The Location of A New Restaurant In Kirkland

I. Description of The Problem And Discussion of The Background

Kirkland is a city in western Washington with a population of about 93,000 according to 2019 census report. It is adjacent to Bellevue and Redmond, where many big companies such as Expedia, and Microsoft locate. And is about 20 minutes drive from Seattle downtown. Kirkland has beautiful waterfront areas, numerous parks, and several art galleries. It has attracted more and more people to move in and live there. According to World Population Review, in the past decade, its population has grown by 88.47% and is continuing to grow at a current rate of 1.32% each year. Hence, there is a growing need for leisure, such as entertainment and dining.

This report will use Python segmenting and clustering techniques to fetch venue data from Foursquare to locate an area which will be ideal for someone to open a new restaurant in Kirkland. It will not consider other factors that generally impact such decisions, like cuisine preferences and average spending of targeted customers, rent cost, etc..

II. Data Used in The Report

In this report, I will use neighborhood information from kirklandwa.org for clustering and segmentation, and the venue information from Foursquare to analyze each neighborhood to find the ideal area to open this new restaurant.

III. Methodology

1. Create A Dataframe With Neighborhood Information

Due to the fact that Kirkland is a small city, there isn't any readily usable open source data online, I will have to create a dataframe with the neighborhood data obtained from kirklandwa.org, using pandas.

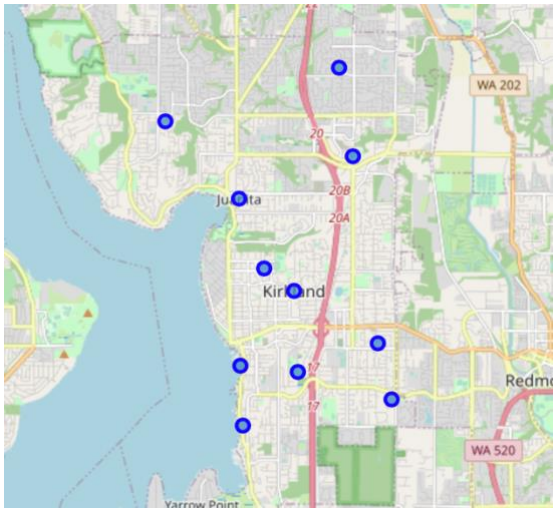
Then I created a second dataframe of coordinates to combine it with the first one, using Geocoder Python package. In this process, I encountered several issues. One of them was that Geocoder was not able to obtain the geographical coordinates of two neighborhoods of North Rose Hill and South Rose Hill. Initially, I decided to remove these two rows of data and

continued with the analysis. However, the second issue I encountered could not be ignored. The geographical coordinates of most of the neighborhood obtained by geocoder were off. When the map was generated with Matplotlib, I could see that only three neighborhoods were pinned correctly in Kirkland, all the rest were either in Seattle or the east coast of the United States. To solve this issue, I added the city of Kirkland between neighborhood name and the state abbreviation to increase the geographical accuracy of where those neighborhoods are located and I added North Rose Hill and South Rose Hill back to see if this time it will generate the coordinates. The amended neighborhood column seemed to work. However, by looking closely at the coordinates, Highlands neighborhood's figures still didn't look right. Then I mapped out the neighborhoods again to confirm the accuracy of the coordinates, in this process I found two more neighborhoods' figures were also off. Therefore, I had to manually replace those numbers with the correct ones found in Google Search Engine. Please see *figure 1* and *figure 2* below for the final dataframe of Kirkland neighborhoods and the map.

