



# Capstone Project - The Battle of Neighbourhoods

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# Introduction

## 1. 1 Background

The average American moves about eleven times in their lifetime. This brings us to the question: Do people move until they find a place to settle down where they truly feel happy, or do our wants and needs change over time, prompting us to eventually leave a town we once called home for a new area that will bring us satisfaction? Or, do we too often move to a new area without knowing exactly what we're getting into, forcing us to turn tail and run at the first sign of discomfort? To minimize the chances of this happening, we should always do proper research when planning our next move in life. Consider the following factors when picking a new place to live so you don't end up wasting your valuable time and money making a move you'll end up regretting. Safety is a top concern when moving to a new area. If you don't feel safe in your own home, you're not going to be able to enjoy living there.

# Introduction

## 1.2 Problem

The crime statistics dataset of London found on Kaggle has crimes in each Boroughs of London from 2008 to 2016. The year 2016 being the latest we will be considering the data of that year which is actually old information as of now. The crime rates in each borough may have changed over time.

This project aims to select the safest borough in London based on the total crimes, explore the neighborhoods of that borough to find the 10 most common venues in each neighborhood and finally cluster the neighborhoods using k-mean clustering.

# Introduction

## 1.3 Interest

- ▶ Experts who are considering to relocate to London will be interested to identify the safest borough in London and explore its neighbourhoods and common venues around each neighbourhood.

# Data Acquisition and Cleaning

## 2.1 Data Acquisition

The data acquired for this project is a combination of data from three sources. The first data source of the project uses a [London crime data](#) that shows the crime per borough in London.

The dataset contains the following columns:

- **Isoa\_code**: code for Lower Super Output Area in Greater London.
- **borough**: Common name for London borough.
- **major\_category**: High level categorization of crime
- **minor\_category**: Low level categorization of crime within major category.
- **value**: monthly reported count of categorical crime in given borough
- **year**: Year of reported counts, 2008-2016
- **month**: Month of reported counts, 1-12

# Data Acquisition and Cleaning

## 2.2 Data Cleaning

The data preparation for each of the three sources of data is done separately. From the London crime data, the crimes during the most recent year (2016) are only selected. The major categories of crime are pivoted to get the total crimes per the boroughs for each major category (see *fig 2.1*).

	Borough	Burglary	Criminal Damage	Drugs	Other Notifiable Offences	Robbery	Theft and Handling	Violence Against the Person	Total
0	Barking and Dagenham	1287	1949	919	378	534	5607	6067	16741
1	Barnet	3402	2183	906	499	464	9731	7499	24684
2	Bexley	1123	1673	646	294	209	4392	4503	12840
3	Brent	2631	2280	2096	536	919	9026	9205	26693
4	Bromley	2214	2202	728	417	369	7584	6650	20164

# Methodology

## **3.1 .Exploratory Data Analysis**

- ▶ Statistical summary of crimes
- ▶ Boroughs with the highest crime rates
- ▶ Boroughs with the lowest crime rates
- ▶ Neighborhoods in Kingston upon Thames

# Methodology

## 3.2 Modelling

Using the final dataset containing the neighborhoods in Kingston upon Thames along with the latitude and longitude, we can find all the venues within a 500 meter radius of each neighborhood by connecting to the Foursquare API. This returns a json file containing all the venues in each neighborhood which is converted to a pandas dataframe. This data frame contains all the venues along with their coordinates and category (see *fig 3.2.1*).

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Berrylands	51.393781	-0.284802	Surbiton Racket & Fitness Club	51.392676	-0.290224	Gym / Fitness Center
1	Berrylands	51.393781	-0.284802	Alexandra Park	51.394230	-0.281206	Park
2	Berrylands	51.393781	-0.284802	K2 Bus Stop	51.392302	-0.281534	Bus Stop
3	Berrylands	51.393781	-0.284802	Cafe Rosa	51.390175	-0.282490	Café
4	Canbury	51.417499	-0.305553	The Boater's Inn	51.418546	-0.305915	Pub



# Results

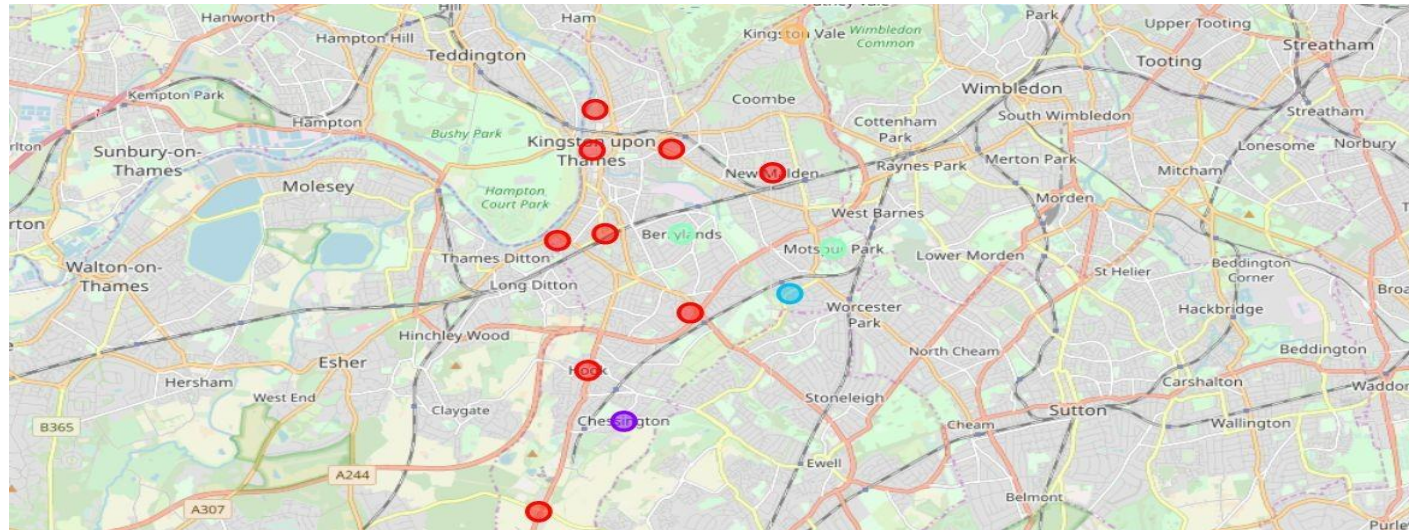
After running the K-means clustering we can access each cluster created to see which neighborhoods were assigned to each of the five clusters. Looking into the neighborhoods in the first cluster (see *fig 4.1*)

