

Predicting the Best Place to Build a Student Hall in London

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1. Introduction: Background and Problem

London is a popular destination for students that aspire to study abroad. One problem they face would be to secure a safe place to live. Especially for students who are new to the town, student halls may be the best choice, as they provide safety with an affordable rent. However, student halls are high in demand, so it may be difficult for students to find a place that is open.

Therefore, this project was launched to build a new student hall that is located in a safe and student-friendly area. In this project, the safety and the general atmosphere was focused. Since the student hall aims to accept students from various universities, it will be disregarded.

2. Data

2.1. List of London Boroughs

Using the Wikipedia page, the population and the coordinates of the London boroughs were scraped. The table below is the simplified dataset with only the necessary information extracted.

	BoroughName	Population	Latitude	Longitude
0	Barking and Dagenham	194352	51.5607	0.1557
1	Barnet	369088	51.6252	-0.1517
2	Bexley	236687	51.4549	0.1505
3	Brent	317264	51.5588	-0.2817
4	Bromley	317899	51.4039	0.0198

2.2. London Recorded Crime

The crime record of London in the past 24 months was obtained from London Datastore.

The monthly average of the number of crimes were calculated.

	LookUp_BoroughName	MonthlyAverage
0	Barking and Dagenham	1625.166667
1	Barnet	2524.416667
2	Bexley	1425.083333
3	Brent	2540.500000
4	Bromley	2027.833333

2.3. Foursquare API

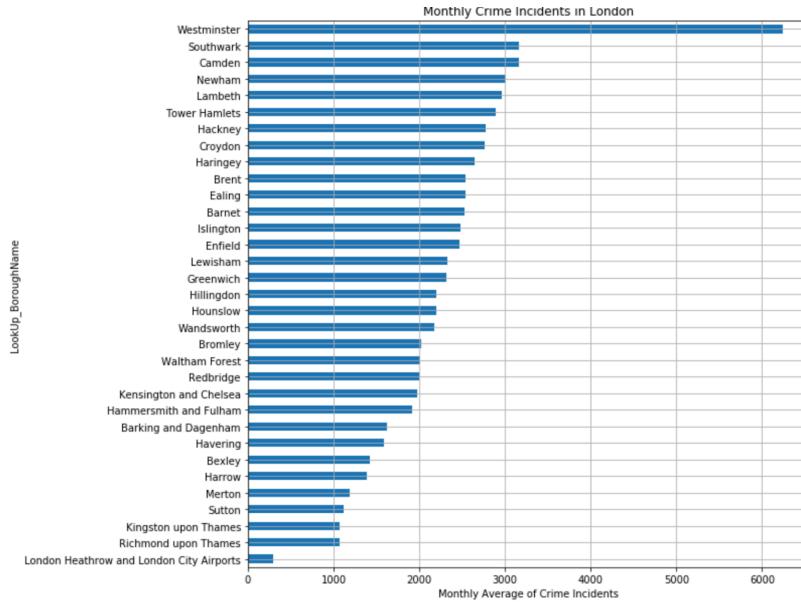
The top 50 venues in each neighborhood was extracted.

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	Morrisons	51.559774	0.148752	Supermarket
4 Barking and Dagenham	51.5607	0.1557	Beacontree Heath Leisure Centre	51.560997	0.148932	Gym / Fitness Center

