

# **Battle of Neighborhoods**

## **Description**

The problem we attempt to solve will be to locate the best area to open an Asian restaurant in the city of London. we will approach this problem by applying machine learning techniques and data mining and analysis to model a proper solution to the problem.

## **Data**

The data we will use are as follows:

- Foursquare Api
- London City Hall website

## **Methodology**

Our Methodology to approach this problem will be by understanding the social demography of the different neighborhoods and Boroughs to understand the ethnic distribution among the city and we will also the most popular venues in each area and try to get an understanding of the social taste for food and the statues of competing Asian restaurants. We will then apply k-means analysis to cluster the city and venues and reach conclusion on best cluster to open the business.

## **Detailed Approach**

Our detailed approach will be by mining for data of the distribution of ethnic groups in London Boroughs and understand the demography of each borough and the ethnic concentration in each. We will then obtain the top venues in each borough using foursqaure API and will have a look at the top 10 venues in each borough. With these data we will apply k-means algorithm to cluster the boroughs and venues in clusters and analyze each to determine best cluster to achieve our objective.

## **Target Audience**

Our Target audience are the investors willing to invest in restaurant business.

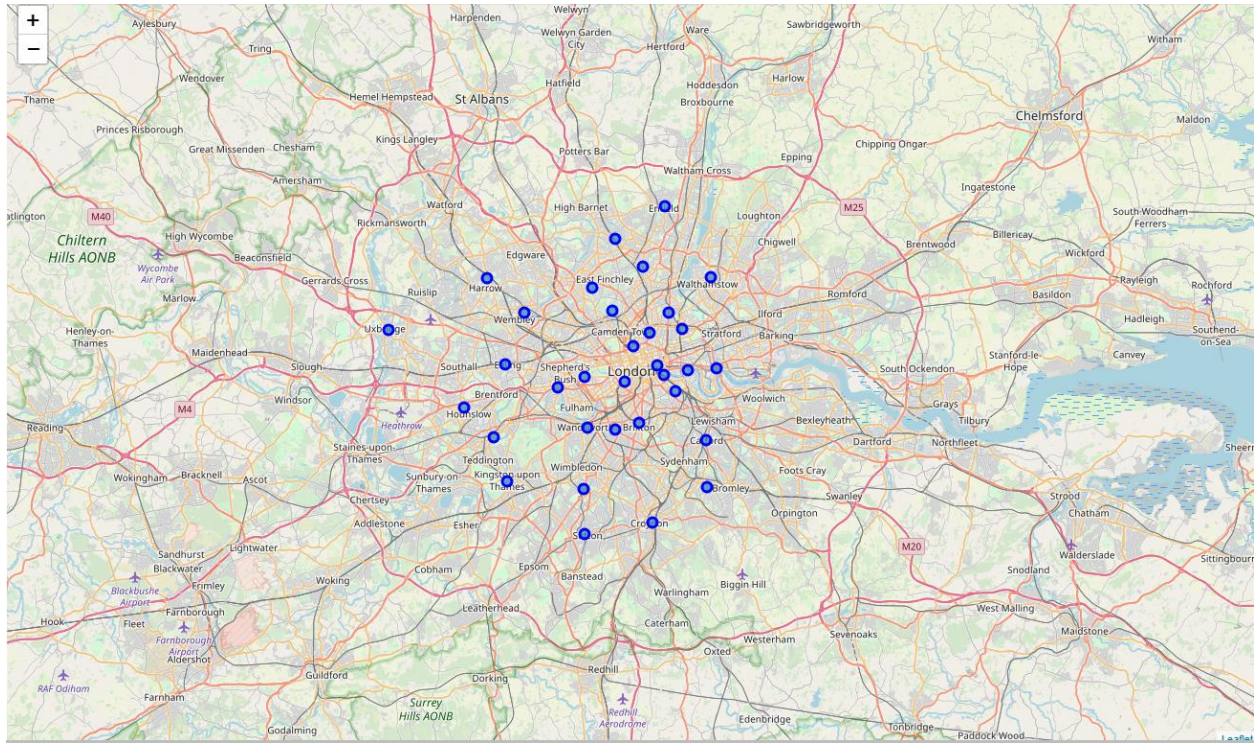
# Data Analysis

Data frame of Boroughs in London and ethnicity

Borough	White British	White Irish	White Other	Mixed	Asian	Black	Other
Barking and Dagenham	91,949	1,730	14,707	7,878	29,594	37,140	2,913
Barnet	162,117	8,685	57,751	17,169	65,918	27,431	17,315
Bexley	179,250	2,596	8,116	5,395	15,243	19,624	1,773
Brent	55,887	12,320	44,673	15,775	105,986	58,632	17,942
Bromley	239,478	4,463	16,929	10,897	16,067	18,686	2,872
Camden	96,937	7,053	42,065	12,322	35,446	18,060	8,455
City of London	4,243	180	1,376	289	940	193	154
Croydon	171,740	5,369	23,086	23,895	59,627	73,256	6,405
