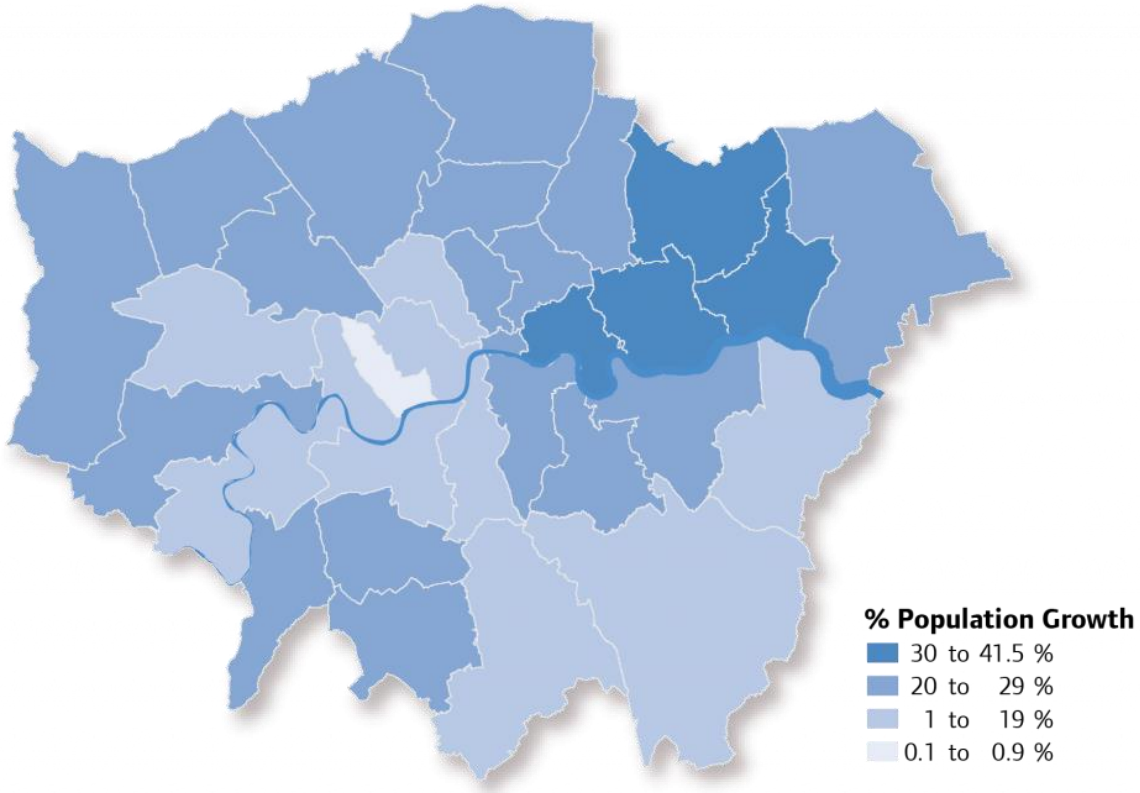
PREDICTING LONDON RENTAL LOCATIONS

London is packed with people looking to rent



- London population is still growing at a rapid pace.
- In 2019, London reached an approximate population of 9 million.
- Housing prices are rising year on year.
- As a result, more and more people are turning to renting.

The problem

- Determine a list of boroughs appropriate for renting based on a set list of criteria.

- The criteria used to determine such boroughs are:

    1. Reasonably safe to live in (a big city is never going to be perfectly safe!).
    2. Affordable for a possible first-time renter.
    3. Provides a selection of essential public services close by.

- This will be applicable to any individual who is interested in renting a one bedroom flat in London.

The Data Sources

- Crime records were gathered by the Metropolitan Police and provided through the London Datastore.
- Population data was required in order to calculate the crime rate per borough. This information was kindly provided by Thomas Brinkhoff, via his website http://www.citypopulation.de.
- Average monthly rent data was provided by the Valuation Office Agency through the London Datastore.
- Public service venues were gathered through the FourSquare places API.

The Cleaning

- Crime: Filtered to 2019. Sum up all crimes occurring, irrespective of type, by borough. Exclude crimes taking place in airports.
- Population: Merge with crime data. Calculate crime rate defined as the percentage of crimes committed in a borough vs. the population of that borough.
- Rent: Filtered to 2019. Whilst the data set included a variety of descriptive statistics, we focused on the average (mean) rent.
- Venue: One hot encode venue types. Take mean frequency of each venue type by borough.

The Data Sets

After the cleaning detailed in previous slides, these were the resulting data sets.

