USING MACHINE LEARNING TO RECOMMEND A LOCATION TO OPEN A JAMAICAN- MEXICAN RESTAURANT IN JAMAICA.

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1. Introduction

1.1. Background

Tourism is a big part of Jamaica's economy and Jamaican cuisine is well known around the world. In fact, sampling the Jamaican cuisine is a must for many tourists, particularly epicureans.

As Jamaica seeks to ramp up its efforts in tourism, understanding the local market better is becoming increasingly important. This information will not only aid in identifying the best locations to open new businesses but will also enable the country to better appeal to various kinds of tourist.

1.2. Problem

An entrepreneur wants to share some of their treasured home recipes in a new restaurant since Jamaican influenced Mexican restaurants in Jamaica are limited. As such, finding the right location, which is accessible to both tourists and locals is very important. This project will focus on identifying and recommending the best town, in Jamaica, for an entrepreneur to open a new 'Jam-Mexican' restaurant.

1.3. Interest

The target audience for this analysis is the entrepreneur wanting to open a new Jamaican influenced Mexican restaurants in Jamaica. This analysis will help in identifying the best location to open the restaurant, so it is available to its target clientele.

2. Data acquisition

2.1. Data sources

The list of parishes in Jamaican can be found on Wikipedia. This list will be scrapped into a data frame using python and the geographical locations found using the geocoder package. The Foursquare API will then be used to obtain the venues data for each of these parishes.

The table obtained from Wikipedia contains data relating to the population and area of each parish, as show in below table. This data will be dropped as it is not relevant to the analysis. The counties, Cornwall; Middlesex; and Surrey were also eliminated from the dataset as they were also irrelevant to the analysis.

	Parish	Capital	Area km²	Population Census 2011[1]
	Cornwall County			
1	Hanover	Lucea	450.4	69,533
2	Saint Elizabeth	Black River	1,212.4	150,205
3	Saint James	Montego Bay	594.9	183,811
4	Trelawny	Falmouth	874.6	75,164
5	Westmoreland	Savanna-la-Mar	807.0	144,103
	Middlesex County			
6	Clarendon	May Pen	1,196.3	245,103

7	Manchester	Mandeville	830.1	189,797
8	Saint Ann	Saint Ann's Bay	1,212.6	172,362
9	Saint Catherine	Spanish Town	1,192.4	516,218
10	Saint Mary	Port Maria	610.5	113,615
Surrey County				
11	Kingston Parish[1][2]	Kingston	21.8	89,057
12	Portland	Port Antonio	814.0	81,744
13	Saint Andrew[1]	Half Way Tree	430.7	573,369
14	Saint Thomas	Morant Bay	742.8	93,902
Total			10,991.0	2,697,98

Table 1: Table obtained from Wikipedia of Jamaica's Parishes

The Foursquare's recommended venues API will be used to gather those venues within a 15 km radius of each parish capital. Since the entrepreneur requires that the restaurant be easily accessible to both locals and tourists, the considered distance from a parish capital was kept relatively small to enable ease of commute.

Also, only those venues related to specialty restaurants were considered. The below table displays an extract of the data that will be used from the Foursquare's API.

Neighbourhood	Neighbourhood Latitude	Neighbourhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
May Pen	17.974637	-77.258195	Homar's Roti & The Grill	17.955390	-77.232362	Indian Restaurant
May Pen	17.974637	-77.258195	Murray's Fish and Jerk Hut	17.990426	-77.368564	Caribbean Restaurant
May Pen	17.974637	-77.258195	Juici Patties	17.995355	-77.374100	Fast Food Restaurant
May Pen	17.974637	-77.258195	Fyah Side	17.969874	-77.352091	BBQ Joint
May Pen	17.974637	-77.258195	Juici Patties	17.970148	-77.245048	Fast Food Restaurant
May Pen	17.974637	-77.258195	Payless Shoesource	17.966802	-77.242359	Shoe Store
May Pen	17.974637	-77.258195	Burger King	17.967499	-77.241759	Fast Food Restaurant
May Pen	17.974637	-77.258195	Rio Minho	17.956346	-77.256346	River
Lucea	18.442328	-78.172684	Grand Palladium Lady Hamilton Resort & Spa	18.457286	-78.152699	Resort
Lucea	18.442328	-78.172684	Grand Palladium Jamaica Resort & Spa	18.458698	-78.150561	Resort
Lucea	18.442328	-78.172684	negril buffet	18.457896	-78.151831	Breakfast Spot

Table 2: Sample of Venues obtained from Foursquare's Recommended Venues API

3. Methodology

Initially, the pandas html table scraping method was used to retrieve and convert the table of parishes into a dataframe. The data from the table was cleaned, removing any irrelevant data and the Gecoder package was used to obtain the Geographical location of each parish. The location details were then inserted into the original dataframe. To verify the coordinates

obtained, the map of Jamaica, overlaid with these parish coordinates was created using the Folium package.