Ealing	103,035	10,428	52,355	15,066	100,439	36,860	20,266
Enfield	126,450	6,899	57,291	17,183	34,893	53,687	16,063
Greenwich	133,130	4,291	21,581	12,274	29,894	48,655	4,732
Hackney	89,030	5,216	40,371	15,869	25,867	56,858	13,059
Hammersmith and Fulham	81,989	6,321	35,912	10,044	16,635	21,505	10,087
Haringey	88,424	6,997	58,922	16,548	24,150	47,830	12,055
Harrow	73,826	7,336	19,829	9,499	101,808	19,708	7,050
Havering	197,615	2,989	7,345	4,933	11,545	11,481	1,324
Hillingdon	142,916	5,949	17,166	10,479	69,253	20,082	8,091
Hounslow	96,264	4,775	29,466	10,349	87,257	16,813	9,033
Islington	98,322	8,140	34,053	13,339	19,034	26,294	6,943
Kensington and Chelsea	62,271	3,715	46,031	8,986	15,861	10,333	11,452
Kingston upon Thames	101,015	2,718	15,486	6,269	26,152	4,021	4,399
Lambeth	118,250	7,456	47,319	23,160	20,938	78,542	7,421
Lewisham	114,446	5,206	28,034	20,472	25,534	74,942	7,251
Merton	96,658	4,417	28,531	9,334	36,143	20,811	3,799
Newham	51,516	2,172	35,528	13,945	133,895	60,256	10,672
Redbridge	96,253	3,900	18,493	11,456	116,503	24,845	7,520
Richmond upon Thames	133,582	4,766	22,377	6,780	13,607	2,816	3,062
Southwark	114,534	6,222	35,593	17,778	27,192	77,511	9,453
Sutton	134,854	3,219	11,376	7,134	22,035	9,120	2,408
Tower Hamlets	79,231	3,863	31,725	10,360	104,501	18,629	5,787
Waltham Forest	92,999	3,959	37,841	13,766	54,389	44,791	10,504
Wandsworth	163,739	7,664	47,813	15,241	33,338	32,756	6,444
Westminster	77,334	4,960	53,036	11,395	31,862	16,472	24,337

# London coordination and Map

The geographical coordinate of London is 51.5073219, -0.1276474.



## Explore the Neighborhoods with Foursquare data

	Borough	Neighborhood	Latitude	Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Barking and Dagenham		51.5607	-0.1557	Parliament Hill	51.559661	-0.159639	Scenic Lookout
1	Barking and Dagenham		51.5607	-0.1557	Parliament Hill Farmers' Market	51.559420	-0.151418	Farmers Market
2	Barking and Dagenham		51.5607	-0.1557	GAIL's Bakery	51.561942	-0.149528	Bakery
3	Barking and Dagenham		51.5607	-0.1557	Parliament Hill Fields Playground	51.556653	-0.157296	Playground
4	Barking and Dagenham		51.5607	-0.1557	Bistro Laz	51.561333	-0.150528	Mediterranean Restaurant

