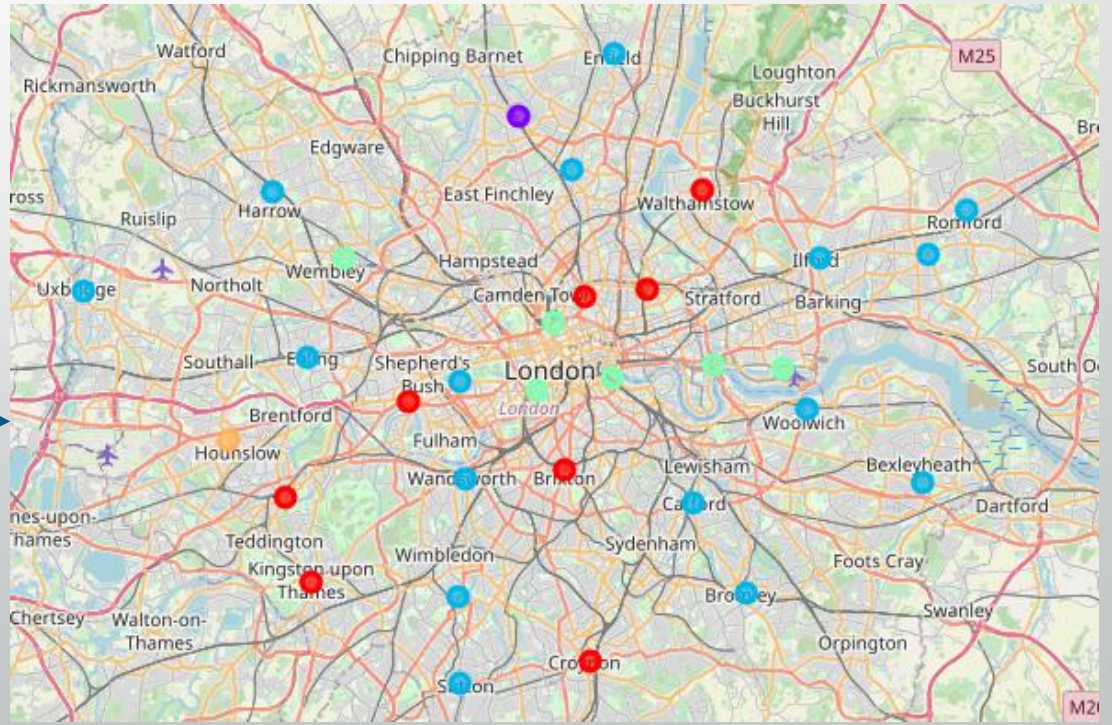
	BoroughName	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Barking and Dagenham	Pool	Golf Course	Bus Station	Supermarket	Park	Gym / Fitness Center	Martial Arts Dojo	Film Studio	Fast Food Restaurant	Farmers Market
1	Barnet	Café	Bus Stop	Yoga Studio	English Restaurant	Food Court	Flea Market	Fish Market	Film Studio	Fast Food Restaurant	Farmers Market
2	Bexley	Clothing Store	Coffee Shop	Pub	Supermarket	Fast Food Restaurant	Pharmacy	Warehouse Store	Portuguese Restaurant	Hotel	Department Store
3	Brent	Coffee Shop	Hotel	Clothing Store	Sporting Goods Shop	Grocery Store	American Restaurant	Sandwich Place	Bar	Pizza Place	Chocolate Shop
4	Bromley	Coffee Shop	Clothing Store	Pizza Place	Burger Joint	Gym / Fitness Center	Bar	Irish Pub	English Restaurant	Furniture / Home Store	Burrito Place

3. Methodology

(4) Cluster analysis: K-means clustering

- Based on common venue categories, the boroughs were grouped into 5 different clusters, which are represented on the map by different coloured dots.

