Opening a Musical Theme Cafe in London

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1. Introduction

In modern society, coffee shop plays an important role in people's lives. It has become a popular place at where people choose to chat, meet friends and get relaxed. In this project, we are interested in opening a musical theme cafe in London. We would collect the data with "geopy" library in Python and the Foursquare API and conduct our analysis through machine learning – K-Means clustering method.

1.1 Background

In modern society, coffee shop plays an important role in people's lives. It has become a popular place at where people choose to chat, meet friends and get relaxed. The Cafes and Coffee Shops industry includes all specialist unlicensed establishments that focus on the sale of coffee, in addition to other hot and cold drinks or light snacks. The performance of cafe industry could be influenced by both economic and social factor. In recent 5 years, the cafe industry has performed strongly as a result of growing demand and the popularity of coffee culture. The average annual industry growth rate is 6.1% from 2014 to 2019 in the UK. As for cafe industry's prospect, IBIS World expected the industry revenue to raise at a compound annual rate of 4.8% from 2019 to 2024.

Musical is also popular in modern society. Compared with opera, musical is more related to modern music and easier to understand. In the UK, the most famous theatres are crowed in London's West End. Alongside Broadway in New York, West End theatre represents the highest quality theatre in the world. Besides, as many famous museums, galleries, finest shopping streets, bars and clubs located in the West End, it does not only attract tens of thousands of tourists every year but it is also one of the busiest areas in London.

1.2 Interest

Based on the background above, we are interested in opening a more distinctive coffee shop with musical themed. As for the location of the new coffee shop, we prefer somewhere in 2km radius of the centre of the west end theatres – Leicester Square. Within this radius we will try to find some perfect places where are not already crowded with cafes and also as close as possible to the theatre centre.

2. Methodology

In this project we will direct our efforts on detecting areas of London's West End that have low cafe density. We will limit our analysis to area ~2km around West End centre.

In first step we have collected the required data: location of every cafe within 2km from West End centre (Leicester Square).

Second step in our analysis will be calculation and exploration of cafe density across different areas of West End - we will use heatmaps to identify a few promising areas close to centre with low number of cafes in general and focus our attention on those areas.

In third and final step we will focus on most promising areas and within those create clusters of locations that meet some basic requirements established in discussion with stakeholders: we will take into consideration locations with no cafe in radius of 100 meters. We will present map of all such locations but also create clusters (using k-means clustering) of those locations to identify general zones, neighbourhoods and addresses which should be a starting point for final 'street level' exploration and search for optimal venue location by stakeholders.

3. Data Analysis

Following our methodology, we need location data for the Leicester Square and all existing cafes within 2km radius of Leicester Square.

