

Capstone Project - The Battle of Neighborhoods

Business Problem section – Analysis of London Housing Market

Background

According to Bloomberg News, the London Housing Market is in a rut. It is now facing a number of different headwinds, including the prospect of higher taxes and a warning from the Bank of England that U.K. home values could fall as much as 30 percent in the event of a disorderly exit from the European Union. More specifically, four overlooked cracks suggest that the London market may be in worse shape than many realize: hidden price falls, record-low sales, homebuilder exodus and tax hikes addressing overseas buyers of homes in England and Wales.

Business Problem

In this scenario, it is urgent to adopt machine learning tools in order to assist homebuyers clientele in London to make wise and effective decisions. As a result, the business problem we are currently posing is: how could we provide support to homebuyers clientele in to purchase a suitable real estate in London in this uncertain economic and financial scenario?

To solve this business problem, we are going to cluster London neighborhoods in order to recommend venues and the current average price of real estate where homebuyers can make a real estate investment. We will recommend profitable venues according to amenities and essential facilities surrounding such venues i.e. elementary schools, high schools, hospitals & grocery stores.

Data section

Data on London properties and the relative price paid data were extracted from the HM Land Registry (<http://landregistry.data.gov.uk/>). The following fields comprise the address data included in Price Paid Data: Postcode; PAON Primary Addressable Object Name. Typically the house number or name; SAON Secondary Addressable Object Name. If there is a sub-building, for example, the building is divided into flats, there will be a SAON; Street; Locality; Town/City; District; County.

To explore and target recommended locations across different venues according to the presence of amenities and essential facilities, we will access data through FourSquare API interface and arrange them as a dataframe for visualization. By merging data on London properties and the relative price paid data from the HM Land Registry and data on amenities and essential facilities surrounding such properties from FourSquare API interface, we will be able to recommend profitable real estate investments.

Methodology section

The Methodology section will describe the main components of our analysis and predication system. The Methodology section comprises four stages:

1. Collect Inspection Data
2. Explore and Understand Data
3. Data preparation and preprocessing
4. Modeling

After importing the necessary libraries, we download the data from the HM Land Registry website as follows:

```
#Read the data for examination (Source: http://landregistry.data.gov.uk/)
df_ppd = pd.read_csv("http://prod2.publicdata.landregistry.gov.uk.s3-
website-eu-west-1.amazonaws.com/pp-2018.csv")
```

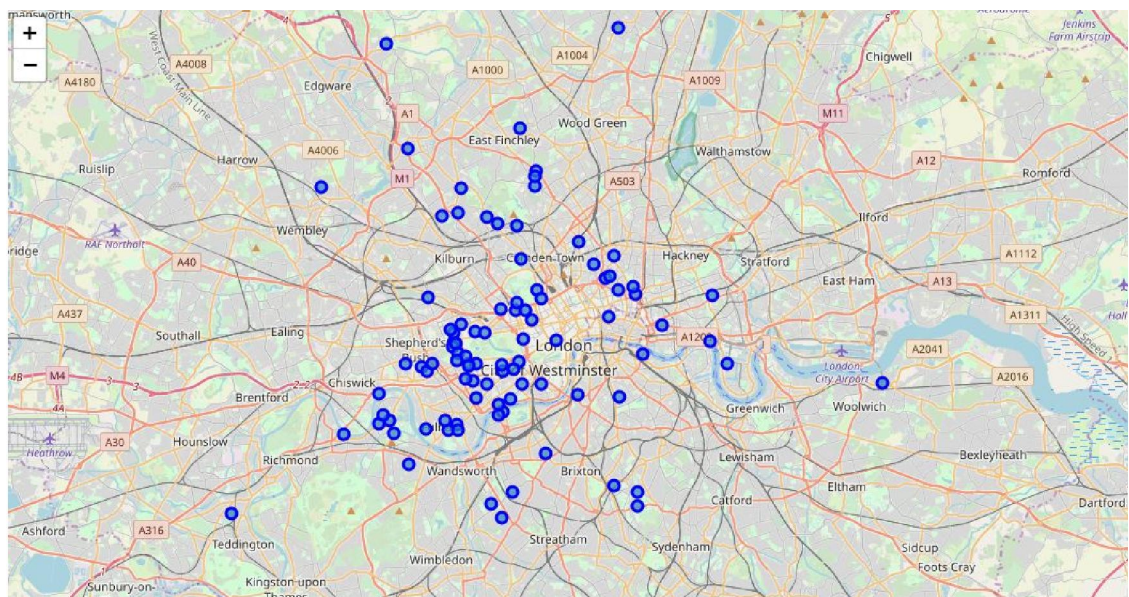
Before using data, we will have to explore and understand it.

