Capstone project: Battle of the neighborhoods

Recommendation of a new office location for food delivery industry in Seattle

I. Introduction

Food delivery industry is very competitive these days and the delivery time matters most for customers' satisfaction. Besides, food must be kept at a consistent temperature to stay fresh and tasty. Choosing the right location of the office or distribution center for efficiency and fast delivery of the food is crucial to this kind of business. It is a common pattern of a startup company in this industry to start from a small area, contact local popular restaurants and gradually increase the restaurant base in new areas. To get more food delivery orders and be more competitive, the new office or distribution center need to be close to most of the popular restaurants among the neighborhoods as much as it can

This purpose of this project is to find an area or neighborhood surrounded by most of popular restaurants. It would help the stakeholders of this project to make a better decision on choosing the location of the new office for food delivery industry in Seattle. The new office can enhance the efficiency of the delivery system and cut-down the operational time and costs to minimal.

II. Data source
This project made use of the following data sources:

1. **Postal codes of different neighborhoods in Seattle**

Postal codes in Seattle was retrieved from this websitehttp://seattlearea.com/zip-codes/

2. **Neighborhood location data retrieved using Google maps API**
Location coordinates of different neighborhoods is returned by using Google API

3. **Finding popular venues in different neighborhoods from FourSquare API**
I have used the FourSquare API to explore different neighborhoods in Seattle. The Foursquare explore function will be used to get the most popular venues in each neighborhood. The resultant data set will be shown in ascending order.

III. Methodology:

First of all, the postal codes of different neighborhoods in Seattle will be collected by Web scraping(HTTP request) in this web page "http://seattlearea.com/zip-codes/". Data will be cleaned and selected by Beautiful Soup library. After that, the geographical coordinates, latitude, and longitude of different neighborhood will be retrieved by using the Google API. The neighborhood with name, postal code, geographical coordinates will be regrouped and cleaned by the functions in Pandas library. Then FourSquare API will be called to retrieve all the venues in different neighborhoods with the radius of 1000m. Finally, the machine learning algorithm K-means clustering would be applied to form the clusters of different venues categories for all the neighborhoods.

The following is the result of grouping data with postal code and geographical coordinates:

PostalCode	Neighborhood	Latitude	Longitude
98003	Federal Way	47.316504	-122.322397
98005	Bellevue	47.615044	-122.171758
98033	Kirkland	47.66883	-122.192387
98037	Lynnwood	47.841952	-122.288181
98040	Mercer Island	47.582423	-122.233123
98052	Redmond	47.670119	-122.118237
98055	Renton	47.462337	-122.205506
98101	Seattle	47.608492	-122.336407
98101	Downtown	47.608492	-122.336407
98102	Capital Hill	47.633822	-122.321545
98103	Greenwood	47.660009	-122.342557
98103	Freemont	47.660009	-122.342557
98103	Greenlake	47.660009	-122.342557
98104	International District	47.601557	-122.332335
98104	Pioneer Square	47.601557	-122.332335
98105	University District	47.661424	-122.268374
98105	Laurelhurst	47.661424	-122.268374
98107	Ballard	47.66836	-122.376958
98109	South	47.628859	-122.345692
98109	Queen Anne	47.628859	-122.345692
98110	Bainbridge Island	47.645833	-122.543441
98110	Madrona	47.645833	-122.543441
98116	West Seattle	47.57458	-122.404784

98116	Alki Beach	47.57458	-122.404784
98118	Columbia City	47.541202	-122.267563
98121	Belltown	47.615247	-122.349745
98125	Northgate	47.71702	-122.300934
98144	Mount Baker	47.584576	-122.303649
98199	Magnolia	47.650708	-122.4