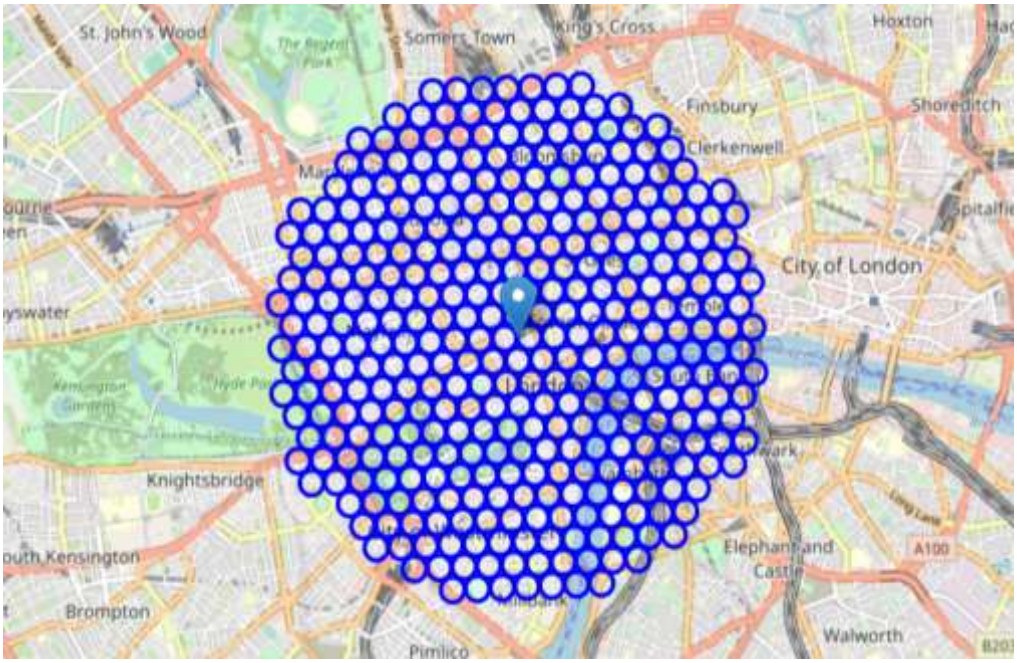
3.1 Data Collection and Processing

Based on definition of our problem, factors that will influence our decision are: number of existing cafes in the neighbourhood and distance of neighbourhood from West End centre (theatre centre). We decided to use regularly spaced grid of locations, cantered around city centre, to define our neighbourhoods. Following data sources will be needed to extract the required information: firstly, centres of candidate areas will be generated algorithmically and approximate addresses of centres of those areas will be obtained using “geolocator. Geocode”. Secondly, number of cafes and location in every neighbourhood will be obtained using Foursquare API. Finally, coordinate of West End centre will be obtained using “geolocator. Geocode” of the well-known London location, Leicester Square.

3.1.1 Neighbourhood Candidates

Firstly, we collect the coordinate of Leicester Square and then convert it into X/Y coordinates in meters to create a hexagonal grid of cells 2km radius around the theatre centre. Every cell is 200 meters from each other (Plot 1). We collect approximate addresses, latitude and longitude coordinates and X/Y coordinates for every cell centre and place them in a Pandas data frame. There are 364 cell centre points in the data frame.

Plot 1: Neighbourhood candidates plot



3.1.2 Foursquare

For every cell centre we found above we would find all cafes in its neighbourhood through Foursquare API. We search for shops whose category name including café, coffee shop, cafe or coffee and whose category id is café or coffee shop. There are 198 coffee shops satisfy these factors but the mean number of cafes in a neighbourhood is about 0.4 which is suggesting that the competition is not very sever. The plot of all cafes within 2km radius from Leicester Square has shown in plot 2 below.