Borough	Total Crimes
Richmond upon Thames	12932
Kingston upon Thames	13216
Sutton	13951
Merton	14513
Harrow	17365

Crimes by borough (2019)

	Average rent
Kensington and Chelsea	2062
Camden	1659
Hammersmith and Fulham	1454
Southwark	1419
Islington	1558

Average monthly rent by borough (2019)

Borough	Crime Rate
Westminster	31.75
Kensington and Chelsea	16.17
Camden	14.73
Hammersmith and Fulham	12.90
Southwark	12.56

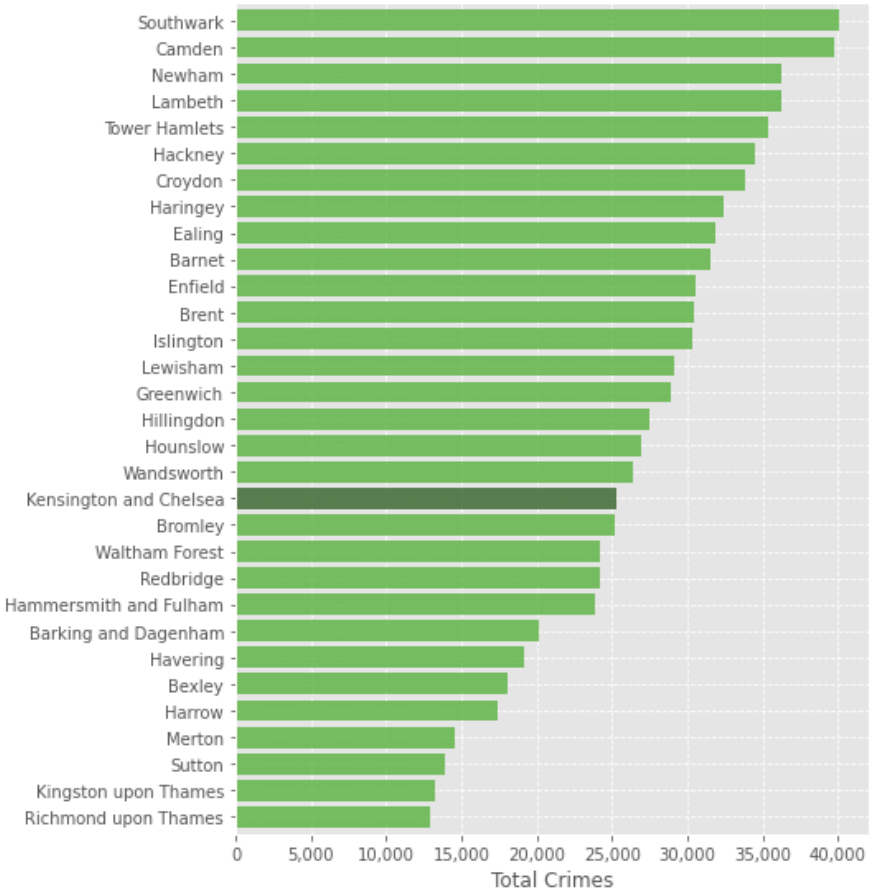
Crime rate by borough (2019)

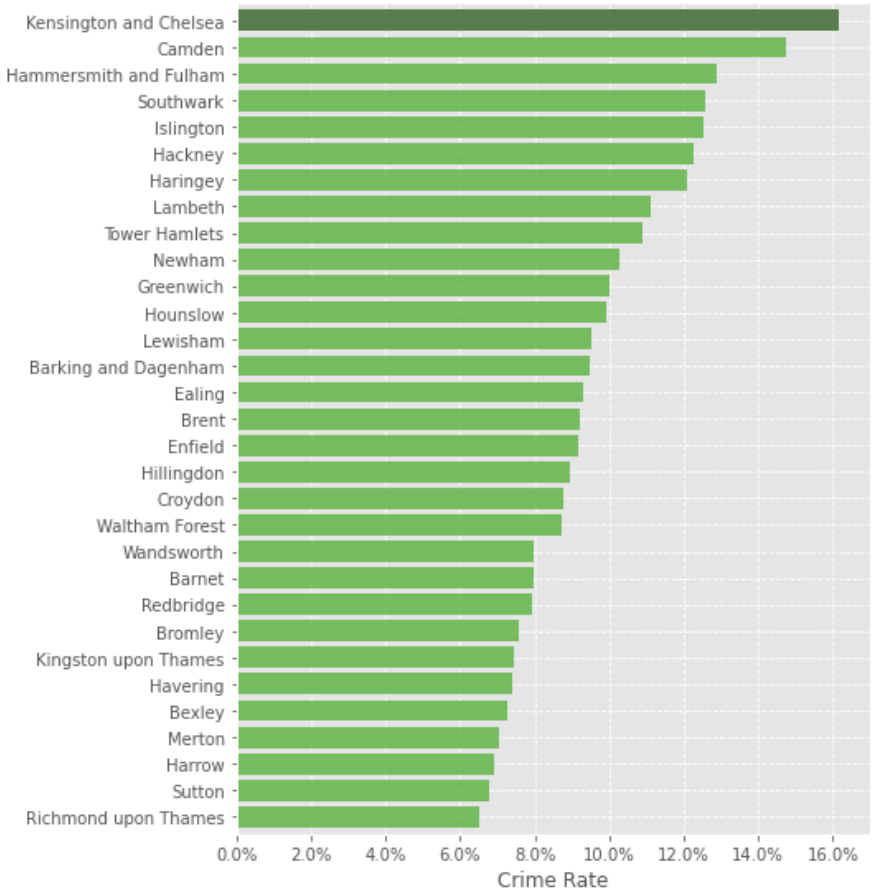
Borough	Afghan Restaurant	American Restaurant	Antique Shop	Argentinian Restaurant	Art Gallery	Arts & Crafts Store	Asian Restaurant	Athletics & Sports	Austrian Restaurant	...	Vietnamese Restaurant	Warehouse Store	Waterfront
Barking and Dagenham	0.0	0.00	0.0	0.0	0.0	0.00	0.000000	0.00	0.0	...	0.0	0.00	0.0
Barnet	0.0	0.00	0.0	0.0	0.0	0.00	0.000000	0.00	0.0	...	0.0	0.00	0.0
Bexley	0.0	0.01	0.0	0.0	0.0	0.01	0.000000	0.01	0.0	...	0.0	0.00	0.0

