Battle of Neighbourhoods Houston

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Introduction:

The city of Houston is most populous city in the United States and in fact it is the 4th biggest cities in United States. It is most diversified as lot of people from different countries live there. It offers many business opportunities for new bees so is competitive. A careful consideration of analysis for the business expansion is so much important as it directly proportional to the cost of the business. The analysis from this report help for the new businesses strategically target the market and help in high return on investment so is low risk.

Description:

Opening a new restaurant can be daunting. There are so many things to consider from choosing the right location to finding the financing to selecting the right name. As location being one of the main factors in opening a new restaurant we will focus on the restaurant business around Houston area in this report.

First step in opening a new restaurant is deciding what type of restaurant it is going to be? Is it a high end fine dining restaurant or casual style dinner or a specific type of cuisine in mind such as French , Italian or Indian. Choosing a restaurant location in a busy area with plenty of foot traffic, or is there enough parking or are there any other restaurants opened or closed in the same spot?

We will focus on different types of restaurants which are opened or closed in a particular place and then decide if it is good place to open a new restaurant based on the popular cuisine around that place.

Target Audience:

The objective of this project is to recommend which neighbourhood of Houston is a good choice for a new restaurant business to open.

Data:

We will be using list of Houston Neighbourhood data scrapped form Wikipedia(https://en.wikipedia.org/wiki/List_of_Houston_neighborhoods) for analysis. There are total 88 neighbourhoods are in Houston. We will find latitude and longitude of each neighbourhood and cluster them according the restaurants present in each neighbourhood fetched from foursquare location data. Then we will make decision examining each cluster of neighbourhoods.

Sample records from Wikipedia.

#	Name	Location relative to Downtown Houston	Approximate boundaries
1	Willowbrook	Northwest	Along Texas State Highway 249 northwest of Beltway 8
2	Greater Greenspoint	North	Around the junction of Beltway 8 and Interstate 45 North
3	Carverdale	Northwest	South of the junction of Beltway 8 and U.S. Route 290
4	Fairbanks / Northwest Crossing	Northwest	Along U.S. Route 290 between Interstate 610 and Beltway 8
5	Greater Inwood	Northwest	North of Fairbanks / Northwest Crossing and east of Acres Home

Then we will find latitude and longitude of each neighbourhood and map to the data frame.

	Neighborhood	Relative_Location	Latitude	Longitude
1	Willowbrook	Northwest, Houston	29.660254	-95.456096
2	Greater Greenspoint	North, Houston	29.944719	-95.416074
3	Carverdale	Northwest, Houston	29.848687	-95.539450
4	Fairbanks / Northwest Crossing	Northwest, Houston	29.852615	-95.506541

We will then use this Houston geographical data as input to the foursquare location data and fetch top 100 restaurants nearby to each neighbourhood within 3000 meters. The sample foursquare location data looks like this,

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
78	Greater Greenspoint	29.944719	-95.416074	Indian Grill	29.950014	-95.415005	Indian Restaurant
597	Memorial	31.237513	-85.443024	Taj	31.228799	-85.431290	Indian Restaurant
896	Sharpstown	29.684862	-95.515562	Maharaja Bhog	29.688870	-95.531143	Indian Restaurant
1011	Gulfton	29.716613	-95.472053	India's Restaurant	29.731958	-95.478907	Indian Restaurant
1074	Gulfton	29.716613	-95.472053	Shiv Sagar Veg Restaurant	29.716364	-95.500511	Indian Restaurant

Methodology:

Business Understanding:

