**Segmenting and Clustering of neighborhoods of Westminster in London city.**

**Introduction:**

Stakeholders are looking forward to making Hotel in Westminster because Westminster is a tourist area and many tourists would love to stay in Westminster as most of the sights and attractions are in Westminster, such as National Portrait Gallery, National Gallery, Westminster Abbey, Guards Museum, Trafalgar Square, Horse Guards Parade, Houses of Parliament, London Eye, Buckingham Palace and Westminster Cathedral. As all the tourist would prefer a hotel which is near to these sights and attraction, it would be worth to segment and cluster the neighborhoods (areas) of Westminster to see which neighborhood would be best to make a hotel for tourists in Westminster.

**Data:**

1. Westminster is a borough of London. To figure out the best suitable neighborhoods to make a hotel in Westminster I needed geo-coordinates of Westminster, so I used a list of 32 London boroughs from Wikipedia page (https://en.wikipedia.org/wiki/List\_of\_London\_boroughs) and by using web scraping I extracted longitude and latitude of each borough and build data frame of Borough, Longitude and Latitude. This data gave us the longitude and latitude of Westminster.

2. By using the data of Westminster, which was obtained by step 1 and Wikimedia tool forge (https://tools.wmflabs.org) we were able to extract the links of geo-coordinates of neighborhoods of Westminster using Beautiful soup and linking them to borough name, area (neighborhood) and code. This allowed us to build a clean data frame of Borough, Neighborhood, latitude, and longitude at the end.

3. When I used Four square API this data helped us to find the venues in the neighborhoods and the 10 most common venues in the neighborhoods and by K means clustering of data obtained we will be able to find the neighborhoods which are best to make a hotel.

Links which have been used in this notebook:

List of London boroughs- https://en.wikipedia.org/wiki/List\_of\_London\_boroughs

Wikimedia tool forge - https://tools.wmflabs.org

**Methodology:**

1. The Wikipedia page (https://en.wikipedia.org/wiki/List\_of\_London\_boroughs) was scraped using the Beautiful Soup library to build a clean data frame of Borough, Longitude and Latitude.

2. Wikipedia page (https://en.wikipedia.org/wiki/List\_of\_London\_boroughs) was scraped again using beautiful soup when Wikimedia tool forge (https://tools.wmflabs.org) was used to extract the links of geo-coordinates of neighborhoods of Westminster using Beautiful soup and linking them to borough name, area (neighborhood) and code. This allowed us to build a clean data frame of Borough, Neighborhood, latitude, and longitude at the end.

3. Maps were used to show the coordinates: of boroughs in London, neighborhoods in Westminster, and a cluster of labels of each neighborhood.

4. Four API Square was used to find: the venues in neighborhoods of Westminster and to find the 10 most common venues visited in the neighborhoods of Westminster.

5. Segmenting and clustering, which is K-means clustering. K-means can group data only unsupervised based on the similarity of most commonly visited venues in each neighborhood. Most commonly visited venues within a cluster are very similar and most commonly visited venues across different clusters are very different or dissimilar. This will make it very easier for me to find neighborhoods in which I can make hotel as the cluster of neighborhoods in which 'Hotel' is the most commonly visited venue will be separate from other clusters, so I will precisely know which neighborhoods (areas) I should choose to make hotel.

**Results:**

Cluster 1:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Neighborhood** | **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** |
| 10 | Marylebone | Bus stop | Coffee shop | Pizza place | Deli/ Bodega | Café | Pub | Fish & Chips shop | Gastropub | General entertainment | Greek restaurant |

Cluster 2:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Neighborhood** | **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** |
| 5 | Covent Garden | Construction & Landscaping | Lounge | Women’s store | Fast Food Restaurant | Garden | Furniture/ Home store | Fried Chicken Joint | French Restaurant | Fountain | Food Truck |
| 16 | St James’s | Construction & Landscaping | Lounge | Women’s store | Fast Food Restaurant | Garden | Furniture/ Home store | Fried Chicken Joint | French Restaurant | Fountain | Food Truck |