Mean venue type frequency by borough

Total Crime vs. Crime Rate

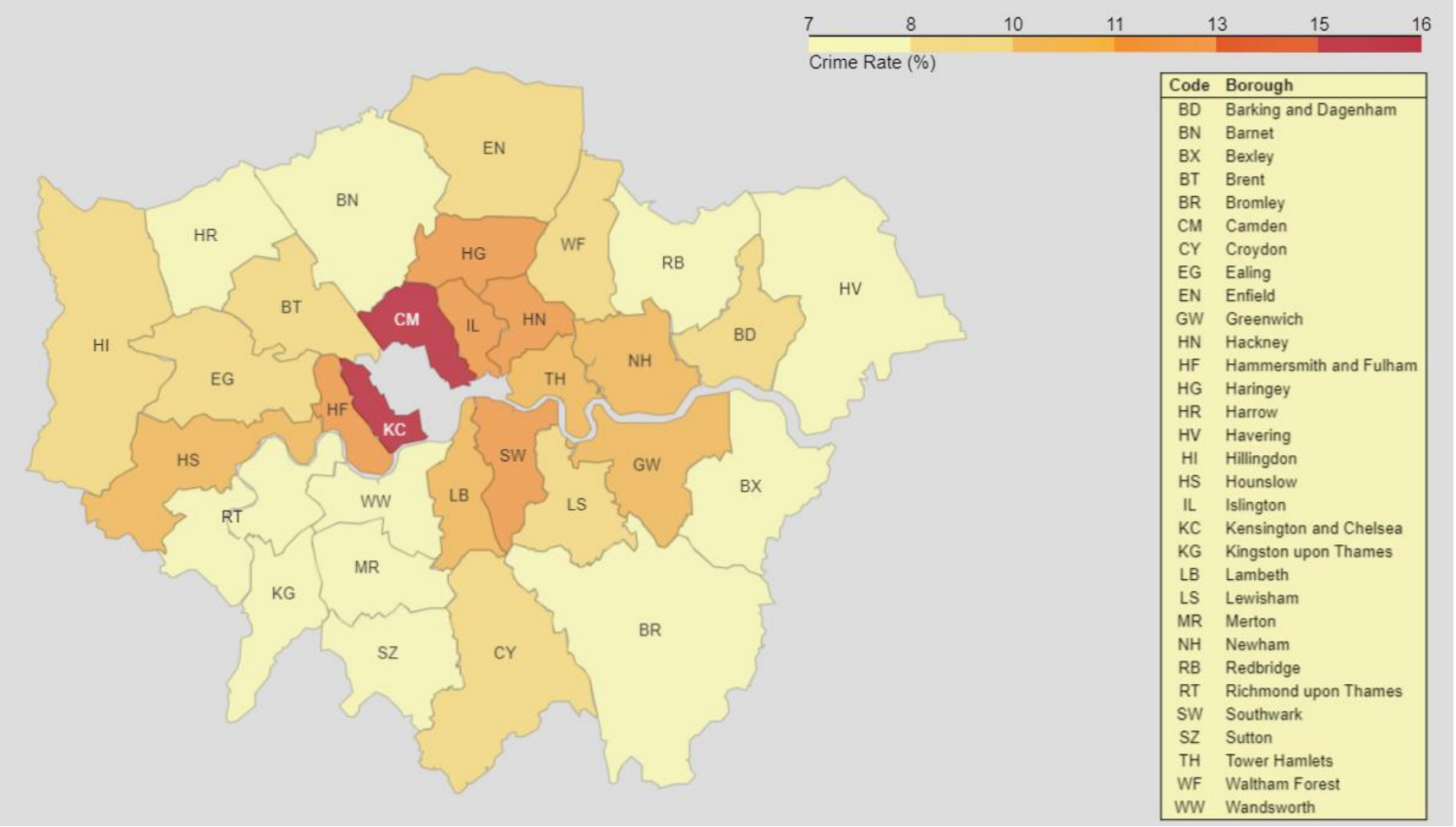
- A borough with a higher than average population will likely have a higher number of crimes.
- Risk suggesting a borough with a lower volume of crimes but high crime rate, e.g. Kensington & Chelsea.
- As such, it is important to use crime rate.