The objective of this project is to find which neighbourhood of Houston is a good choice for a new restaurant business to open. i.e finding the best location for a new restaurant to start.
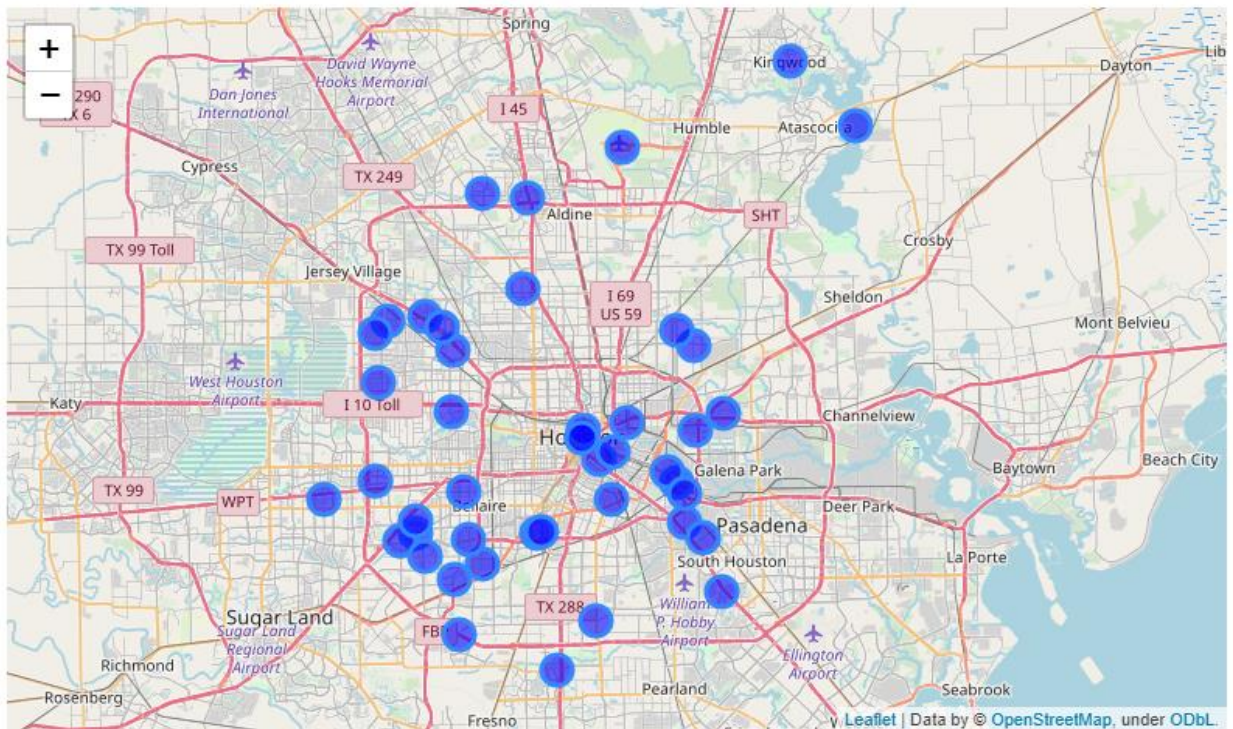
Analytical Approach:

Houston City has total of 88 Neighbourhoods and our goal in this project is to cluster these neighbourhood based on the similarities between neighbourhoods based on the restaurants present in the neighbourhood.

Exploratory Data Analysis:

Houston Neighbourhood data:

1. We first scrap the neighbourhood information from the Wikipedia and load that into a data frame dropping unnecessary columns.
2. Then we perform data wrangling to convert the data into analysis ready form
3. Then we use geopy library to get the latitude and longitude information for each neighbourhood
4. Then we use this data to get the 100 nearby restaurants within 3000 meters using foursquare location data.
5. Calculate and perform unique restaurant categories in each neighbourhood and find the top 10 most common restaurants.
6. Then we will cluster all the restaurants in all the neighbourhoods using k-means clustering algorithm.

Houston city Neighbourhood visualization:

Total number of venues in each Neighbourhood:

There are around 100 different types of restaurants in all the neighbourhood and total of 2327 restaurants.

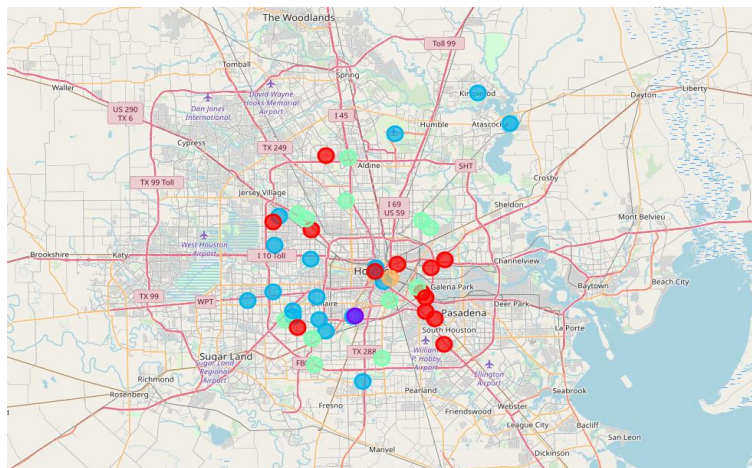| Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Acres Home	49	49	49	49	49	49
Alief	95	95	95	95	95	95
Astrodome Area	4	4	4	4	4	4
Braeburn	36	36	36	36	36	36
Braeswood	16	16	16	16	16	16
Carverdale	57	57	57	57	57	57
Central Southwest	98	98	98	98	98	98
Downtown	8	8	8	8	8	8
East Houston	19	19	19	19	19	19
Edgebrook	81	81	81	81	81	81
Fairbanks / Northwest Crossing	57	57	57	57	57	57

