

2. Data Acquisition and Cleaning

2.1 Data Acquisition

The data acquired for this project come from three sources:

- London crime data (Kaggle)
- list of London boroughs (Wikipedia)
- list of Neighbourhoods in the Royal Borough of Kingston upon Thames (Wikipedia)

The first data source of the project uses a London crime data that shows the crime per borough in London. The columns of the data as below:

- **Isao_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
- **month**: Month of reported counts

The second source of data is scraped from a Wikipedia that contains the list of London boroughs. The page is useful because it contains additional information about the boroughs, the column of the data as below:

- **Borough**: The names of the London boroughs
- **Inner**: Categorizing the borough as an Inner London borough or an Outer London Borough
- **Status**: Categorizing the borough as Royal, City or other borough
- **Local authority**: The local authority assigned to the borough
- **Political control**: The political party that control the borough
- **Headquarters**: Headquarters of the Boroughs
- **Area (sq mi)**: Area of the borough in square miles
- **Population**: The population in the borough recorded during the year 2013
- **Co-ordinates**: The latitude and longitude of the boroughs.
- **Nr. in map**: The number assigned to each borough to represent visually on a map

The third data source is the list of Neighbourhoods in the Royal Borough of Kingston upon Thames as found on a Wikipedia. This dataset is created from scratch using the list of neighbourhood found online and coordinates from Google Maps API geocoding the column of the data as below:

- **Neighbourhood:** Name of the neighbourhood in the Borough
- **Borough:** Name of the Borough
- **Latitude:** Latitude of the Borough
- **Longitude:** Longitude of the Borough

2.2 Data Cleaning

The data preparation for each of the three data source is done one by one. 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.

	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

Fig 2.1 London crime data after pre-processing

The second data is scraped from a Wikipedia page using the **Beautiful Soup** library in python. Using this library we can extract the data in the tabular format as shown in the website. After the web scraping, string manipulation is required to get the names of the boroughs in the correct form (see *fig 2.2*) . This is important because we will be merging the two datasets together using the Borough names.

	Borough	Inner	Status	Local authority	Political control	Headquarters	Area (sq mi)	Population (2013 est)[1]	Co-ordinates	Nr. in map
0	Barking and Dagenham	NaN	NaN	Barking and Dagenham London Borough Council	Labour	Town Hall, 1 Town Square	13.93	194352	51°33'39"N 0°09'21"E / 51.5607°N 0.1557°E / ...	25
1	Barnet	NaN	NaN	Barnet London Borough Council	Conservative	North London Business Park, Oakleigh Road South	33.49	369088	51°37'31"N 0°09'06"W / 51.6252°N 0.1517°W / ...	31
2	Bexley	NaN	NaN	Bexley London Borough Council	Conservative	Civic Offices, 2 Watling Street	23.38	236687	51°27'18"N 0°09'02"E / 51.4549°N 0.1505°E / ...	23
3	Brent	NaN	NaN	Brent London Borough Council	Labour	Brent Civic Centre, Engineers Way	16.70	317264	51°33'32"N 0°16'54"W / 51.5588°N 0.2817°W / ...	12
4	Bromley	NaN	NaN	Bromley London Borough Council	Conservative	Civic Centre, Stockwell Close	57.97	317899	51°24'14"N 0°01'11"E / 51.4039°N 0.0198°E / ...	20

Fig 2.2 List of London Boroughs

The two datasets are merged on the Borough names to form a new dataset that combines the necessary information in one dataset (see *fig 2.3*). The purpose of this dataset is to visualize the crime rates in each borough and identify the borough with the least crimes recorded during the year 2016.

	Borough	Local authority	Political control	Headquarters	Area (sq mi)	Population (2013 est)[1]	Co-ordinates	Burglary	Criminal Damage	Drugs	Other Notifiable Offences	Robbery	Theft and Handling	Violence Against the Person	Total
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4	Bromley	Bromley London Borough Council	Conservative	Civic Centre, Stockwell Close	57.97	317899	51°24'14"N 0°01'11"E / 51.4039°N 0.0198°E /...	2214	2202	728	417	369	7584	6650	20164

Fig 2.3 London Borough Crime

After visualizing the crime in each borough we can find the borough with the lowest crime rate and hence tag that borough as the safest borough. The third source of data is acquired from the list of neighbourhoods in the safest borough on Wikipedia. This dataset is created from scratch, the pandas data frame is created with the names of the neighbourhoods and the name of the borough with the latitude and longitude left blank (see *fig 2.4*).

	Neighborhood	Borough	Latitude	Longitude
0	Berrylands	Kingston upon Thames		
1	Canbury	Kingston upon Thames		
2	Chessington	Kingston upon Thames		
3	Coombe	Kingston upon Thames		
4	Hook	Kingston upon Thames		

Fig 2.4 Neighbourhoods of the safest borough

The coordinates of the neighbourhoods is be obtained using Google Maps API geocoding to get the final dataset (See *Fig 2.5*) .

	Neighborhood	Borough	Latitude	Longitude
0	Berrylands	Kingston upon Thames	51.393781	-0.284802
1	Canbury	Kingston upon Thames	51.417499	-0.305553
2	Chessington	Kingston upon Thames	51.358336	-0.298622
3	Coombe	Kingston upon Thames	51.419450	-0.265398
4	Hook	Kingston upon Thames	51.367898	-0.307145

Fig 2.5 Neighbourhoods of the safest borough

The new dataset is used to generate the 10 most common venues for each neighbourhood using the Foursquare API, finally using k means clustering algorithm to cluster similar neighbourhoods together.