	BoroughName	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue
0	Barking and Dagenham	Pool	Golf Course	Bus Station	Supermarket
1	Barnet	Café	Bus Stop	Yoga Studio	English Restaurant
2	Bexley	Clothing Store	Coffee Shop	Pub	Supermarket
3	Brent	Coffee Shop	Hotel	Clothing Store	Sporting Goods Shop
4	Bromley	Coffee Shop	Clothing Store	Pizza Place	Burger Joint



3. Methodology

(4) Cluster analysis: K-means clustering

- Each of the clusters were named based on their individual characteristics

BoroughName	CrimePer1000	Cluster Labels	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
Barking and Dagenham	8.315668	0	Pool	Golf Course	Bus Station	Supermarket	Park	Gym / Fitness Center	Martial Arts Dojo	Film Studio	Fast Food Restaurant	Farmers Market

Cluster 0: Healthy area (Gym, pool)

BoroughName	CrimePer1000	Cluster Labels	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
Brent	7.869498	1	Coffee Shop	Hotel	Clothing Store	Sporting Goods Shop	Grocery Store	American Restaurant	Sandwich Place	Bar	Pizza Place
Camden	13.198009	1	Hotel	Café	Coffee Shop	Bakery	Breakfast Spot	Burger Joint	Italian Restaurant	Garden	Train Station
Kensington and Chelsea	12.148069	1	Café	Juice Bar	Restaurant	Clothing Store	Gym / Fitness Center	Burger Joint	Bakery	Sporting Goods Shop	Lebanese Restaurant

Cluster 1: Lively area (Pubs, restaurants)

3. Methodology

(4) Cluster analysis: K-means clustering

- Each of the clusters were named based on their individual characteristics

BoroughName	CrimePer1000	Cluster Labels	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
Bexley	5.931181	2	Clothing Store	Coffee Shop	Pub	Supermarket	Fast Food Restaurant	Pharmacy	Warehouse Store
Bromley	6.240452	2	Coffee Shop	Clothing Store	Pizza Place	Burger Joint	Gym / Fitness Center	Bar	Irish Pub
Croydon	7.390638	2	Pub	Coffee Shop	Portuguese Restaurant	Asian Restaurant	Clothing Store	Park	Spanish Restaurant

Cluster 2: Shopping area (Coffee shops, clothing stores

BoroughName	CrimePer1000	Cluster Labels	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
Barnet	6.684607	3	Café	Bus Stop	Yoga Studio	English Restaurant	Food Court	Flea Market	Fish Market	Film Studio	Fast Food Restaurant	Farmers Market

Cluster 3: Market area

3. Methodology

(4) Cluster analysis: K-means clustering

- Each of the clusters were named based on their individual characteristics

BoroughName	CrimePer1000	Cluster Labels	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
Hounslow	8.259275	4	Metro Station	Park	Bed & Breakfast	Café	Yoga Studio	English Restaurant	Food Court	Flea Market	Fish Market