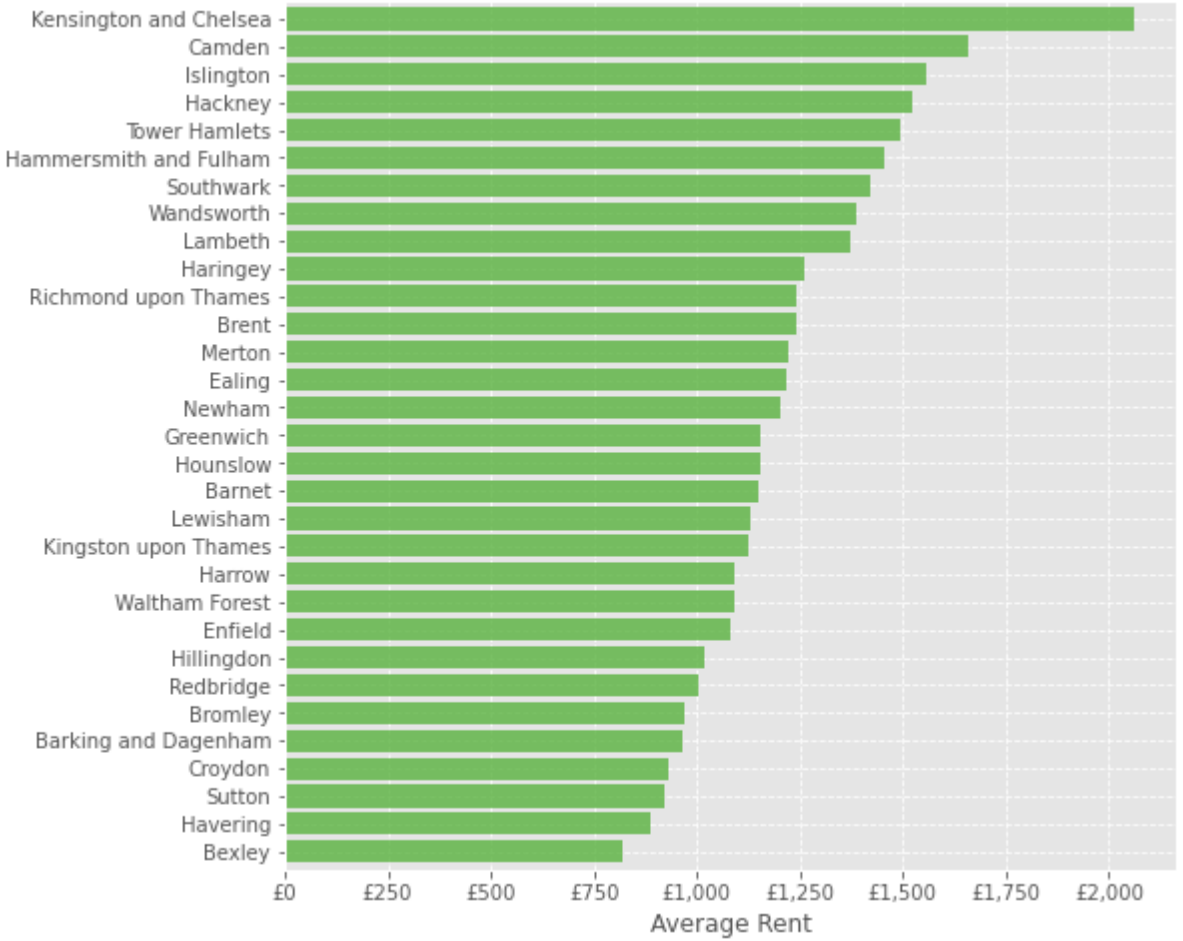
Map of Crime Rate

- The closer you are to central London, the higher the crime rate.
- There are pockets of safety in central London, e.g. Wandsworth.
- South west & far east are the safest regions to live.