Figure 1

	Zipcode	Neighborhood	Latitude	Longitude
0	98034	Finn hill, Kirkland, WA	47.717321	-122.227347
1	98034	Juanita, Kirkland, WA	47.703154	-122.207069
2	98034	Kingsgate, Kirkland, WA	47.727326	-122.179758
3	98034	Totem Lake, Kirkland, WA	47.710855	-122.176017
4	98033	Market, Kirkland, WA	47.685957	-122.192025
5	98033	Norkirk, Kirkland, WA	47.690116	-122.200412
6	98033	Highlands, Kirkland, WA	47.689600	122.186000
7	98033	North Rose Hill, Kirkland	47.693200	122.170300
8	98033	Moss Bay, Kirkland, WA	47.672043	-122.206791
9	98033	Everest, Kirkland, WA	47.670958	-122.190983
10	98033	South Rose Hill, Kirkland	47.676225	-122.169086
11	98033	Bridle Trails, Kirkland, WA	47.665880	-122.165365
12	98033	Lakeview, Kirkland, WA	47.676900	122.206000
13	98033	Central Houghton, Kirkland, WA	47.660932	-122.205957

Figure 2



2. Analyze Neighborhoods in Kirkland

Now that we have the correct coordinates of each neighborhood in Kirkland, we can start our exploratory analysis.

2.1 Obtain venue data for each neighborhood from Foursquare

2.2 Get venue counts for each neighborhood

Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Bridle Trails, Kirkland, WA	30	30	30	30	30	30
Central Houghton, Kirkland, WA	30	30	30	30	30	30
Everest, Kirkland, WA	30	30	30	30	30	30
Finn hill, Kirkland, WA	30	30	30	30	30	30
Juanita, Kirkland, WA	30	30	30	30	30	30
Kingsgate, Kirkland, WA	30	30	30	30	30	30
Market, Kirkland, WA	30	30	30	30	30	30
Moss Bay, Kirkland, WA	30	30	30	30	30	30
Norkirk, Kirkland, WA	30	30	30	30	30	30
South Rose Hill, Kirkland	30	30	30	30	30	30
Totem Lake, Kirkland, WA	30	30	30	30	30	30

From this step, I found out that only 11 neighborhoods has venue data from Foursquare. So I will use these 11 neighborhoods to continue with the following analysis.

2.3 Analyze each neighborhood

In this step, I found out the total amount of unique venue types in Kirkland. Then assigned venue types to each neighborhood to create a new dataframe. From this dataframe, I then grouped the counts for each venue type by neighborhood to further get the means of each venue type for each neighborhood. By doing this, I was able to create a new dataframe with top 10 most popular venues for each neighborhood.

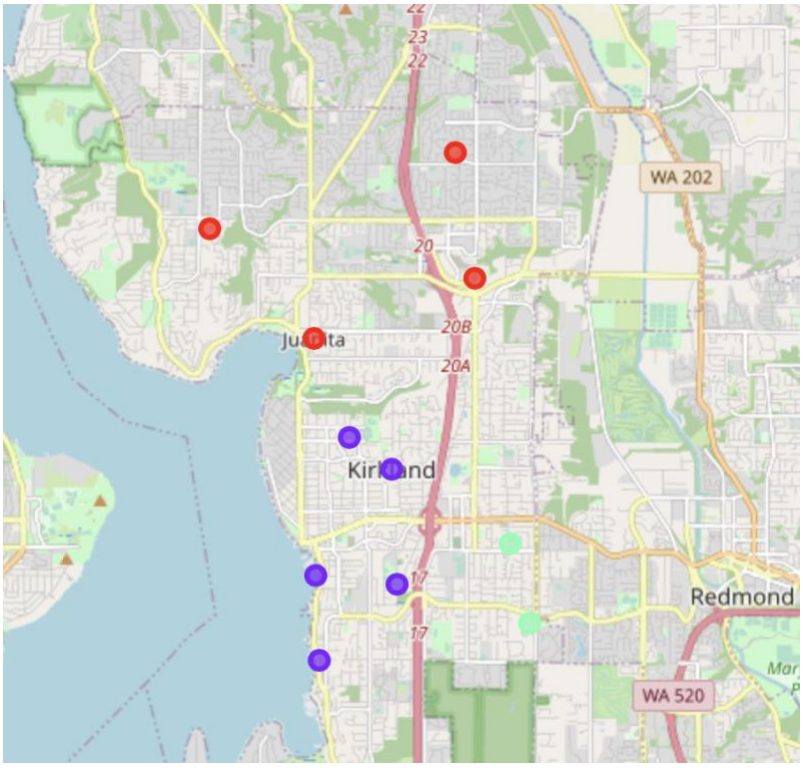
	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Finn hill, Kirkland, WA	47.717321	-122.227347	Juanita Beach Park	47.704708	-122.215304	Park
1	Finn hill, Kirkland, WA	47.717321	-122.227347	Cafe Juanita	47.707618	-122.212426	Italian Restaurant
2	Finn hill, Kirkland, WA	47.717321	-122.227347	Bala Yoga	47.707220	-122.211075	Yoga Studio
3	Finn hill, Kirkland, WA	47.717321	-122.227347	Urban Coffee Lounge	47.707020	-122.211462	Coffee Shop
4	Finn hill, Kirkland, WA	47.717321	-122.227347	Juanita Bay	47.701548	-122.219466	Bay