Find 10 most common restaurants in each neighbourhood:

	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	Acres Home	Mexican Restaurant	Fast Food Restaurant	American Restaurant	Sandwich Place	Fried Chicken Joint	Pizza Place	BBQ Joint	Burger Joint	Diner	Café
1	Alief	Vietnamese Restaurant	Asian Restaurant	Fast Food Restaurant	Cajun / Creole Restaurant	Fried Chicken Joint	Pizza Place	Sandwich Place	Bakery	Mexican Restaurant	Café
2	Astrodome Area	Restaurant	American Restaurant	Salad Place	Filipino Restaurant	Cuban Restaurant	Deli / Bodega	Dim Sum Restaurant	Diner	Donut Shop	Dumpling Restaurant
3	Braeburn	Fast Food Restaurant	Fried Chicken Joint	Mexican Restaurant	African Restaurant	Donut Shop	Chinese Restaurant	Sandwich Place	Indian Restaurant	Seafood Restaurant	Food Truck
4	Braeswood	Mexican Restaurant	Food	Breakfast Spot	Burger Joint	Pizza Place	Donut Shop	Chinese Restaurant	Fried Chicken Joint	Food Truck	Cajun / Creole Restaurant
5	Carverdale	Café	BBQ Joint	Sandwich Place	Fast Food Restaurant	Donut Shop	Mexican Restaurant	Chinese Restaurant	Asian Restaurant	Taco Place	Bakery
6	Central Southwest	Burger Joint	Mexican Restaurant	Vietnamese Restaurant	Italian Restaurant	Sandwich Place	Steakhouse	Southern / Soul Food Restaurant	BBQ Joint	Taco Place	Pizza Place

Results:

From the foursquare location data, we got 100 restaurants in each neighbourhood and found most common restaurants. Performing the k-means clustering on the most common restaurants for each neighbourhood will partition the data set into 5 clusters. The 5 clusters are partitioned based on similar type of restaurants that belong to neighbourhoods.

The folium representation of the clustered data will look like below.

Examining the Clusters:

We can examine each cluster and determine the discriminating types of restaurants that distinguish each cluster.

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
6	Acres Home	Mexican Restaurant	Fast Food Restaurant	American Restaurant	Sandwich Place	Fried Chicken Joint	Pizza Place	BBQ Joint	Burger Joint	Diner	Café
7	Hidden Valley	Sandwich Place	Fast Food Restaurant	Mexican Restaurant	Café	Breakfast Spot	American Restaurant	Pizza Place	Food	Sushi Restaurant	Restaurant
8	Westbranch	Mexican Restaurant	Pizza Place	Burger Joint	Fast Food Restaurant	Fried Chicken Joint	Taco Place	Deli / Bodega	Noodle House	Food	Vietnamese Restaurant
11	Langwood	Mexican Restaurant	Sandwich Place	Fast Food Restaurant	Pizza Place	Seafood Restaurant	Chinese Restaurant	Fried Chicken Joint	Taco Place	Deli / Bodega	Food Truck
32	Braeswood	Mexican Restaurant	Food	Breakfast Spot	Burger Joint	Pizza Place	Donut Shop	Chinese Restaurant	Fried Chicken Joint	Food Truck	Cajun / Creole Restaurant
57	Pleasantville Area	Mexican Restaurant	Fried Chicken Joint	Fast Food Restaurant	Food	Sandwich Place	Taco Place	Pizza Place	Italian Restaurant	Donut Shop	American Restaurant
58	Northshore	Mexican Restaurant	Fast Food Restaurant	Sandwich Place	Pizza Place	Seafood Restaurant	Fried Chicken Joint	Indian Restaurant	Steakhouse	Wings Joint	Diner
65	Harrisburg / Manchester	Mexican Restaurant	Pizza Place	Fast Food Restaurant	Chinese Restaurant	Seafood Restaurant	Sandwich Place	Burger Joint	Donut Shop	Fried Chicken Joint	Bakery

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
34	Astrodome Area	Restaurant	American Restaurant	Salad Place	Filipino Restaurant	Cuban Restaurant	Deli / Bodega	Dim Sum Restaurant	Diner	Donut Shop	Dumpling Restaurant