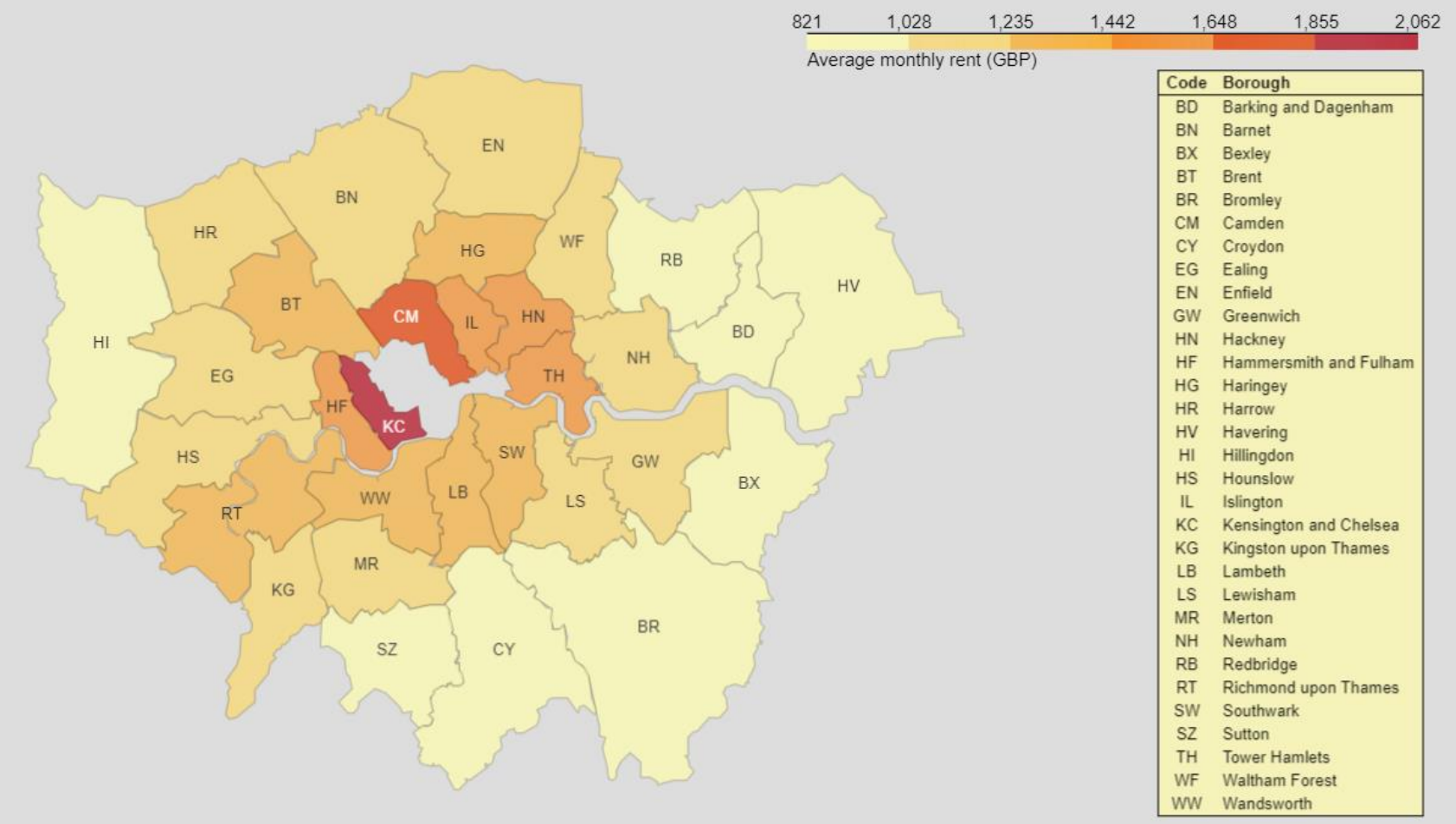
Average Monthly Rent

- Extremely large range in the average rent across the London Boroughs.
- Kensington & Chelsea top the list, with a monthly average breaching £2,000.
- Bexley trails the list at just over £750 per month.
- Kensington & Chelsea are ahead of the next best by approx. £400.



Map of Average Monthly Rent

- Reduction in average monthly rent as the distance to central London increases.
- South west displays a higher average rent than the far east.
- Perhaps due to the quality of transport links available when comparing the two.



Code	Borough
BD	Barking and Dagenham
BN	Barnet
BX	Bexley
BT	Brent
BR	Bromley
CM	Camden
CY	Croydon
EG	Ealing
EN	Enfield
GW	Greenwich
HN	Hackney
HF	Hammersmith and Fulham
HG	Haringey
HR	Harrow
HV	Havering
HI	Hillingdon
HS	Hounslow
IL	Islington
KC	Kensington and Chelsea
KG	Kingston upon Thames
LB	Lambeth
LS	Lewisham
MR	Merton
NH	Newham
RB	Redbridge
RT	Richmond upon Thames
SW	Southwark
SZ	Sutton
TH	Tower Hamlets
WF	Waltham Forest
WW	Wandsworth

Feature and Model Selection

- A total of 265 features were used for clustering. These include crime rate, average monthly rent and the mean frequency of all venue types.
- k-means clustering was the algorithm used to determine the groups of boroughs with a total of 6 clusters.
- The cluster labels were merged with crime rate, average monthly rent and the top 10 most common venue types.