Next, the Foursquare's recommended venues API was used to pull all the venues within a 15 km radius of the parish coordinates. The API provided the names, categories, latitude and longitude of the venues retrieved along with the category into which the venue falls. From this list, I identified those categories relating to specialty restaurants and created a dataframe consisting of only these venues to be used throughout the remainder of the analysis. I then analyzed each parish/neighborhood by grouping the rows by neighborhood and taking the mean on the frequency of occurrence of each venue category.

Finally, K-means clustering was employed to identify where the top specialty restaurants were located. The K-means clustering algorithm identifies 'k' number of centroids and then allocates each data point to the neared cluster while minimizing the size of each cluster. The centroids are then plotted to visualize the clusters created.

4. Results

Three clusters were identified as follows:
1. Cluster 0: Parishes with a few specialty restaurants
2. Cluster 1: Parishes with very little specialty restaurants
3. Cluster 2: Parishes with plenty specialty restaurants
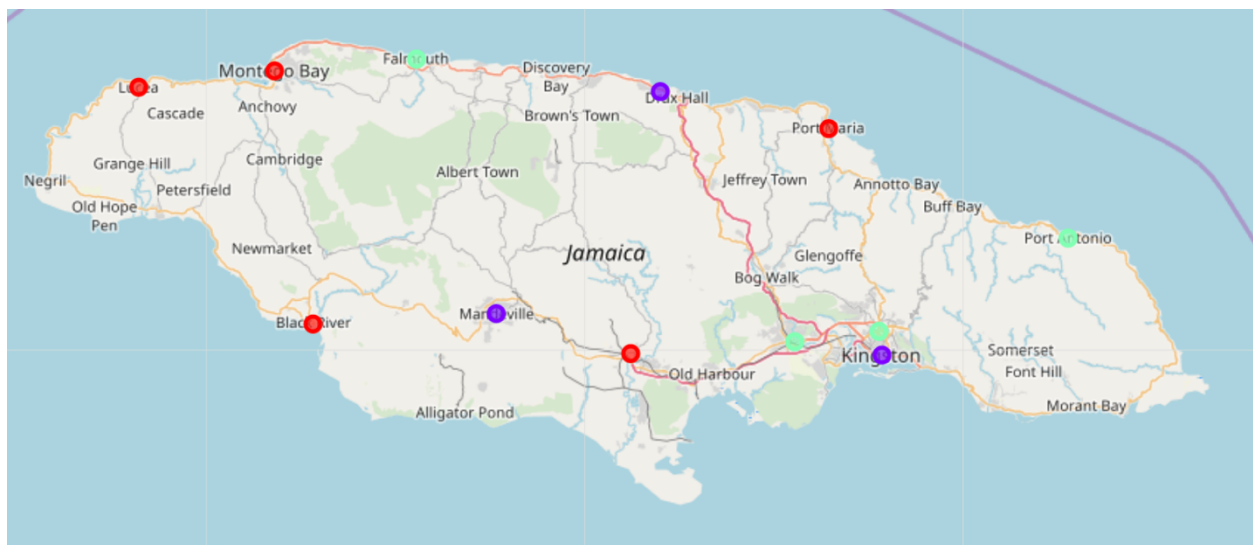
Map of Jamaica Overlaid with the Three Clusters Created.

Cluster 0 is depicted in the above map in green, cluster 1 in purple and cluster 2 in red. As can be seen, many of the parishes with coastal capitals fall in cluster 2. A deeper analysis can be done to asses any correlation.

5. Recommendations

Those parishes falling in cluster 2 have the most occurrences of specialty restaurants, among these parishes in Jamaica's second city Montego Bay. Montego Bay is a bustling city with large volumes of tourists, as such, this is not very surprising. This city would pose to be very competitive as tourists and locals have considerable variety not just from specialty restaurants but also from the plethora of all-inclusive resorts. The other towns in cluster 2, though there is significant demand for specialty restaurants, they may pose a challenge in attracting many tourists due to their remoteness.

Cluster 1 indicates parishes where there is underserved market for specialty restaurants. Among these parishes is Jamaica's capital city, Kingston. Though Kingston is a bustling city, with many business travelers, tourists and active locals, the variety is specialty restaurants is still relatively small. Another candidate in cluster 1 is St. Ann's Bay, which is in another major tourist parish. St. Ann's Bay, though the market may be grouping the same problem of competition with all-inclusive resorts may pose a problem for business in the long run.

Kingston city is the best option based on this analysis to choose for the new location of a Jam-Mexican Restaurant. It provides a growing market for specialty restaurants and both local, traveling business professionals and tourists alike will be able to locate and travel to the restaurant with ease.

6. Conclusion

The K-means clustering algorithm was used to assist in recommending the best location for a new Jamaican influenced Mexican restaurant in Jamaica. By assessing where the top specialty restaurants close to the capitals are centered, we were able to recommend choosing Kingston as the ideal area to open this restaurant. Both tourists and locals alike will be able to get to the location and there is currently an underserved market for varied cuisines.

7. References

List of Parishes in Jamaica:
https://en.wikipedia.org/wiki/Parishes_of_Jamaica

Foursquare Venue Recommendations Documentation:
https://developer.foursquare.com/docs/api/venues/explore

Github Repository containing solution notebook:
https://github.com/joejode/Data-Sience-Projects