Cluster 4: Traveller area

4. Results

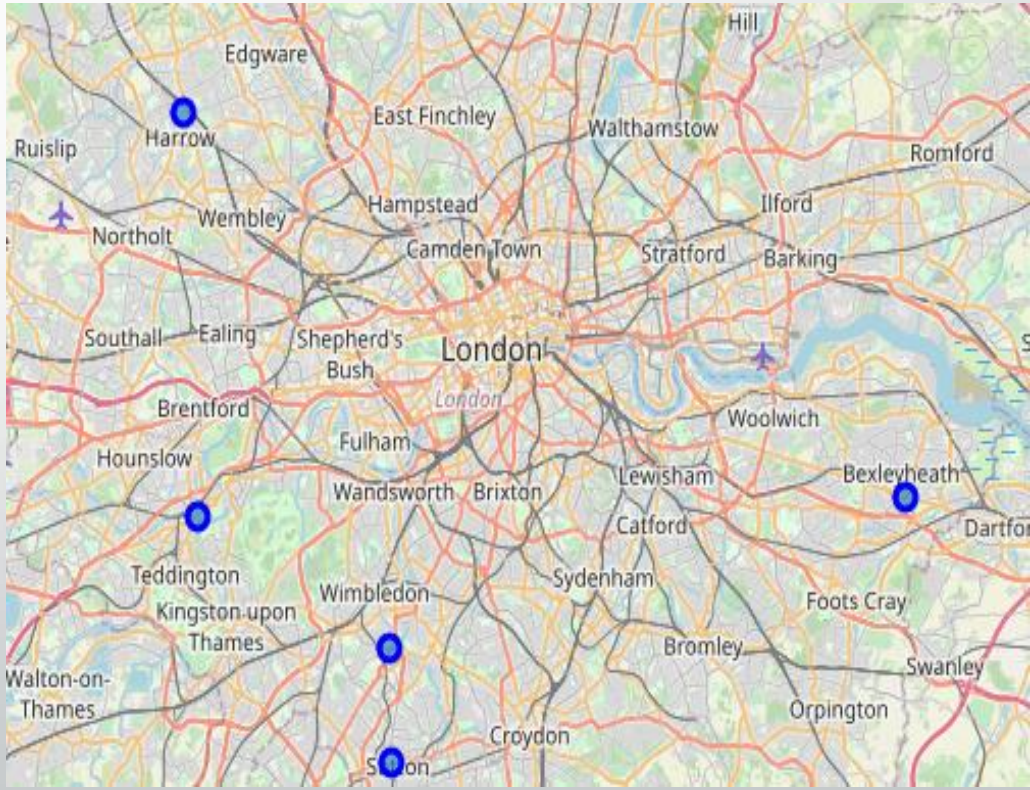
- Using different analysis, I was able to discover the best areas to live based on the criteria of general atmosphere and safety. Now, we will look back at all the analysis performed in the project before making a conclusion on which area would be the best for HS to live in.
- For safety, I decided to normalise the crime to population video and reversed the safety score so that the closes value to 1 represents the area that has the lowest crime per head.
- With regards to atmosphere, I decided to give an arbitrary value to each cluster on the basis of personal preference, since preference is difficult to quantify without being subjective. The highest value was given to the Shopping Area (Cluster 2) while the lowest was given to the Traveller Area (Cluster 4).
- Finally, by adding the Safety score to the Atmosphere value, I was able to find the best area to live in, which was Richmond upon Thames, scoring 2.0.

BoroughName	CrimePer1000	Cluster Labels	Safety	Atmosphere
Barking and Dagenham	8.315668	0.8	0.864607	0.0
Barnet	6.684607	3.0	0.943901	0.7
Bexley	5.931181	2.0	0.980529	1.0
Brent	7.869498	1.0	0.886298	0.9
Bromley	6.240452	2.0	0.965494	1.0

BoroughName	Safety	Atmosphere	Score
Richmond upon Thames	1.000000	1.0	2.000000
Harrow	0.995407	1.0	1.995407
Sutton	0.990868	1.0	1.990868
Merton	0.988647	1.0	1.988647
Bexley	0.980529	1.0	1.980529

5. Conclusion

- Based on the analysis, I have found that the 5 boroughs below would be the best places for HS to live according on the criteria that he set out, based on general atmosphere and safety. They all belong to the Shopping Area cluster, which contains many clothing shops and coffee shops, as well as a number of restaurants that serve a range of cuisines. The only thing that sets them apart is the safety score.
- From the map, we can see that all of the top 5 boroughs are located far out from the city, which is due to the limitations held by the research carried out.
- As well as taking into account crime rates and the types of stores that exist in each area, I could've perhaps also taken into account the number of each type of store that exists in each borough, as well as other factors such as house/rental prices.
- Nevertheless, performing this research was still incredible enjoyable as I was able to explore each borough in a lot of depth.



References

- "Borough Level Crime", London Datastore
- "List of London Boroughs"
- Foursquare API
- IBM Data Science Professional Certificate notes, Coursera