After calling FourSquare API and removing all the duplicate data, there are 258 unique categories venues in total. I grouped the top 5 venues for each neighborhood. From the result of this grouping, we can find that the top 5 of most common venues in Northgate is related to food or drinks with different varieties.
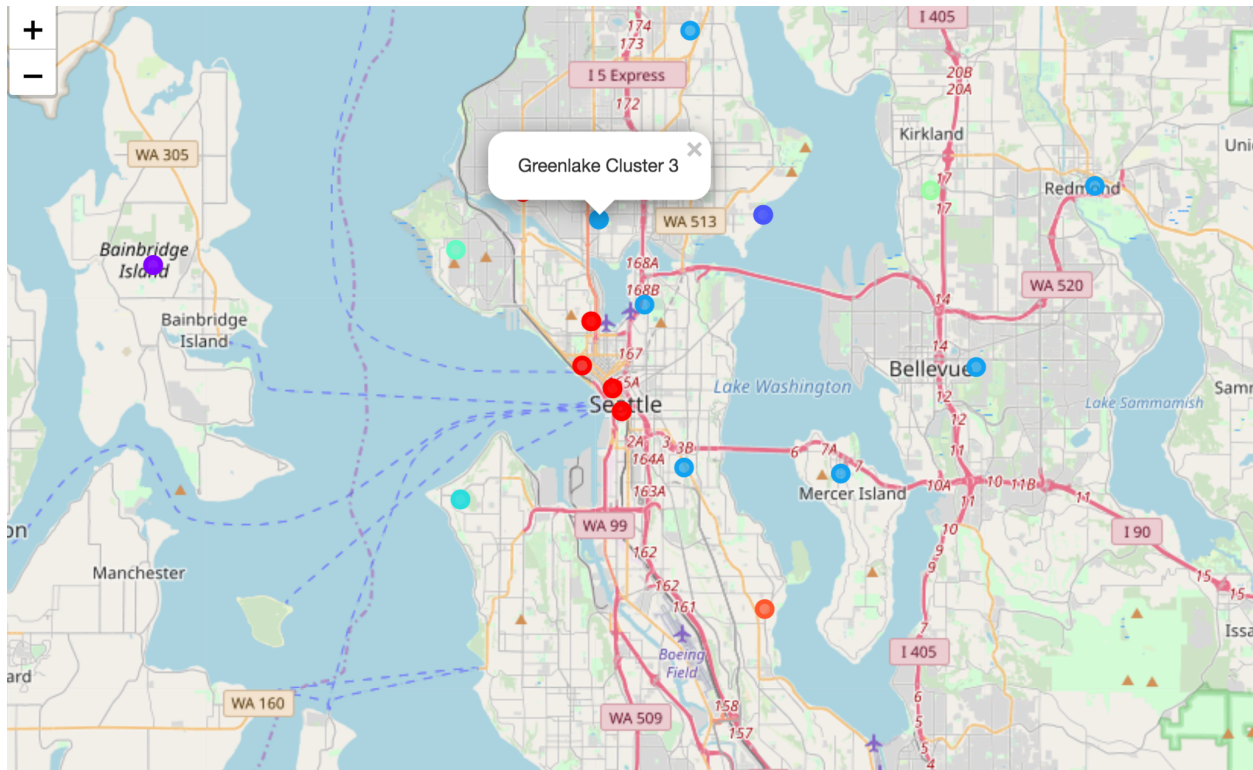
Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
Alki Beach	Park	Beach	Coffee Shop	Ice Cream Shop	Trail
Bainbridge Island	Skate Park	Yoga Studio	French Restaurant	Food Truck	Food Stand
Ballard	Brewery	Coffee Shop	Ice Cream Shop	Sandwich Place	New American Restaurant
Bellevue	Spa	Rental Car Location	Automotive Shop	Coffee Shop	Furniture / Home Store
Belltown	Sushi Restaurant	Bar	Breakfast Spot	Sculpture Garden	Pizza Place
Capital Hill	Coffee Shop	Sandwich Place	Bus Stop	Italian Restaurant	Garden
Columbia City	Mexican Restaurant	Park	Bus Line	Video Store	Medical Center
Downtown	Coffee Shop	Hotel	American Restaurant	Spa	Cocktail Bar
Federal Way	Japanese Restaurant	Korean Restaurant	Shoe Store	Mexican Restaurant	Miscellaneous Shop
Freemont	Coffee Shop	Japanese Restaurant	Zoo Exhibit	Thai Restaurant	Bar
Greenlake	Coffee Shop	Japanese Restaurant	Zoo Exhibit	Thai Restaurant	Bar
Greenwood	Coffee Shop	Japanese Restaurant	Zoo Exhibit	Thai Restaurant	Bar
International District	Coffee Shop	Hotel	Cocktail Bar	Café	Donut Shop

Kirkland	Asian Restaurant	Sandwich Place	Convenience Store	Grocery Store	Gas Station
Laurelhurst	Beach	Pharmacy	Park	Café	Massage Studio
Lynnwood	Fast Food Restaurant	Pizza Place	Coffee Shop	Pharmacy	Park
Madrona	Skate Park	Yoga Studio	French Restaurant	Food Truck	Food Stand
Magnolia	Park	Trail	Bus Stop	Athletics & Sports	Chinese Restaurant
Mercer Island	Coffee Shop	Pizza Place	Park	Sandwich Place	Pharmacy
Mount Baker	Park	Bus Station	Mexican Restaurant	Convenience Store	Playground
Northgate	Pizza Place	Sandwich Place	Coffee Shop	Sushi Restaurant	Thai Restaurant
Pioneer Square	Coffee Shop	Hotel	Cocktail Bar	Café	Donut Shop
Queen Anne	Coffee Shop	Exhibit	Museum	Gym / Fitness Center	Pizza Place
Redmond	Bakery	Sandwich Place	Coffee Shop	Gym / Fitness Center	Mexican Restaurant
Renton	Residential Building (Apartment / Condo)	Coffee Shop	Supermarket	Optical Shop	Bar
Seattle	Coffee Shop	Hotel	American Restaurant	Spa	Cocktail Bar
South	Coffee Shop	Exhibit	Museum	Gym / Fitness Center	Pizza Place
University District	Beach	Pharmacy	Park	Café	Massage Studio
West Seattle	Park	Beach	Coffee Shop	Ice Cream Shop	Trail