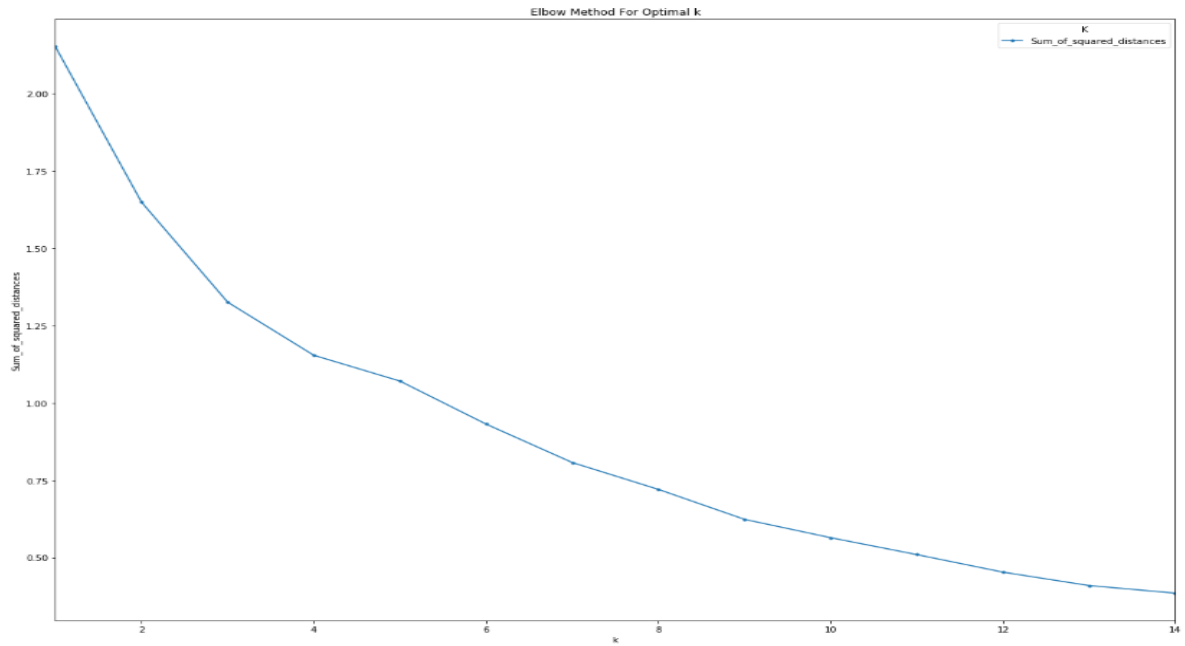
## Top 10 venues by Borough

	Borough	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	Mediterranean Restaurant	Café	Farmers Market	Food	Scenic Lookout	Grocery Store	Track Stadium	Trail	Bakery	Lake
1	Barnet	Café	Lawyer	Bus Stop	Yoga Studio	Fish & Chips Shop	Gaming Cafe	Furniture / Home Store	Fruit & Vegetable Store	Frozen Yogurt Shop	Fried Chicken Joint
2	Bexley	Grocery Store	Italian Restaurant	Fish & Chips Shop	Coffee Shop	Breakfast Spot	Supermarket	Fish Market	Bar	Historic Site	Caucasian Restaurant
3	Brent	Hotel	Clothing Store	Coffee Shop	Sporting Goods Shop	Bar	American Restaurant	Sandwich Place	Music Venue	Burger Joint	Grocery Store
4	Bromley	Café	Pub	Gastropub	Park	Gaming Cafe	Fruit & Vegetable Store	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Forest
5	Camden	Hotel	Coffee Shop	Pub	Café	Plaza	Italian Restaurant	Burger Joint	Garden	Bookstore	Deli / Bodega
6	City of London	Coffee Shop	Gym / Fitness Center	Seafood Restaurant	Italian Restaurant	Asian Restaurant	Pub	French Restaurant	Steakhouse	Restaurant	Hotel
7	Croydon	Coffee Shop	Pub	Gym / Fitness Center	Asian Restaurant	Portuguese Restaurant	Mediterranean Restaurant	Breakfast Spot	Brewery	Burger Joint	Burrito Place
8	Ealing	Coffee Shop	Clothing Store	Bakery	Bus Stop	Pub	Italian Restaurant	Park	Pizza Place	Hotel	Burger Joint
9	Enfield	Coffee Shop	Café	Clothing Store	Turkish Restaurant	Gift Shop	Bookstore	Supermarket	Department Store	Women's Store	Optical Shop
10	Greenwich	Brewery	Grocery Store	Recreation Center	Park	Café	Bar	Pharmacy	Italian Restaurant	Vietnamese Restaurant	Pub
11	Hackney	Pub	Coffee Shop	Café	Cocktail Bar	Grocery Store	Brewery	Bakery	Vietnamese Restaurant	Hotel	Clothing Store
12	Hammersmith and Fulham	Pub	Café	Hotel	Indian Restaurant	Italian Restaurant	Coffee Shop	Gastropub	Thai Restaurant	Bus Stop	Garden Center
13	Haringey	Fast Food Restaurant	Café	Indian Restaurant	Gym / Fitness Center	Portuguese Restaurant	Pub	Playground	Convenience Store	Park	Movie Theater
14	Harrow	Thai Restaurant	Indie Movie Theater	Indian Restaurant	Coffee Shop	Supermarket	Convenience Store	Yoga Studio	Food	Fish & Chips Shop	Fish Market
15	Havering	Park	Breakfast Spot	Forest	Yoga Studio	Garden Center	Gaming Cafe	Furniture / Home Store	Fruit & Vegetable Store	Frozen Yogurt Shop	Fried Chicken Joint