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
1	Willowbrook	Fast Food Restaurant	Chinese Restaurant	Sandwich Place	Mexican Restaurant	Pizza Place	BBQ Joint	Burger Joint	Bakery	Restaurant	Café
3	Carverdale	Café	BBQ Joint	Sandwich Place	Fast Food Restaurant	Donut Shop	Mexican Restaurant	Chinese Restaurant	Asian Restaurant	Taco Place	Bakery
10	Spring Branch West	Korean Restaurant	Mexican Restaurant	Fast Food Restaurant	Steakhouse	Seafood Restaurant	Bakery	Burger Joint	Italian Restaurant	Mediterranean Restaurant	Sandwich Place
16	Memorial	Fast Food Restaurant	American Restaurant	Pizza Place	Sandwich Place	Mexican Restaurant	Fried Chicken Joint	Breakfast Spot	Steakhouse	Italian Restaurant	BBQ Joint
19	Westchase	Chinese Restaurant	Asian Restaurant	Bakery	Vietnamese Restaurant	Mexican Restaurant	Sushi Restaurant	Latin American Restaurant	Sandwich Place	Seafood Restaurant	Japanese Restaurant
25	Alief	Vietnamese Restaurant	Asian Restaurant	Fast Food Restaurant	Cajun / Creole Restaurant	Fried Chicken Joint	Pizza Place	Sandwich Place	Bakery	Mexican Restaurant	Café
26	Sharpstown	Pizza Place	Sandwich Place	Fast Food Restaurant	Latin American Restaurant	Chinese Restaurant	Mexican Restaurant	Donut Shop	Fried Chicken Joint	Middle Eastern Restaurant	Seafood Restaurant
27	Gulfton	Burger Joint	American Restaurant	Pizza Place	Mexican Restaurant	Fast Food Restaurant	Italian Restaurant	Seafood Restaurant	Fried Chicken Joint	Indian Restaurant	Bakery
28	University Place	Italian Restaurant	Pizza Place	Chinese Restaurant	Japanese Restaurant	Café	Mexican Restaurant	Sandwich Place	French Restaurant	Deli / Bodega	Sushi Restaurant

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
2	Greater Greenspoint	Fast Food Restaurant	Sandwich Place	Pizza Place	Seafood Restaurant	Fried Chicken Joint	Burger Joint	Cajun / Creole Restaurant	Mexican Restaurant	Chinese Restaurant	American Restaurant
4	Fairbanks / Northwest Crossing	Fast Food Restaurant	Food	Mexican Restaurant	Donut Shop	Pizza Place	Sandwich Place	Deli / Bodega	Cajun / Creole Restaurant	Seafood Restaurant	Burger Joint
15	Greater Heights	Fast Food Restaurant	Fried Chicken Joint	Sandwich Place	Pizza Place	Donut Shop	Mexican Restaurant	Diner	BBQ Joint	Burger Joint	Seafood Restaurant
30	Braeburn	Fast Food Restaurant	Fried Chicken Joint	Mexican Restaurant	African Restaurant	Donut Shop	Chinese Restaurant	Sandwich Place	Indian Restaurant	Seafood Restaurant	Food Truck
37	Westbury	Fast Food Restaurant	Food Truck	Fried Chicken Joint	Steakhouse	Burger Joint	American Restaurant	Chinese Restaurant	Peruvian Restaurant	Sandwich Place	Food
41	Fort Bend / Houston	BBQ Joint	Fast Food Restaurant	Fried Chicken Joint	Sandwich Place	Pizza Place	Chinese Restaurant	Food Truck	Tex-Mex Restaurant	Mexican Restaurant	Food
49	East Houston	Food	Fast Food Restaurant	Fried Chicken Joint	Sandwich Place	Seafood Restaurant	Mexican Restaurant	Donut Shop	Burger Joint	Pizza Place	BBQ Joint

Cluster 5:

	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
63	Second Ward	Food Truck	New American Restaurant	Italian Restaurant	Snack Place	Mexican Restaurant	Xinjiang Restaurant	Dim Sum Restaurant	Diner	Donut Shop	Dumpling Restaurant

Discussions:

1. From the geographical presentation of the clusters we can say that there is a scope to open a new restaurant in Second Ward and Astrodome area.
2. From the results we can suggest that opening a new Food truck business at Downtown will be a benefit for the business.
3. It can also be suggested that opening a Mexican type of restaurant near Airport area has low profile.

Conclusion

As the analysis is performed on small set of data, we can achieve better results by increasing the neighbourhood information. Houston has scope to expand different types restaurants at different places. Based on the current results it can be observed that East and West side of Downtown Houston has many different types of new restaurant business to offer. It can also be explored further with careful consideration of neighbourhoods at North and West sides of downtown Houston.