	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	Bridle Trails, Kirkland, WA	Park	Coffee Shop	Japanese Restaurant	Pizza Place	Gym	Playground	Organic Grocery	Optical Shop	Knitting Store	Grocery Store
1	Central Houghton, Kirkland, WA	Sandwich Place	Hotel	Park	Beach	Burger Joint	American Restaurant	Ice Cream Shop	Grocery Store	Irish Pub	Greek Restaurant
2	Everest, Kirkland, WA	Beach	Park	Sandwich Place	Playground	Organic Grocery	Burger Joint	Café	Grocery Store	Chinese Restaurant	Coffee Shop
3	Finn hill, Kirkland, WA	Coffee Shop	Park	Sushi Restaurant	Shoe Repair	Italian Restaurant	Gym / Fitness Center	Gym	Grocery Store	Greek Restaurant	Mediterranean Restaurant
4	Juanita, Kirkland, WA	Coffee Shop	Park	Sushi Restaurant	Indian Restaurant	Shoe Repair	Italian Restaurant	Harbor / Marina	Gym / Fitness Center	Grocery Store	Mediterranean Restaurant
5	Kingsgate, Kirkland, WA	Winery	Coffee Shop	Grocery Store	Japanese Restaurant	Pharmacy	Pet Store	New American Restaurant	Mediterranean Restaurant	Karaoke Bar	Italian Restaurant
6	Market, Kirkland, WA	Park	Sandwich Place	Playground	Sports Bar	Mexican Restaurant	Coffee Shop	Optical Shop	Dessert Shop	Café	Burger Joint
7	Moss Bay, Kirkland, WA	Sandwich Place	Coffee Shop	Beach	Park	Playground	Chinese Restaurant	Persian Restaurant	Organic Grocery	Dessert Shop	Mexican Restaurant
8	Norkirk, Kirkland, WA	Park	Sandwich Place	Yoga Studio	Burger Joint	Harbor / Marina	Hotel	Ice Cream Shop	Greek Restaurant	Italian Restaurant	French Restaurant
9	South Rose Hill, Kirkland	Pizza Place	Playground	Park	Coffee Shop	Waterfront	Warehouse Store	Mexican Restaurant	Knitting Store	Optical Shop	Organic Grocery
10	Totem Lake, Kirkland, WA	Coffee Shop	Japanese Restaurant	Asian Restaurant	Grocery Store	Brewery	Pet Store	Cosmetics Shop	Comic Shop	Clothing Store	Mediterranean Restaurant

2.4 Cluster neighborhoods

In this step, I tried randomly clustering neighborhoods with k equals to 3, 4, 5 and found that when k equals to 3, neighborhoods were distributed more evenly into groups.