2. Explore and Understand Data

We read the dataset that we collected from the HM Land Registry website into a pandas' data frame and display the first five rows of it as follows:

Our dataset consists of over 700000 rows and 16 columns. We will now prepare and preprocess data accordingly.

3. Data preparation and preprocessing



At this stage, we prepare our dataset for the modeling process, opting for the most suitable machine learning algorithm for our scope. Accordingly, we perform the following steps:

- Rename the column names
- Format the date column
- Sort data by date of sale
- Select data only for the city of London
- Make a list of street names in London
- Calculate the street-wise average price of the property
- Read the street-wise coordinates into a data frame, eliminating recurring word London from individual names
- Join the data to find the coordinates of locations which fit into client's budget

Plot recommended locations on London map along with current market prices

4. Modeling

```
[34]: location_venues.groupby('Street').count()
```

```
[34]:
```

	Street	Latitude	Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
	Street						
	ALBION SQUARE	26	26	26	26	26	26
	ANHALT ROAD	15	15	15	15	15	15
	ANSDELL TERRACE	57	57	57	57	57	57
	APPLEGARTH ROAD	7	7	7	7	7	7
	BARONSMEAD ROAD	17	17	17	17	17	17
	BEAUCLERC ROAD	31	31	31	31	31	31
	BICKENHALL STREET	97	97	97	97	97	97
	BIRCHLANDS AVENUE	11	11	11	11	11	11
	BRAMPTON GROVE	4	4	4	4	4	4
	BRIARDALE GARDENS	6	6	6	6	6	6
	BROOKWAY	3	3	3	3	3	3
	BURBAGE ROAD	17	17	17	17	17	17
	BURY WALK	11	11	11	11	11	11

After exploring the dataset and gaining insights into it, we are ready to use the clustering methodology to analyze real estates. We will use the k-means clustering technique as it is fast and efficient in terms of computational cost, is highly flexible to account for mutations in real estate market in London and is accurate.

	Street	Avg_Price	Latitude	Longitude
194	ALBION SQUARE	2450000.0	-41.273758	173.289393
388	ANHALT ROAD	2435000.0	51.480326	-0.166761
402	ANSDELL TERRACE	2250000.0	51.499890	-0.189103
417	APPLEGARTH ROAD	2400000.0	53.749244	-0.326780
845	BARONSMEAD ROAD	2375000.0	51.477315	-0.239457

Results and Discussion section

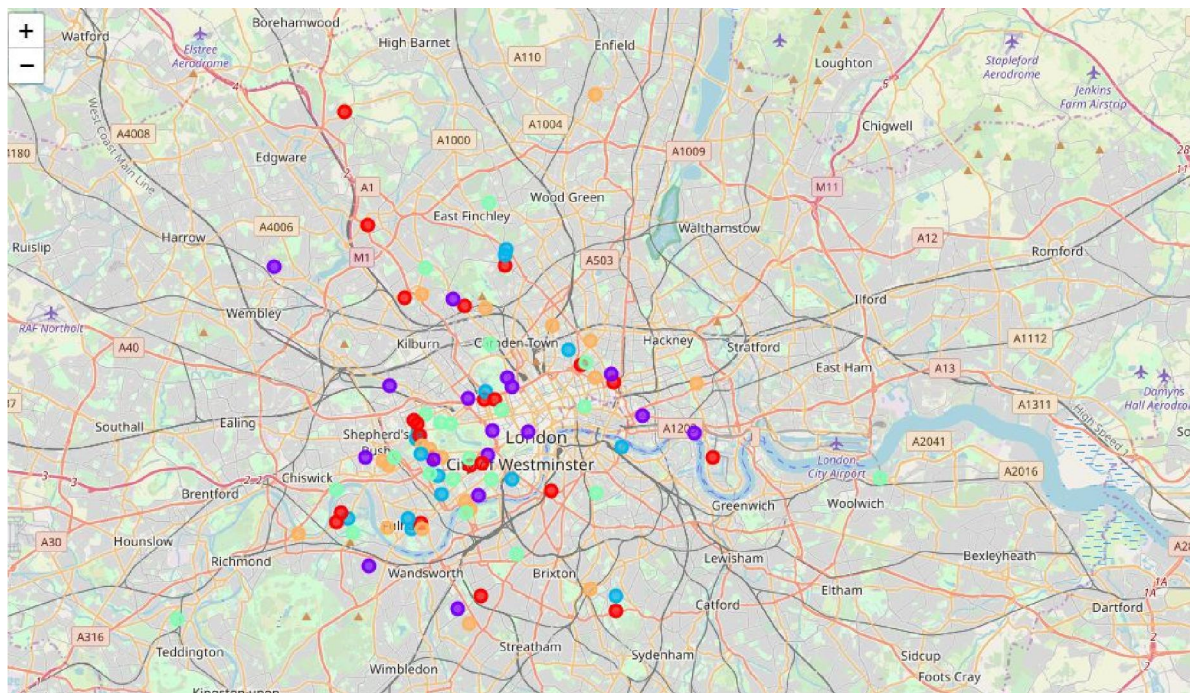
First of all, even though the London Housing Market may be in a rut, it is still an "ever-green" for business affairs.