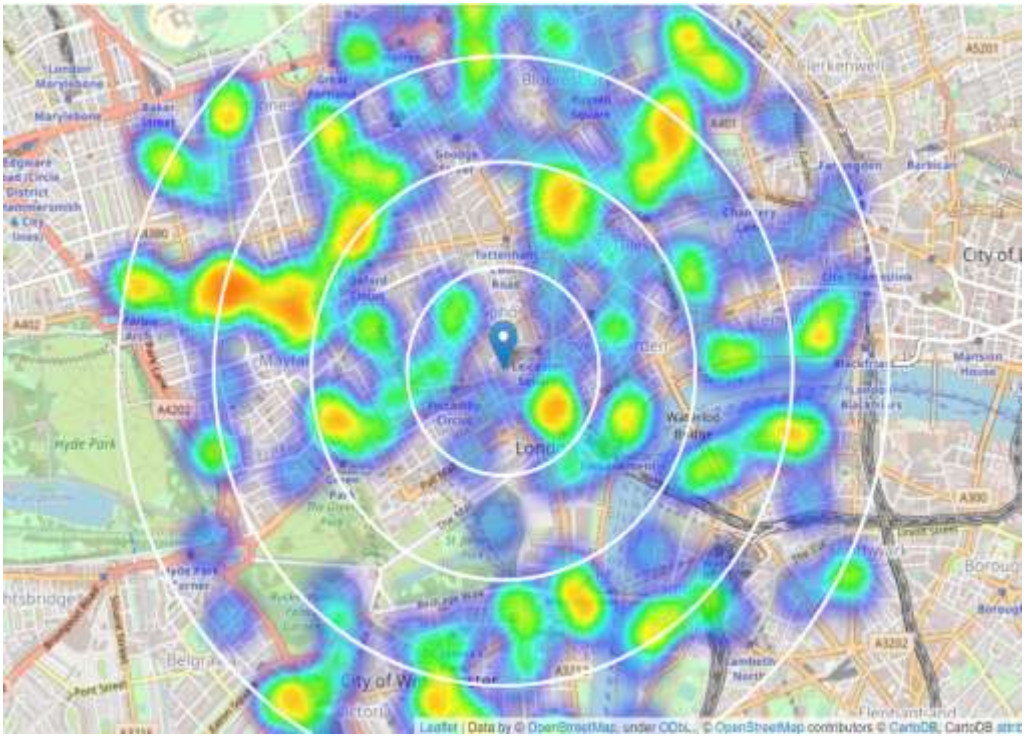
Plot 2: Cafes around Leicester Square

3.2 Analysis

Firstly, for every cell centre we analysed its distance to the nearest coffee shop. The mean distance is 138.15 meters which means that on average we can find a cafe within 140 meters for every candidate cell. This is fairly close we need to filter our areas carefully.

In order to narrow the size of aim area we plot the density of cafes around in a heatmap and also drew circle indicating distance of 500 metres, 1000 metres, 1500 metres and 2000 meters. (plot 3)

Plot 3: Heatmap of cafes within 2km radius



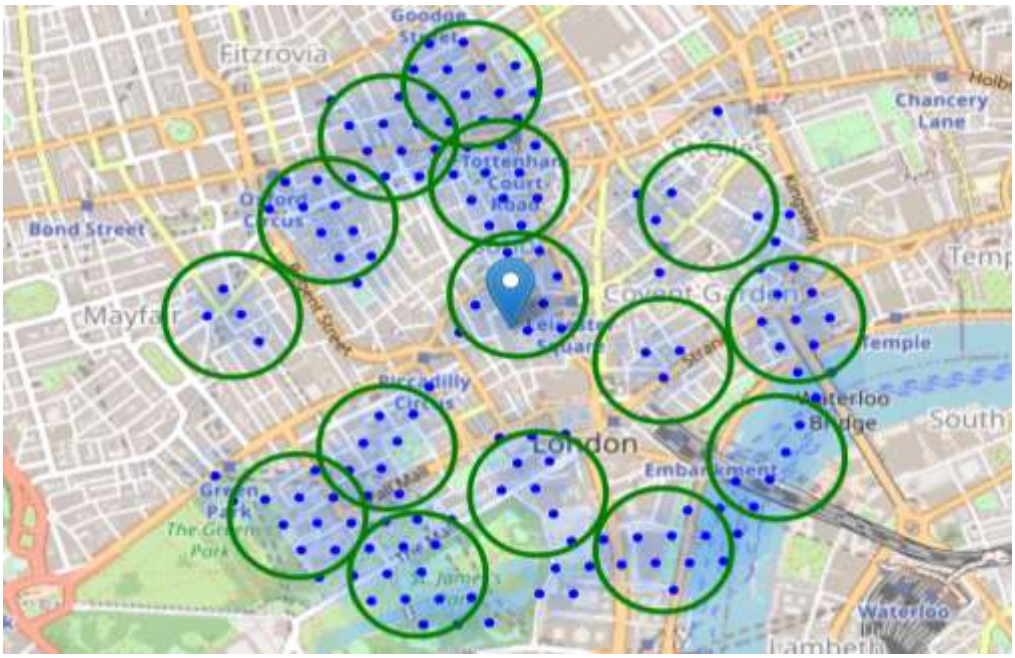
It is not so “hot” in plot 3, and we can find some empty place in vicinity of Leicester Square. There are plenty empty spaces in the north, south, south-west and east from Leicester Square within the 1km radius circle. Therefore, in the next step analysis we will focus on the 1km radius area for the Leicester Square.