16	Hillingdon	Coffee Shop	Italian Restaurant	Clothing Store	Fast Food Restaurant	Dessert Shop	Toy / Game Store	Sandwich Place	Shopping Mall	Bookstore	Burger Joint
17	Hounslow	Bed & Breakfast	Café	Pizza Place	Park	Film Studio	Fruit & Vegetable Store	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Forest
18	Islington	Pub	Mediterranean Restaurant	Bakery	Middle Eastern Restaurant	French Restaurant	Cocktail Bar	Boutique	Park	Music Venue	Theater
19	Kensington and Chelsea	Clothing Store	Café	Hotel	French Restaurant	Restaurant	Bakery	Italian Restaurant	Garden	Burger Joint	Breakfast Spot
20	Kingston upon Thames	Coffee Shop	Café	Italian Restaurant	Clothing Store	Pub	Bookstore	Department Store	Burger Joint	Sushi Restaurant	Bakery
21	Lambeth	Caribbean Restaurant	Pub	Market	Pizza Place	Tapas Restaurant	Beer Bar	Mexican Restaurant	Coffee Shop	Gym / Fitness Center	Grocery Store
22	Lewisham	Supermarket	Grocery Store	Pub	Train Station	Coffee Shop	Platform	Italian Restaurant	Japanese Restaurant	Hardware Store	Shopping Mall
23	Merton	Park	Fast Food Restaurant	Supermarket	Café	Indian Restaurant	Bakery	Garden Center	Burger Joint	Grocery Store	Coffee Shop
24	Newham	Pub	Italian Restaurant	Hostel	Park	English Restaurant	Hotel	Indian Restaurant	Bus Stop	American Restaurant	Frozen Yogurt Shop
25	Redbridge	Pub	Café	Cocktail Bar	Turkish Restaurant	Pizza Place	Italian Restaurant	Spanish Restaurant	Burrito Place	Grocery Store	Nightclub
26	Richmond upon Thames	Coffee Shop	Pub	Italian Restaurant	Bus Stop	Indian Restaurant	Grocery Store	Sandwich Place	Pharmacy	Stationery Store	Café
27	Southwark	Coffee Shop	Pub	Restaurant	Bar	Scenic Lookout	English Restaurant	Café	Grocery Store	French Restaurant	Gym / Fitness Center
28	Sutton	Pub	Clothing Store	Coffee Shop	Bar	Sandwich Place	Café	Pizza Place	Italian Restaurant	Video Game Store	Bookstore
29	Tower Hamlets	Italian Restaurant	Coffee Shop	Hotel	Sandwich Place	Fried Chicken Joint	Outdoor Sculpture	Chinese Restaurant	Grocery Store	Gym / Fitness Center	Convenience Store
30	Waltham Forest	Pub	Gym	Coffee Shop	Tea Room	Gym / Fitness Center	Art Gallery	Beer Store	Pizza Place	Vegetarian / Vegan Restaurant	Pool
31	Wandsworth	Pub	Clothing Store	Coffee Shop	Asian Restaurant	Burger Joint	Breakfast Spot	Pizza Place	Supermarket	Gym / Fitness Center	Multiplex
32	Westminster	Sandwich Place	Hotel	Coffee Shop	Theater	Italian Restaurant	Gym / Fitness Center	Pub	Café	Hotel Bar	Sushi Restaurant