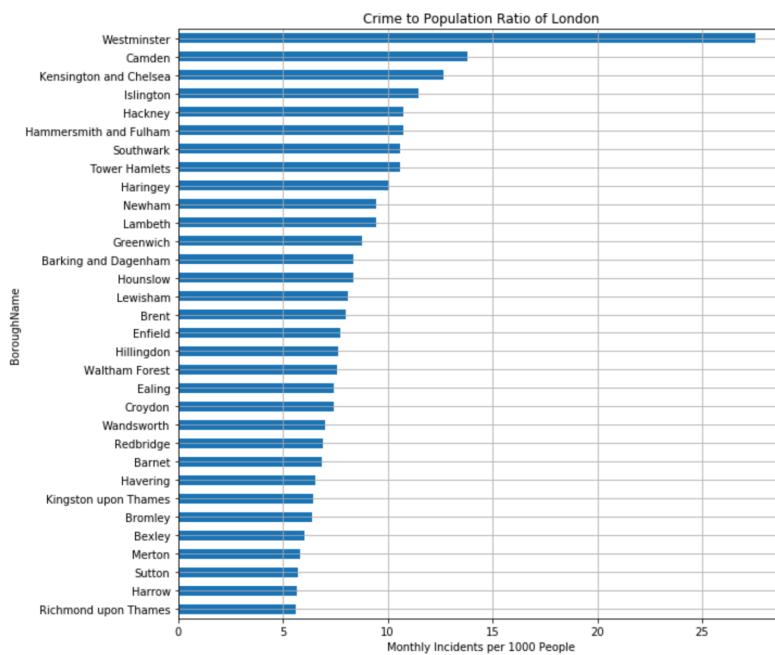
3. Methodology

3.1. Exploratory Analysis

This bar chart displays the boroughs' monthly crime incidents. Westminster by far has the largest number of crime numbers, followed by Southwark and Camden.



However, we need to take the population difference into account. The chart below shows the crime to population ratio of the number of crime records. Westminster still has the most incidents, but then is followed by Camden, and Kensington and Chelsea.

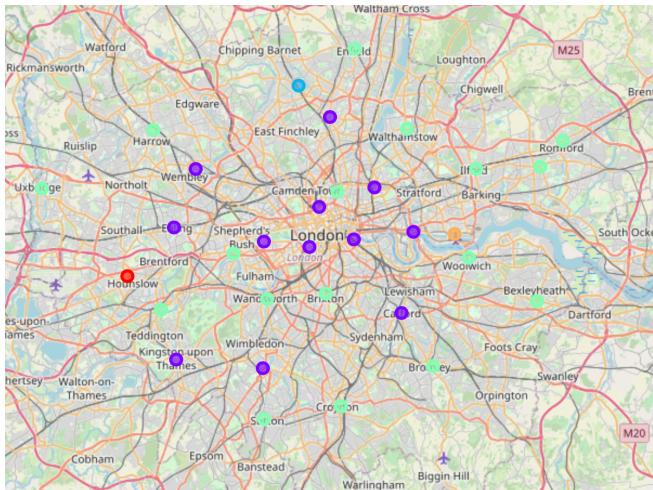


3.2. Cluster analysis of the popular venues

A one hot encoding method was used to find out and group different boroughs by the top 50 venues. The table below shows how many of each venue category exists in the boroughs.

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	Park	Bus Station	Supermarket	Golf Course	Martial Arts Dojo	Gym / Fitness Center	Discount Store	Donut Shop	Food Court
1	Barnet	Café	Bus Stop	Yoga Studio	Fast Food Restaurant	Gaming Cafe	Furniture / Home Store	French Restaurant	Food Court	Flea Market	Fish Market
2	Bexley	Coffee Shop	Pub	Clothing Store	Italian Restaurant	Supermarket	Fast Food Restaurant	Pharmacy	Hotel	Furniture / Home Store	Optical Shop
3	Brent	Coffee Shop	Hotel	Clothing Store	Grocery Store	Bar	Sporting Goods Shop	American Restaurant	Sandwich Place	Sports Bar	Outlet Store
4	Bromley	Clothing Store	Coffee Shop	Pizza Place	Burger Joint	Gym / Fitness Center	Portuguese Restaurant	Burrito Place	Café	Sandwich Place	Chocolate Shop

Based on the venue categories, K-Means clustering was conducted to group the boroughs into five different groups, based on the similarity. The different clusters are represented by the different colors in the map below.



After observing each cluster and its characteristics, we have named them. This is cluster 0, the “family” area.

BoroughName	CrimeToPop	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
16	Hounslow	8.358358	0	Café Chinese Restaurant	Park	Bed & Breakfast	Yoga Studio	Fast Food Restaurant	Gaming Cafe	Furniture / Home Store	French Restaurant	Food Court

This is cluster 1, the “busy” area.