We may discuss our results under two main perspectives.

First, we may examine them according to neighborhoods/London areas. It is interesting to note that, although West London (Notting Hill, Kensington, Chelsea, Marylebone) and North-West London (Hampsted) might be considered highly profitable venues to purchase a real estate according to amenities and essential facilities surrounding such venues i.e. elementary schools, high schools, hospitals & grocery stores, South-West London (Wandsworth, Balham) and North-West London (Islington) are arising as next future elite venues with a wide range of amenities and facilities. Accordingly, one might target under-priced real estates in these areas of London in order to make a business affair.

Second, we may analyze our results according to the five clusters we have produced. Even though, all clusters could praise an optimal range of facilities and amenities, we have found two main patterns. The first pattern we are referring to, i.e. Clusters 0, 2 and 4, may target home buyers prone to live in 'green' areas with parks, waterfronts. Instead, the

second pattern we are referring to, i.e. Clusters 1 and 3, may target individuals who love pubs, theatres and soccer.



Conclusion

To sum up, according to Bloomberg News, the London Housing Market is in a rut. It is now facing a number of different headwinds, including the prospect of higher taxes and a warning from the Bank of England that U.K. home values could fall as much as 30 percent in the event of a disorderly exit from the European Union. In this scenario, it is urgent to adopt machine learning tools in order to assist homebuyers clientele in London to make wise and effective decisions. As a result, the business problem we were posing was: how could we provide support to homebuyers clientele in to purchase a suitable real estate in London in this uncertain economic and financial scenario?

	Avg_Price	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
388	2435000.0	Pub	Grocery Store	English Restaurant	Plaza	Farmers Market	Cocktail Bar	Gym / Fitness Center	Diner	Pizza Place	Garden
417	2400000.0	Pub	Burger Joint	Nightclub	Furniture / Home Store	River	Casino	Fish Market	Falafel Restaurant	Farm	Farmers Market
1617	2397132.0	Gym / Fitness Center	Health & Beauty Service	Indian Restaurant	Grocery Store	Convenience Store	Coffee Shop	Zoo	Fish & Chips Shop	Falafel Restaurant	Farm
1781	2400000.0	Electronics Store	Park	Art Gallery	Zoo	Fish Market	Falafel Restaurant	Farm	Farmers Market	Fast Food Restaurant	Filipino Restaurant
1896	2445000.0	Café	Gastropub	Gas Station	Coffee Shop	Brewery	Fish & Chips Shop	Athletics & Sports	Stadium	Pizza Place	Convenience Store

To solve this business problem, we clustered London neighborhoods in order to recommend venues and the current average price of real estate where homebuyers can make a real estate investment. We recommended profitable venues according to amenities and essential facilities surrounding such venues i.e. elementary schools, high schools, hospitals & grocery stores.

First, we gathered data on London properties and the relative price paid data were extracted from the HM Land Registry (<http://landregistry.data.gov.uk/>). Moreover, to explore and target recommended locations across different venues according to the presence of amenities and essential facilities, we accessed data through FourSquare

API interface and arranged them as a data frame for visualization. By merging data on London properties and the relative price paid data from the HM Land Registry and data on amenities and essential facilities surrounding such properties from FourSquare API interface, we were able to recommend profitable real estate investments.

Second, The Methodology section comprised four stages: 1. Collect Inspection Data; 2. Explore and Understand Data; 3. Data preparation and preprocessing; 4. Modeling. In particular, in the modeling section, we used the k-means clustering technique as it is fast and efficient in terms of computational cost, is highly flexible to account for mutations in real estate market in London and is accurate.

Finally, we drew the conclusion that even though the London Housing Market may be in a rut, it is still an "ever-green" for business affairs. We discussed our results under two main perspectives. First, we examined them according to neighborhoods/London areas. although West London (Notting Hill, Kensington, Chelsea, Marylebone) and North-West London (Hampstead) might be considered highly profitable venues to purchase a real estate according to amenities and essential facilities surrounding such venues i.e. elementary schools, high schools, hospitals & grocery stores, South-West London (Wandsworth, Balham) and North-West London (Islington) are arising as next future elite venues with a wide range of amenities and facilities. Accordingly, one might target under-priced real estates in these areas of London in order to make a business affair. Second, we analyzed our results according to the five clusters we produced. While Clusters 0, 2 and 4 may target home buyers prone to live in 'green' areas with parks, waterfronts, Clusters 1 and 3 may target individuals who love pubs, theatres and soccer.