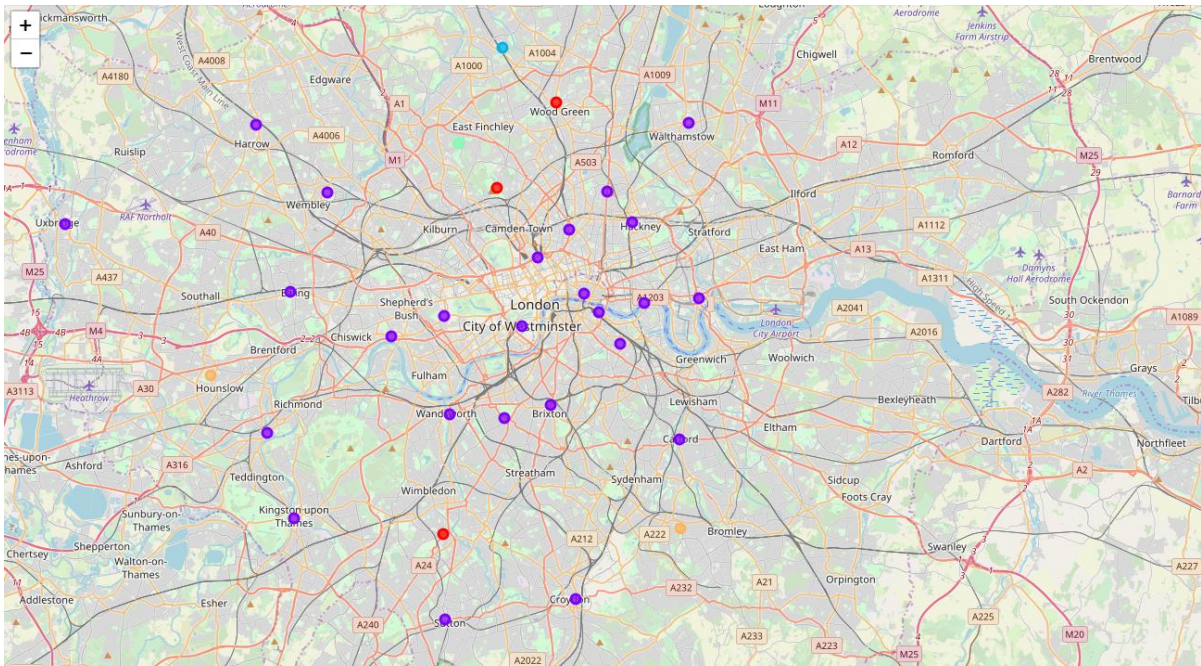


# K Mean Analysis

Optimum number of clusters = 5



London map by clusters



# Results

## Cluster 1

	Borough	White British	White Irish	White Other	Mixed	Asian	Black	Other	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	162117	8685	57751	17169	65918	27431	17315	2	Café	Lawyer	Bus Stop	Yoga Studio	Fish & Chips Shop	Gaming Café	Furniture / Home Store	Fruit & Vegetable Store	Frozen Yogurt Shop	Fried Chicken Joint