The 1km radius circle is located in borough of Westminster and Camden which are two famous boroughs in London. Within this radius we found 150 cafes with no cafes around in 150 metres radius and drew them in another heatmap in plot 4 below.

Plot 4: Heatmap of all good locations within 1km radius circle

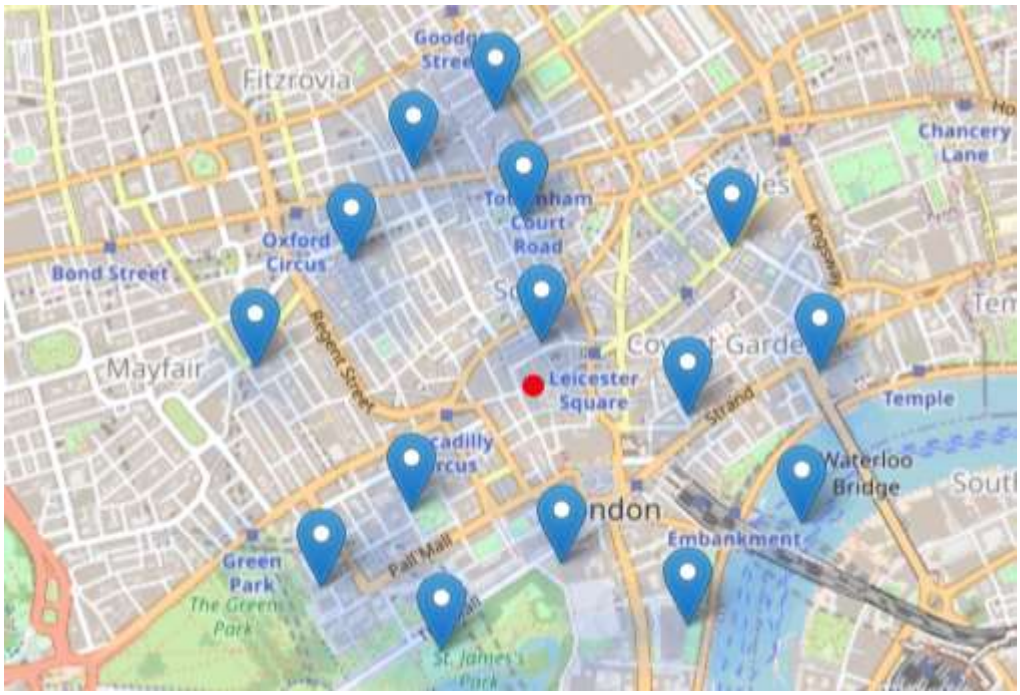
In order to get final results, we cluster these good locations in plot 4 into 15 clusters using the most popular clustering machine learning method called K-Means. Results for clustering is shown in plot 5. Every green circle in plot 5 indicates a cluster which radius is 200 metres. Centres of every cluster circle are nicely placed in zones "rich" with location candidates. Therefore, locations of cluster centres would be a good start point for further analysis.

Plot 5: Clusters



In plot 6, we can see most cluster centres are good and close to Leicester Square, but it is worth to notice that one is in the river. Therefore, in our final result list will not include this location. The result recommendation list in the appendix. (list 1)

Plot 6: Map of recommendation locations



4. Results and Discussion

Our analysis shows that although there are many cafes in London (~190 in our initial area of interest which was 4x4km around Leicester Square), there are pockets of low cafe density fairly close to “theatre centre”. Highest concentration of cafes was detected south-east and west from Leicester Square, so we focused our attention to areas north, south, south-west and east, corresponding to boroughs City of Westminster and Camden.

After directing our attention to this narrower area of interest (covering approx. 2*2km from Leicester Square) we first created a dense grid of location candidates (spaced 100m apart); those locations were then filtered so that those with cafes in radius of 150m were removed.