Cluster 3:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Neighborhood** | **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 | Aldwych | Theatre | Coffee shop | Burger Joint | Dessert Shop | Hotel | Restaurant | Ice cream shop | Cocktail bar | Bakery | Tea room |
| 1 | Bayswater | Pub | Coffee shop | Grocery store | Italian Restaurant | Hotel | Chinese Restaurant | Yoga studio | English restaurant | Ice cream shop | Historic site |
| 4 | Chinatown | Theatre | Hotel | Desert shop | Coffee shop | Italian Restaurant | Book store | Restaurant | Wine bar | English restaurant | Garden |
| 6 | Knightsbrige | Theatre | Coffee shop | Ice cream shop | Dessert Shop | Clothing Store | Bakery | Burger Joint | French restaurant | Sushi Restaurant | Shoe store |
| 9 | Maida Vale | Café | Pub | Restaurant | Seafood Restaurant | Garden | Business Service | Gym | Dim Sum Restaurant | Park | Plaza |
| 11 | May fair | Sandwich Place | Italian Restaurant | French restaurant | Juice bar | Burger Joint | Pub | Hotel | Cosmetics shop | Coffee shop | Bakery |
| 17 | St John’s Wood | Coffee Shop | Cocktail Bar | Tapas Restaurant | Bakery | Hotel | Pizza Place | Clothing store | Japanese restaurant | Restaurant | Tea room |
| 18 | Westminster | Theatre | Restaurant | Italian Restaurant | Clothing store | Hotel | Sea food restaurant | Café | Boutique | Book store | Lounge |

Cluster 4:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Neighborhood** | **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** |
| 8 | Little Venice | Café | Bus stop | Hotel | Thai Restaurant | Grocery store | Hookah bar | Coffee shop | Pub | Flower shop | Gastropub |
| 12 | Millbank | Hotel | French restaurant | Restaurant | Hotel bar | Café | Cocktail bar | Seafood restaurant | Japanese restaurant | Lounge | Indian restaurant |
| 13 | Paddington | Hotel | Coffee shop | Sandwich Place | Juice bar | Sporting goods shop | Indian restaurant | Café | Hotel Bar | Falafel restaurant | Restaurant |
| 14 | Pimlico | Hotel | Coffee shop | Café | Italian restaurant | Sandwich place | Grocery store | Pub | Bar | Beer Bar | Outdoor sculpture |
| 15 | Soho | Hotel | Café | Pub | Park | Italian restaurant | Chinese restaurant | Sandwich place | Camera store | Pizza Place | Turkish restaurant |

Cluster 5:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Neighbourhood** | **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** |
| 2 | Belgravia | Boutique | Café | Italian restaurant | Hotel | Clothing store | Japanese restaurant | Coffee shop | Jewellery store | Department store | Russian restaurant |
| 3 | Charing cross | Boutique | Café | Italian restaurant | Hotel | Clothing store | Japanese restaurant | Coffee shop | Jewellery store | Department store | Russian restaurant |
| 7 | Lisson Grove | Boutique | Café | Italian restaurant | Hotel | Clothing store | Japanese restaurant | Coffee shop | Jewellery store | Department store | Russian restaurant |

According to the results the best areas to make hotel will be: Millbank, Paddington, Pimlico and Soho because ‘Hotel’ is the most common venue visited in these areas , which suggest that these areas are highly popular and preferred by tourists/people to stay in hotel, so constructing hotel in any of these areas would be very beneficial to both stakeholders and tourists because it is the most preferred places to stay within tourists/ people they will earn well and make profit and individuals who love to stay in these areas of Westminster will get an extra hotel.

**Discussion:**

All the goals of this project were met as we were successful in finding the neighborhoods, which were best to make a hotel. However, some of the recommendations that I would like to give to the stakeholders is that they should make hotel in an area (neighborhood) in which they can find a good space, so the hotel doesn't look crowded and at a place which is near to the transportation services, so it is easier for a tourist to travel from one place to another.

**Conclusion:**

In conclusion, best areas to make hotel will be: Millbank, Paddington, Pimlico and Soho because ‘Hotel’ is the most common venue visited in these areas , which suggest that these areas are highly popular and preferred by tourists/people to stay in hotel, so constructing hotel in these areas would be very beneficial to both stakeholders and tourists because it is the most preferred places to stay within tourists/ people, so stakeholders will earn well and make profit and individuals who love to stay in these areas of Westminster will get an extra hotel. However, stakeholders must consider the recommendations that I have made, so the hotel that they make becomes the most preferred hotel within tourists. Also, once the hotel is made, they should take care of the basic requirements of customers such as good reception services; free breakfast; free Wi-Fi; bar; restaurant; regular cleaning of the room; 24-hour room service; all the rooms must have: clean towels; shower gel, and clean bedsheets. This will all add up to making a hotel the most preferred hotel in tourists and they will enjoy their stay.