## Cluster 2

	Borough	White British	White Irish	White Other	Mixed	Asian	Black	Other	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
32	Westminster	77334	4960	53036	11395	31862	16472	24337	1	Sandwich Place	Hotel	Coffee Shop	Theater	Italian Restaurant	Gym / Fitness Center	Pub	Café	Hotel Bar	Sushi Restaurant
31	Wandsworth	163739	7664	47813	15241	33338	32756	6444	1	Pub	Clothing Store	Coffee Shop	Asian Restaurant	Burger Joint	Breakfast Spot	Pizza Place	Supermarket	Gym / Fitness Center	Multiplex
30	Waltham Forest	92999	3959	37841	13766	54389	44791	10504	1	Pub	Gym	Coffee Shop	Tea Room	Gym / Fitness Center	Art Gallery	Beer Store	Pizza Place	Vegetarian / Vegan Restaurant	Pool
29	Tower Hamlets	79231	3863	31725	10360	104501	18629	5787	1	Italian Restaurant	Coffee Shop	Hotel	Sandwich Place	Fried Chicken Joint	Outdoor Sculpture	Chinese Restaurant	Grocery Store	Gym / Fitness Center	Convenience Store
28	Sutton	134854	3219	11376	7134	22035	9120	2408	1	Pub	Clothing Store	Coffee Shop	Bar	Sandwich Place	Café	Pizza Place	Italian Restaurant	Video Game Store	Bookstore
27	Southwark	114534	6222	35593	17778	27192	77511	9453	1	Coffee Shop	Pub	Restaurant	Bar	Scenic Lookout	English Restaurant	Café	Grocery Store	French Restaurant	Gym / Fitness Center
26	Richmond upon Thames	133582	4766	22377	6780	13607	2816	3062	1	Coffee Shop	Pub	Italian Restaurant	Bus Stop	Indian Restaurant	Grocery Store	Sandwich Place	Pharmacy	Stationery Store	Café
25	Redbridge	96253	3900	18493	11456	116503	24845	7520	1	Pub	Café	Cocktail Bar	Turkish Restaurant	Pizza Place	Italian Restaurant	Spanish Restaurant	Burrito Place	Grocery Store	Nightclub
24	Newham	51516	2172	35528	13945	133895	60256	10672	1	Pub	Italian Restaurant	Hostel	Park	English Restaurant	Hotel	Indian Restaurant	Bus Stop	American Restaurant	Frozen Yogurt Shop
22	Lewisham	114446	5206	28034	20472	25534	74942	7251	1	Supermarket	Grocery Store	Pub	Train Station	Coffee Shop	Platform	Italian Restaurant	Japanese Restaurant	Hardware Store	Shopping Mall
21	Lambeth	118250	7456	47319	23160	20938	78542	7421	1	Caribbean Restaurant	Pub	Market	Pizza Place	Tapas Restaurant	Beer Bar	Mexican Restaurant	Coffee Shop	Gym / Fitness Center	Grocery Store
20	Kingston upon Thames	101015	2718	15486	6269	26152	4021	4399	1	Coffee Shop	Café	Italian Restaurant	Clothing Store	Pub	Bookstore	Department Store	Burger Joint	Sushi Restaurant	Bakery

## Cluster 3

	Borough	White British	White Irish	White Other	Mixed	Asian	Black	Other	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	162117	8685	57751	17169	65918	27431	17315	2	Café	Lawyer	Bus Stop	Yoga Studio	Fish & Chips Shop	Gaming Café	Furniture / Home Store	Fruit & Vegetable Store	Frozen Yogurt Shop	Fried Chicken Joint

## Cluster 4

	Borough	White British	White Irish	White Other	Mixed	Asian	Black	Other	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
15	Havering	197615	2989	7345	4933	11545	11481	1324	3	Park	Breakfast Spot	Forest	Yoga Studio	Garden Center	Gaming Café	Furniture / Home Store	Fruit & Vegetable Store	Frozen Yogurt Shop	Fried Chicken Joint

## Cluster 5

	Borough	White British	White Irish	White Other	Mixed	Asian	Black	Other	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
17	Hounslow	96264	4775	29466	10349	87257	16813	9033	4	Bed & Breakfast	Café	Pizza Place	Park	Film Studio	Fruit & Vegetable Store	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Forest
4	Bromley	239478	4463	16929	10897	16067	18686	2872	4	Café	Pub	Gastropub	Park	Gaming Café	Fruit & Vegetable Store	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Forest

## Discussion

By checking and analyzing the results of our model we can find many interesting output that can guide us to our final conclusion.

In cluster one we notice that the Asian population compared to other ethnicities is relatively low, also it shows an Indian restaurant that is popular.

Cluster two Asian population compared to other ethnicities is relatively low, also it shows there is a Chinese, Japanese and an Indian restaurant that are popular which indicates that this cluster is not the best for business.

Cluster three we see that the Asian population is high compared to other ethnicities and no Asian restaurants as competition which might indicate the existence of business opportunity.

In cluster four the Asian population is very low compared to other ethnicities however the population density is high and no Asian restaurants.

Cluster five, Here the Asian population is very high compared to other ethnicities and no Asian restaurants in the popular venues which indicates an opportunity to enter an established market with limited competition.

## Conclusions:

By looking at the results we find that Cluster 5 is the best option for us as the Asian population density is considered high and no popular Asian venues in the market which will limit the competition when penetration the market.