BoroughName	CrimeToPop	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
3 Brent	8.007527	1	Coffee Shop	Hotel	Clothing Store	Grocery Store	Bar	Sporting Goods Shop	American Restaurant	Sandwich Place	Sports Bar	Outlet Store
5 Camden	13.784232	1	Café	Coffee Shop	Pub	Hotel	Hotel Bar	Burger Joint	Pizza Place	Train Station	Breakfast Spot	Dessert Shop
7 Ealing	7.410349	1	Coffee Shop	Italian Restaurant	Hotel	Clothing Store	Vietnamese Restaurant	Park	Burger Joint	Pizza Place	Pub	Ramen Restaurant
10 Hackney	10.761853	1	Pub	Coffee Shop	Cocktail Bar	Bakery	Café	Brewery	Grocery Store	Hotel	Vietnamese Restaurant	Vegetarian / Vegan Restaurant
12 Haringey	10.060013	1	Fast Food Restaurant	Café	Italian Restaurant	Supermarket	Hotel Bar	Gym / Fitness Center	Grocery Store	Mediterranean Restaurant	Movie Theater	Park
18 Kensington and Chelsea	12.688739	1	Clothing Store	Hotel	Juice Bar	Italian Restaurant	Garden	Café	Restaurant	Pub	Modern European Restaurant	Bakery
19 Kingston upon Thames	6.438620	1	Café	Coffee Shop	Burger Joint	Pub	Italian Restaurant	Thai Restaurant	Sushi Restaurant	Department Store	Gastropub	Mexican Restaurant
21 Lewisham	8.117997	1	Grocery Store	Supermarket	Italian Restaurant	Coffee Shop	Train Station	Platform	Bus Stop	Dessert Shop	Pharmacy	Fast Food Restaurant
22 Merton	5.851126	1	Italian Restaurant	Fast Food Restaurant	Park	Café	Supermarket	Bar	Grocery Store	Metro Station	Garden Center	Pizza Place
26 Southwark	10.611833	1	Coffee Shop	Hotel	Bar	Theater	Pub	Art Gallery	English Restaurant	Hotel Bar	Indian Restaurant	Cocktail Bar
28 Tower Hamlets	10.591111	1	Italian Restaurant	Café	Coffee Shop	Hotel	Chinese Restaurant	Outdoor Sculpture	Grocery Store	Gym / Fitness Center	Sandwich Place	Pizza Place
31 Westminster	27.537644	1	Hotel	Coffee Shop	Sandwich Place	Theater	Sushi Restaurant	Pub	Sporting Goods Shop	Hotel Bar	Juice Bar	Korean Restaurant

This is cluster 2, the “quiet” area.

BoroughName	CrimeToPop	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
1 Barnet	6.839606	2	Café	Bus Stop	Yoga Studio	Fast Food Restaurant	Gaming Cafe	Furniture / Home Store	French Restaurant	Food Court	Flea Market	Fish Market

This is cluster 3, the “fun” area.