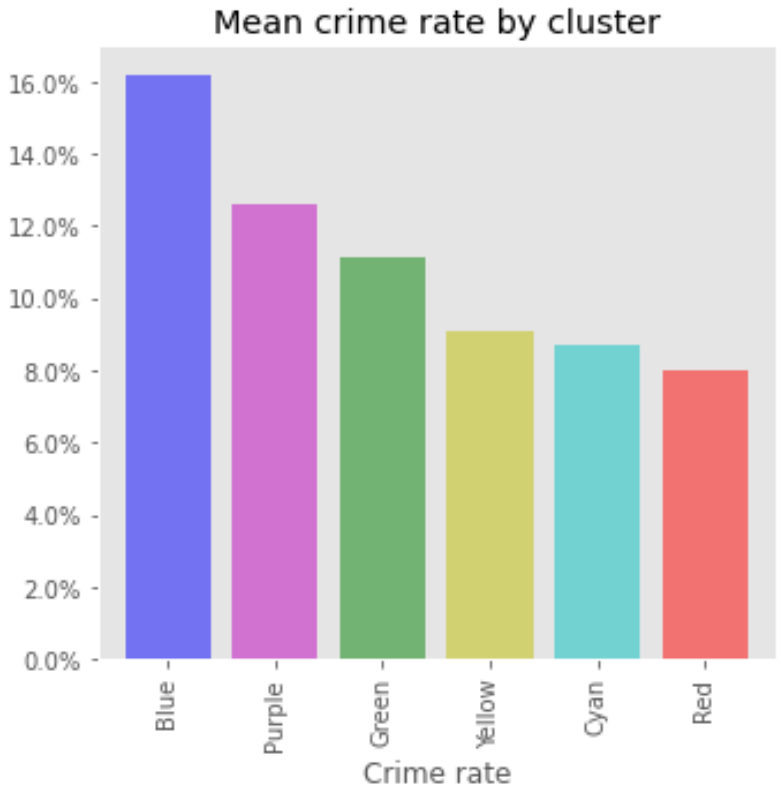
Quantifying the venue types

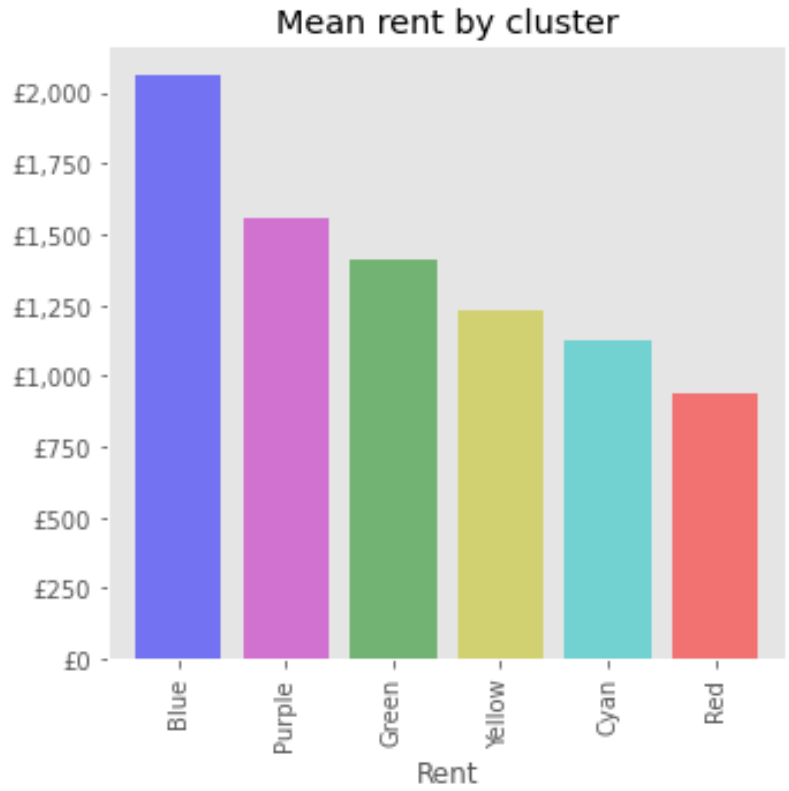
- The top 10 most common venue types were part of a categorical data set, which made it difficult to gather meaningful insights.

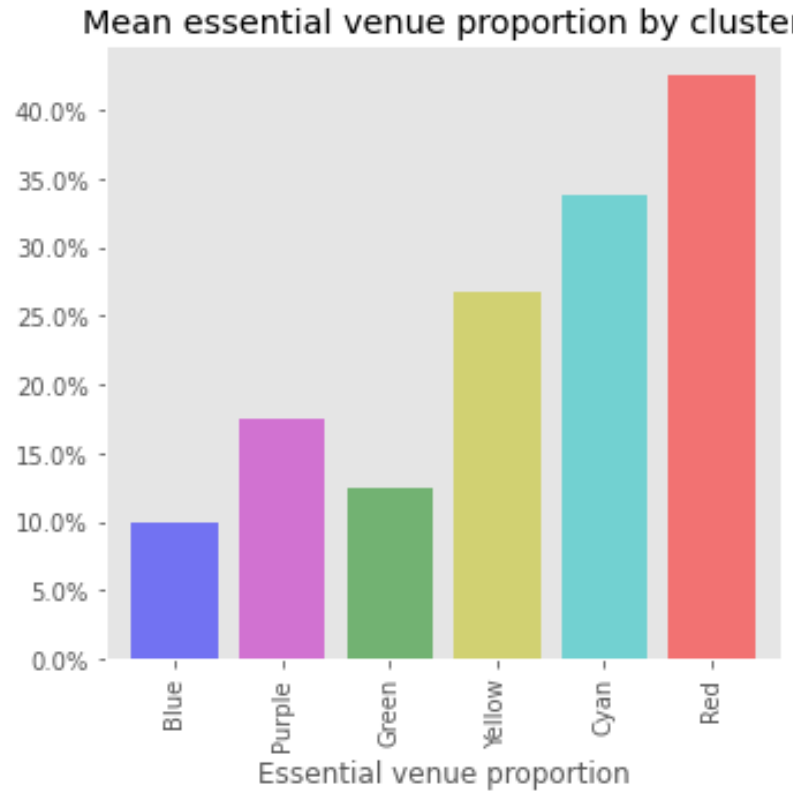
- As such, these venue types were further categorised as “Essential” or “Non-Essential”. Using this new categorisation, we could calculate the percentage of essential venues present in the top 10 – a quantitative metric we can use to compare the clusters.