Result: K-means Clustering result:

PostalCode	Neighborhood	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
98003	Federal Way	3	Japanese Restaurant	Korean Restaurant	Shoe Store	Mexican Restaurant	Miscellaneous Shop
98005	Bellevue	3	Spa	Rental Car Location	Automotive Shop	Coffee Shop	Furniture / Home Store
98033	Kirkland	6	Asian Restaurant	Sandwich Place	Convenience Store	Grocery Store	Gas Station
98037	Lynnwood	8	Fast Food Restaurant	Pizza Place	Coffee Shop	Pharmacy	Park
98040	Mercer Island	3	Coffee Shop	Pizza Place	Park	Sandwich Place	Pharmacy
98052	Redmond	3	Bakery	Sandwich Place	Coffee Shop	Gym / Fitness Center	Mexican Restaurant
98055	Renton	7	Residential Building (Apartment / Condo)	Coffee Shop	Supermarket	Optical Shop	Bar
98101	Seattle	0	Coffee Shop	Hotel	American Restaurant	Spa	Cocktail Bar
98101	Downtown	0	Coffee Shop	Hotel	American Restaurant	Spa	Cocktail Bar
98102	Capital Hill	3	Coffee Shop	Sandwich Place	Bus Stop	Italian Restaurant	Garden
98103	Greenwood	3	Coffee Shop	Japanese Restaurant	Zoo Exhibit	Thai Restaurant	Bar
98103	Freemont	3	Coffee Shop	Japanese Restaurant	Zoo Exhibit	Thai Restaurant	Bar
98103	Greenlake	3	Coffee Shop	Japanese Restaurant	Zoo Exhibit	Thai Restaurant	Bar
98104	International District	0	Coffee Shop	Hotel	Cocktail Bar	Café	Donut Shop
98104	Pioneer Square	0	Coffee Shop	Hotel	Cocktail Bar	Café	Donut Shop
98105	University District	2	Beach	Pharmacy	Park	Café	Massage Studio
98105	Laurelhurst	2	Beach	Pharmacy	Park	Café	Massage Studio
98107	Ballard	0	Brewery	Coffee Shop	Ice Cream Shop	Sandwich Place	New American Restaurant

98109	South	0	Coffee Shop	Exhibit	Museum	Gym / Fitness Center	Pizza Place
98109	Queen Anne	0	Coffee Shop	Exhibit	Museum	Gym / Fitness Center	Pizza Place
98110	Bainbridge Island	1	Skate Park	Yoga Studio	French Restaurant	Food Truck	Food Stand
98110	Madrona	1	Skate Park	Yoga Studio	French Restaurant	Food Truck	Food Stand
98116	West Seattle	4	Park	Beach	Coffee Shop	Ice Cream Shop	Trail
98116	Alki Beach	4	Park	Beach	Coffee Shop	Ice Cream Shop	Trail
98118	Columbia City	9	Mexican Restaurant	Park	Bus Line	Video Store	Medical Center
98121	Belltown	0	Sushi Restaurant	Bar	Breakfast Spot	Sculpture Garden	Pizza Place
98125	Northgate	3	Pizza Place	Sandwich Place	Coffee Shop	Sushi Restaurant	Thai Restaurant
98144	Mount Baker	3	Park	Bus Station	Mexican Restaurant	Convenience Store	Playground
98199	Magnolia	5	Park	Trail	Bus Stop	Athletics & Sports	Chinese Restaurant

IV. Discussion and Conclusion:

It is no doubt that Seattle is a coffee-saturated city. Based on Four Square API exploring result, we can see that the coffee shop venue category is always the most common venue in different neighborhoods.

Among of all neighborhoods, Northgate is the probably the best neighborhood to start a food delivery business. The top five of the most common venues in this neighborhood are related to food or drinks. Those venues categories are Pizza Place, Sandwich Place, Coffee Shop, Sushi Restaurant, Thai Restaurant, etc. As a result, the chances of getting food order delivery are very high.

From the map of K-means clustering result, the three clusters, Pioneer Square, Downtown and Belltown are very close to each other geographically. The most common venues categories in those areas are Coffee shop, Sushi Restaurant, and American Restaurant, etc. Hence, this special condensed area is definitely a good alternative for the new office location other than Northgate.

However, this result of this analysis has some limitations. It cannot reflect the behavior

of the customer in that area. People like to visit the restaurants or stop by the coffee shops does not mean they want food delivery services. The customers may enjoy the service and the time of being there, more than just having the food at their own places. Rental cost is not taken into consideration too. For example, three neighborhoods Pioneer Square, Downtown and Belltown may be the most expensive rental area in Seattle. Hence, the operation cost won't be low if the new office starts to service in that area.