Those location candidates were then clustered to create zones of interest which contain greatest number of location candidates. Addresses of centres of those zones were also generated using reverse geocoding to be used as markers/starting points for more detailed local analysis based on other factors.

Result of all this is 14 zones containing largest number of potential new cafe locations based on number of and distance to existing venues. This does not imply that those zones are actually optimal locations for a new musical theme cafe! Purpose of this analysis was to only provide info on areas close to London's West End centre but not crowded with existing cafes - mand other factors should also be considered. For example, if the theme of the cafe is related

to one particular musical then the distance to the theatre which the musical performed at should also be considered. Recommended zones should therefore be considered only as a starting point for more detailed analysis which could eventually result in location which has not only no nearby competition but also other factors taken into account and all other relevant conditions met.

5. Conclusion

Purpose of this project was to identify London areas close to West End centre with low number of cafes in order to aid stakeholders in narrowing down the search for optimal location for a new musical theme cafe. By calculating cafe density distribution from Foursquare data, we have first identified general boroughs that justify further analysis (City of Westminster and Camden), and then generated extensive collection of locations which satisfy some basic requirements regarding existing nearby cafes. Clustering of those locations was then performed in order to create major zones of interest (containing greatest number of potential locations) and addresses of those zone centres were created to be used as starting points for final exploration by stakeholders.

Final decision on optimal restaurant location will be made by stakeholders based on specific characteristics of neighbourhoods and locations in every recommended zone, taking into consideration additional factors like attractiveness of each location (proximity to park or water), levels of noise, proximity to major roads, real estate availability, prices, social and economic dynamics of every neighbourhood etc.

Appendix

List 1: Address list of recommended centres of areas

Arora Tower, 2, Blackwall Tunnel, Canary Wharf, Blackwall, London Borough of Tower Hamlets, London, Greater London, England, E14 9PQ 0.9km from Leicester Square

Artisans House, 20, Abbott Road, Blackwall, London Borough of Tower Hamlets, London, Greater London, England, E14 0LR 0.7km from Leicester Square

Blackwall Tunnel, Canary Wharf, Blackwall, London Borough of Tower Hamlets, London, Greater London, England, E14 9PQ 0.5km from Leicester Square

Blackwall Tunnel, Canary Wharf, Blackwall, London Borough of Tower Hamlets, London, Greater London, England, E14 9PQ 0.9km from Leicester Square

Cape Henry Court, 8, Jamestown Way, Blackwall, London Borough of Tower Hamlets, London, Greater London, England, E14 2DH 0.5km from Leicester Square

Fortrose Close, Blackwall, London Borough of Tower Hamlets, London, Greater London, England, E14 0GS 0.7km from Leicester Square

Intercontinental Hotel The O2, 1, Blackwall Tunnel, Canary Wharf, Blackwall, London Borough of Tower Hamlets, London, Greater London, England, E14 9PQ 0.8km from Leicester Square

Neutron Tower, 6, Blackwall Way, Blackwall, London Borough of Tower Hamlets, London, Greater London, England, E14 9GW 0.5km from Leicester Square

Oban House, Oban Street, Blackwall, London Borough of Tower Hamlets, London, Greater London, England, E14 0NA 0.5km from Leicester Square

River Lea, Pretoria Road, Canning Town, London Borough of Newham, London, Greater London, England, E16 4NP 0.7km from Leicester Square

River Lea, Pretoria Road, Canning Town, London Borough of Newham, London, Greater London, England, E16 4NP 0.8km from Leicester Square

Saffron Avenue, Blackwall, London Borough of Tower Hamlets, London, Greater London, England, E14 9QS 0.8km from Leicester Square

Saffron Avenue, Blackwall, London Borough of Tower Hamlets, London, Greater London, England, E14 9QS 0.8km from Leicester Square

Sorrel Lane, Blackwall, London Borough of Tower Hamlets, London, Greater London, England, E16 0JG 0.1km from Leicester Square