Cluster	Mean crime rate	Mean rent	Mean essential venue proportion
Blue	16.170000	2062.000	10.000000
Purple	12.600000	1558.500	17.500000
Green	11.140000	1407.750	12.500000
Yellow	9.076667	1230.000	26.666667
Cyan	8.715000	1121.625	33.750000
Red	8.011250	940.250	42.500000

Visualising the clustering results

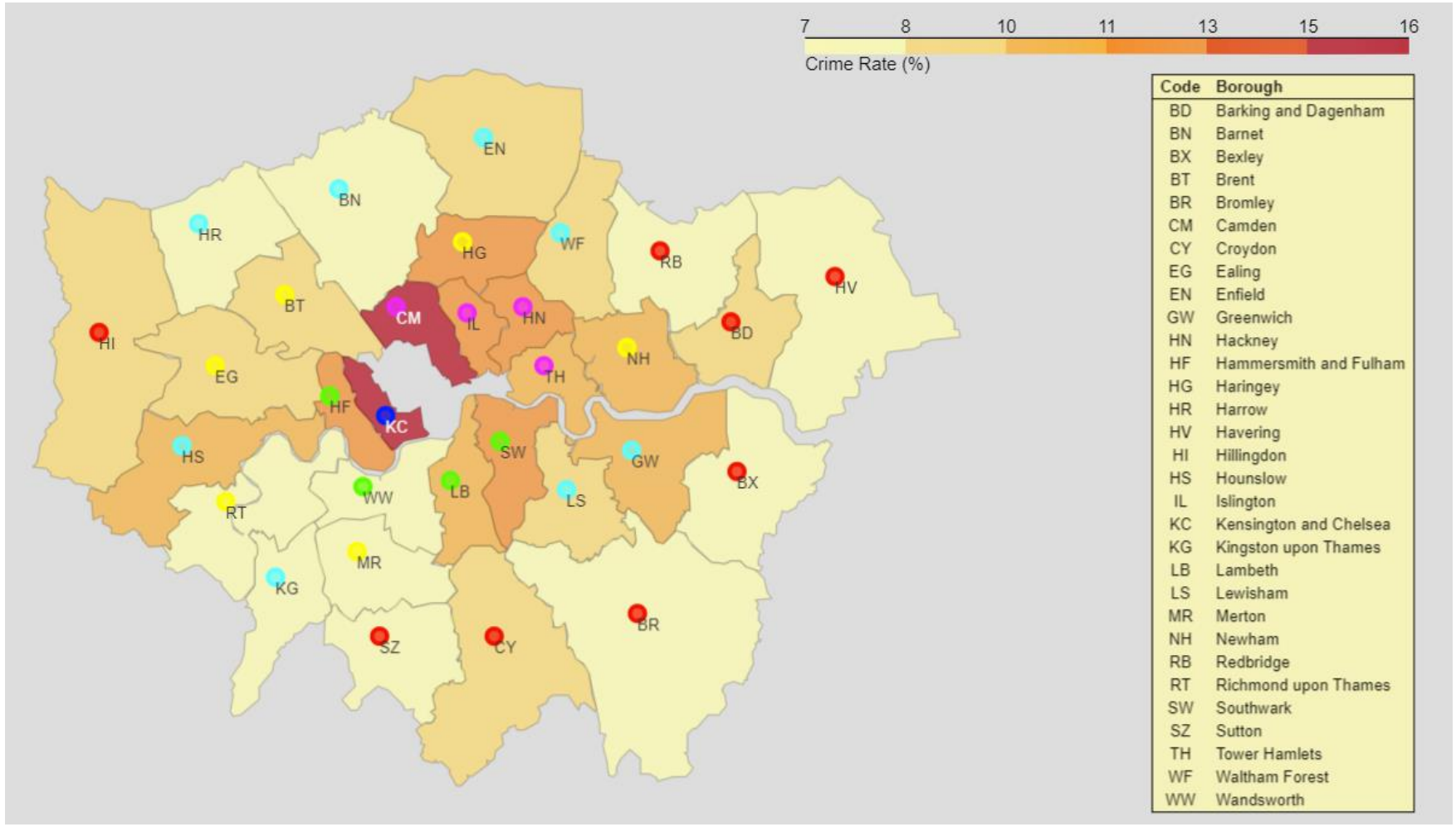






- Provides us with insight into the “good” and “bad” borough clusters based on the three pre-defined criteria.
- We would suggest proceeding with a search in the yellow, red & cyan clusters.