	Neighborhood	Borough	Latitude	Longitude	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
1	Canbury	Kingston upon Thames	51.417499	-0.305553	0	Pub	Café	Plaza	Fish & Chips Shop	Supermarket	Spa	Shop & Service	Park
4	Hook	Kingston upon Thames	51.367898	-0.307145	0	Bakery	Convenience Store	Indian Restaurant	Fish & Chips Shop	Wine Shop	Food	Electronics Store	Farmers Market
5	Kingston upon Thames	Kingston upon Thames	51.409627	-0.306262	0	Coffee Shop	Café	Burger Joint	Sushi Restaurant	Pub	Record Shop	Cosmetics Shop	Market
7	Malden Rushett	Kingston upon Thames	51.341052	-0.319076	0	Convenience Store	Pub	Garden Center	Restaurant	Fast Food Restaurant	Discount Store	Dry Cleaner	Electronics Store
9	New Malden	Kingston upon Thames	51.405335	-0.263407	0	Gastropub	Gym	Sushi Restaurant	Supermarket	Korean Restaurant	Indian Restaurant	Fish & Chips Shop	Dry Cleaner
10	Norbiton	Kingston upon Thames	51.409999	-0.287396	0	Indian Restaurant	Pub	Food	Italian Restaurant	Platform	Grocery Store	Farmers Market	Dry Cleaner
12	Seething Wells	Kingston upon Thames	51.392642	-0.314366	0	Indian Restaurant	Coffee Shop	Italian Restaurant	Pub	Café	Wine Shop	Fast Food Restaurant	Chinese Restaurant
13	Surbiton	Kingston upon Thames	51.393756	-0.303310	0	Coffee Shop	Pub	Supermarket	Breakfast Spot	Grocery Store	Gastropub	French Restaurant	Train Station
14	Tolworth	Kingston upon Thames	51.378876	-0.282860	0	Grocery Store	Pharmacy	Furniture / Home Store	Train Station	Pizza Place	Discount Store	Coffee Shop	Bus Stop

# Results

- ▶ The second cluster has one neighbourhood which consists of Venues such as Restaurants, Golf courses, and wine shops.
  - ▶ The third cluster has one neighbourhood which consists of Venues such as Train stations, Restaurants, and Furniture shops.
  - ▶ The fifth cluster has one neighbourhood which consists of Venues such as Grocery shops, Bars, Restaurants, Furniture shops, and Department stores. We will look into the neighbourhoods in the fourth cluster.
- ▶
- ▶ The fourth cluster has two neighbourhoods in it, these neighbourhoods have common venues such as Parks, Gym/Fitness centres, Bus Stops, Restaurants, Electronics Stores and Soccer fields etc.
  - ▶ Visualising the clustered neighbourhoods on a map using the folium library (see fig 4.2).

# Results



*Fig 4.6 Clustered neighborhoods in the Borough of Kingston upon Thames*

Each cluster is color coded for the ease of presentation, we can see that majority of the neighborhood falls in the red cluster which is the first cluster. Three neighborhoods have their own cluster (Blue, Purple and Yellow), these are clusters two three and five. The green cluster consists of two neighborhoods which is the 4th cluster.

# Discussion

- ▶ The aim of this project is to help people who want to relocate to the safest borough in London, expats can choose the neighbourhoods to which they want to relocate based on the most common venues in it. For example if a person is looking for a neighbourhood with good connectivity and public transportation we can see that Clusters 3 and 4 have Train stations and Bus stops as the most common venues. If a person is looking for a neighbourhood with stores and restaurants in a close proximity then the neighbourhoods in the first cluster are suitable. For a family I feel that the neighbourhoods in Cluster 4 are more suitable due to the common venues in that cluster, these neighbourhoods have common venues such as Parks, Gym/Fitness centres, Bus Stops, Restaurants, Electronics Stores and Soccer fields which is ideal for a family. The choices of neighbourhoods may vary from person to person.

# Conclusion

This project helps a person get a better understanding of the neighbourhoods with respect to the most common venues in that neighbourhood. It is always helpful to make use of technology to stay one step ahead i.e. finding out more about places before moving into a neighbourhood. We have just taken safety as a primary concern to shortlist the safest borough of London. The future of this project includes taking other factors such as cost of living in the areas into consideration to shortlist the borough, such as filtering areas based on a predefined budget.



# THANK YOU 😊

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