Then I inserted the Cluster Labels as a new column into the dataframe. While I was merging this dataframe with the original one named “df”, a new issue came up. Because the one with top 10 venues only has 11 neighborhoods, when merged, there are three rows that contains NaN values, which automatically turned cluster labels values into float datatype, which resulted in errors when generating the map of clustered neighborhoods. To solve this issue, I went back and dropped those three neighborhoods that doesn’t have any venue information. Then did the merge again.
Please see below the map of the clustered neighborhoods.



2.5 Examine each cluster

Once the neighborhoods were clustered, I then examine them to find out the unique characteristics of each one. Please see the top 10 most common venues of each cluster below.

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
0	Finn hill, Kirkland, WA	Coffee Shop	Park	Sushi Restaurant	Shoe Repair	Italian Restaurant	Gym / Fitness Center	Gym	Grocery Store	Greek Restaurant	Mediterranean Restaurant
1	Juanita, Kirkland, WA	Coffee Shop	Park	Sushi Restaurant	Indian Restaurant	Shoe Repair	Italian Restaurant	Harbor / Marina	Gym / Fitness Center	Grocery Store	Mediterranean Restaurant
2	Kingsgate, Kirkland, WA	Winery	Coffee Shop	Grocery Store	Japanese Restaurant	Pharmacy	Pet Store	New American Restaurant	Mediterranean Restaurant	Karaoke Bar	Italian Restaurant
3	Totem Lake, Kirkland, WA	Coffee Shop	Japanese Restaurant	Asian Restaurant	Grocery Store	Brewery	Pet Store	Cosmetics Shop	Comic Shop	Clothing Store	Mediterranean 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
4	Market, Kirkland, WA	Park	Sandwich Place	Playground	Sports Bar	Mexican Restaurant	Coffee Shop	Optical Shop	Dessert Shop	Café	Burger Joint
5	Norkirk, Kirkland, WA	Park	Sandwich Place	Yoga Studio	Burger Joint	Harbor / Marina	Hotel	Ice Cream Shop	Greek Restaurant	Italian Restaurant	French Restaurant
6	Moss Bay, Kirkland, WA	Sandwich Place	Coffee Shop	Beach	Park	Playground	Chinese Restaurant	Persian Restaurant	Organic Grocery	Dessert Shop	Mexican Restaurant
7	Everest, Kirkland, WA	Beach	Park	Sandwich Place	Playground	Organic Grocery	Burger Joint	Café	Grocery Store	Chinese Restaurant	Coffee Shop
10	Central Houghton, Kirkland, WA	Sandwich Place	Hotel	Park	Beach	Burger Joint	American Restaurant	Ice Cream Shop	Grocery Store	Irish Pub	Greek 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
8	South Rose Hill, Kirkland	Pizza Place	Playground	Park	Coffee Shop	Waterfront	Warehouse Store	Mexican Restaurant	Knitting Store	Optical Shop	Organic Grocery
9	Bridle Trails, Kirkland, WA	Park	Coffee Shop	Japanese Restaurant	Pizza Place	Gym	Playground	Organic Grocery	Optical Shop	Knitting Store	Grocery Store

IV. Results

From the above analysis of neighborhoods in kirkland, each cluster has its unique characteristics. Cluster 1 is popular for family leisure and dining. Cluster 2 is popular for family leisure and fastfood. Cluster 3 is popular for family leisure, fast food and errands.

V. Discussion

All three clusters have parks to attract families to spend time in the area, especially during weekends and holidays. But each cluster also has other unique characteristics to offer. Cluster 1 has more table service dining options, which is a go-to area for meals. This guarantees a certain amount of potential customers for any new restaurants as it helps the exposure of the existence of a new restaurant. Cluster 2 seems to have more fast food options. Similar to Cluster 1, Cluster 3 also has more fast food option than table service restaurants.

VI. Conclusion

Based on each clusters' characteristics in Kirkland, it's ideal to open the new restaurant in cluster 1 area.