Visualising the clusters



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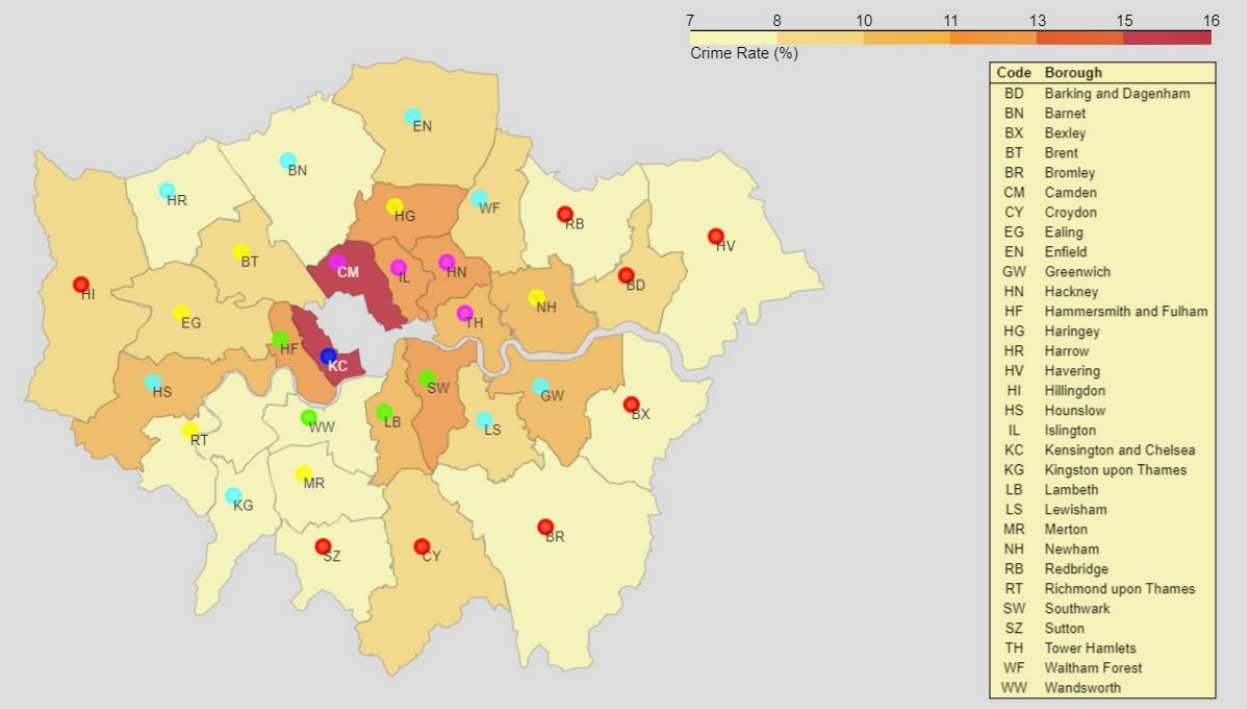
BN	Barnet
BX	Bexley
BT	Brent
BR	Bromley
CM	Camden
CY	Croydon
EG	Ealing
EN	Enfield
GW	Greenwich
HN	Hackney
HF	Hammersmith and Fulham
HG	Haringey
HR	Harrow
HV	Havering
HI	Hillingdon
HS	Hounslow
IL	Islington
KC	Kensington and Chelsea
KG	Kingston upon Thames
LB	Lambeth
LS	Lewisham
MR	Merton
NH	Newham
RB	Redbridge
RT	Richmond upon Thames
SW	Southwark
SZ	Sutton
TH	Tower Hamlets
WF	Waltham Forest
WW	Wandsworth

- The red and cyan clusters have taken the majority of the boroughs around the edge of London.
- This was likely influenced by the rental prices further out from central London.

Suggestions

Cluster	Mean crime rate	Mean rent	Mean essential venue proportion
Yellow	9.076667	1230.000	26.666667
Cyan	8.715000	1121.625	33.750000
Red	8.011250	940.250	42.500000



- The best places to look for a rental based on the defined criteria are within the yellow, cyan and red clusters.
- These clusters account for a sizeable portion of London, so the individual can still experience the cultural variety available.
- If further requirements are needed, the criteria must be adjusted and the analysis re-run.

Evaluation

- Several assumptions have been made during this:
  - Renter would not like to live in an airport.
  - Renter would not like to live in Westminster (due to high crime rate).
  - Renter is searching for a one bedroom flat.
  - Essential venues align with my preferences.

- Other shortfalls to be aware of and future direction:
  - Analysis at borough level is extremely broad – consider running this analysis at ward level.
  - Essential public service venue proportion was determined by the top 10 venues in that borough, this is a large generalisation. Similarly, consider running the analysis at ward level.
  - The k-means model was assumed the best fit, with $k = 6$ clusters. This should be rigorously tested against other categorisation models.
  - Further features could be included, for example, distance to central London by public transport.