BoroughName	CrimeToPop	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
0 Barking and Dagenham	8.361976	3	Pool	Park	Bus Station	Supermarket	Golf Course	Martial Arts Dojo	Gym / Fitness Center	Discount Store	Donut Shop	Food Court
2 Bexley	6.020962	3	Coffee Shop	Pub	Clothing Store	Italian Restaurant	Supermarket	Fast Food Restaurant	Pharmacy	Hotel	Furniture / Home Store	Optical Shop
4 Bromley	6.378860	3	Clothing Store	Coffee Shop	Pizza Place	Burger Joint	Gym / Fitness Center	Portuguese Restaurant	Burrito Place	Café	Sandwich Place	Chocolate Shop
6 Croydon	7.409864	3	Pub	Coffee Shop	Portuguese Restaurant	Italian Restaurant	Breakfast Spot	Spanish Restaurant	Burger Joint	Burrito Place	Café	Caribbean Restaurant
8 Enfield	7.718091	3	Coffee Shop	Clothing Store	Pub	Optical Shop	Café	Pharmacy	Turkish Restaurant	Bookstore	Restaurant	Supermarket
9 Greenwich	8.764728	3	Pub	Coffee Shop	Clothing Store	Supermarket	Hotel	Pharmacy	Grocery Store	Plaza	Fast Food Restaurant	Flea Market
11 Hammersmith and Fulham	10.739336	3	Pub	Italian Restaurant	Indian Restaurant	Café	Gastropub	Coffee Shop	Japanese Restaurant	Gym / Fitness Center	Pharmacy	Chinese Restaurant
13 Harrow	5.676838	3	Indian Restaurant	Fast Food Restaurant	Indie Movie Theater	Coffee Shop	Platform	Supermarket	Grocery Store	Farmers Market	French Restaurant	Food Court
14 Havering	6.546906	3	Coffee Shop	Shopping Mall	Hotel	Clothing Store	Fast Food Restaurant	Department Store	Bakery	Pub	Bookstore	Café
15 Hillingdon	7.662700	3	Coffee Shop	Italian Restaurant	Clothing Store	Pharmacy	Burger Joint	Pizza Place	Department Store	Toy / Game Store	Supermarket	Sandwich Place
17 Islington	11.491868	3	Pub	Ice Cream Shop	Mediterranean Restaurant	Theater	Park	Boutique	Music Venue	Burger Joint	Gift Shop	Furniture / Home Store
20 Lambeth	9.431558	3	Caribbean Restaurant	Market	Tapas Restaurant	BBQ Joint	Beer Bar	Pub	Pizza Place	Indian Restaurant	Restaurant	Cocktail Bar
24 Redbridge	6.919680	3	Clothing Store	Fast Food Restaurant	Bakery	Department Store	Sandwich Place	Coffee Shop	Grocery Store	Supermarket	Portuguese Restaurant	Movie Theater
25 Richmond upon Thames	5.611876	3	Pub	Coffee Shop	Italian Restaurant	Indian Restaurant	Grocery Store	Pharmacy	Deli / Bodega	Bus Stop	Café	Sandwich Place
27 Sutton	5.709138	3	Clothing Store	Pub	Coffee Shop	Italian Restaurant	Pizza Place	Sandwich Place	Bar	Department Store	Café	Bookstore
29 Waltham Forest	7.568746	3	Pub	Coffee Shop	Beer Store	Gym / Fitness Center	Tea Room	Art Gallery	Vegetarian / Vegan Restaurant	Concert Hall	Pizza Place	Pool
30 Wandsworth	6.992930	3	Pub	Coffee Shop	Clothing Store	Asian Restaurant	Breakfast Spot	Supermarket	Pizza Place	Sandwich Place	Indian Restaurant	Portuguese Restaurant

This is cluster 4, the “traveler” area.

	BoroughName	CrimeToPop	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
23	Newham	9.453289	4	Hotel	Airport Service	Rafting	Pharmacy	Chinese Restaurant	Light Rail Station	Sandwich Place	Airport Lounge	Airport	Food Court

4. Results

For safety, we normalized crime to population ratio and reversed the score so that 1 would represent the neighborhood with least crime reports per person.

	BoroughName	CrimeToPop	Cluster Labels	Safety
0	Barking and Dagenham	8.361976	3	0.874572
1	Barnet	6.839606	2	0.944005
2	Bexley	6.020962	3	0.981342
3	Brent	8.007527	1	0.890738
4	Bromley	6.378860	3	0.965019

For atmosphere, the highest score was given to the busy area, and the lowest score was given to the traveler area. The scores were arbitrary, but it represents which neighborhood would be appropriate for students to reside.

	BoroughName	CrimeToPop	Cluster Labels	Safety	Atmosphere
0	Barking and Dagenham	8.361976	3	0.874572	0
1	Barnet	6.839606	2	0.944005	0
2	Bexley	6.020962	3	0.981342	0
3	Brent	8.007527	1	0.890738	0
4	Bromley	6.378860	3	0.965019	0

Taking both two factors into account, we added both of the scores and calculated the final score, which is shown in the table below.

	BoroughName	Safety	Atmosphere	Score
1	Barnet	0.944005	1.0	1.944005
22	Merton	0.989088	0.9	1.889088
19	Kingston upon Thames	0.962294	0.9	1.862294
7	Ealing	0.917974	0.9	1.817974
3	Brent	0.890738	0.9	1.790738

5. Conclusion

From this analysis, we have found out the five boroughs below would be the best places for a student hall to be built. Most belong to the busy and fun area, but are located a little bit far from the center of the city.

