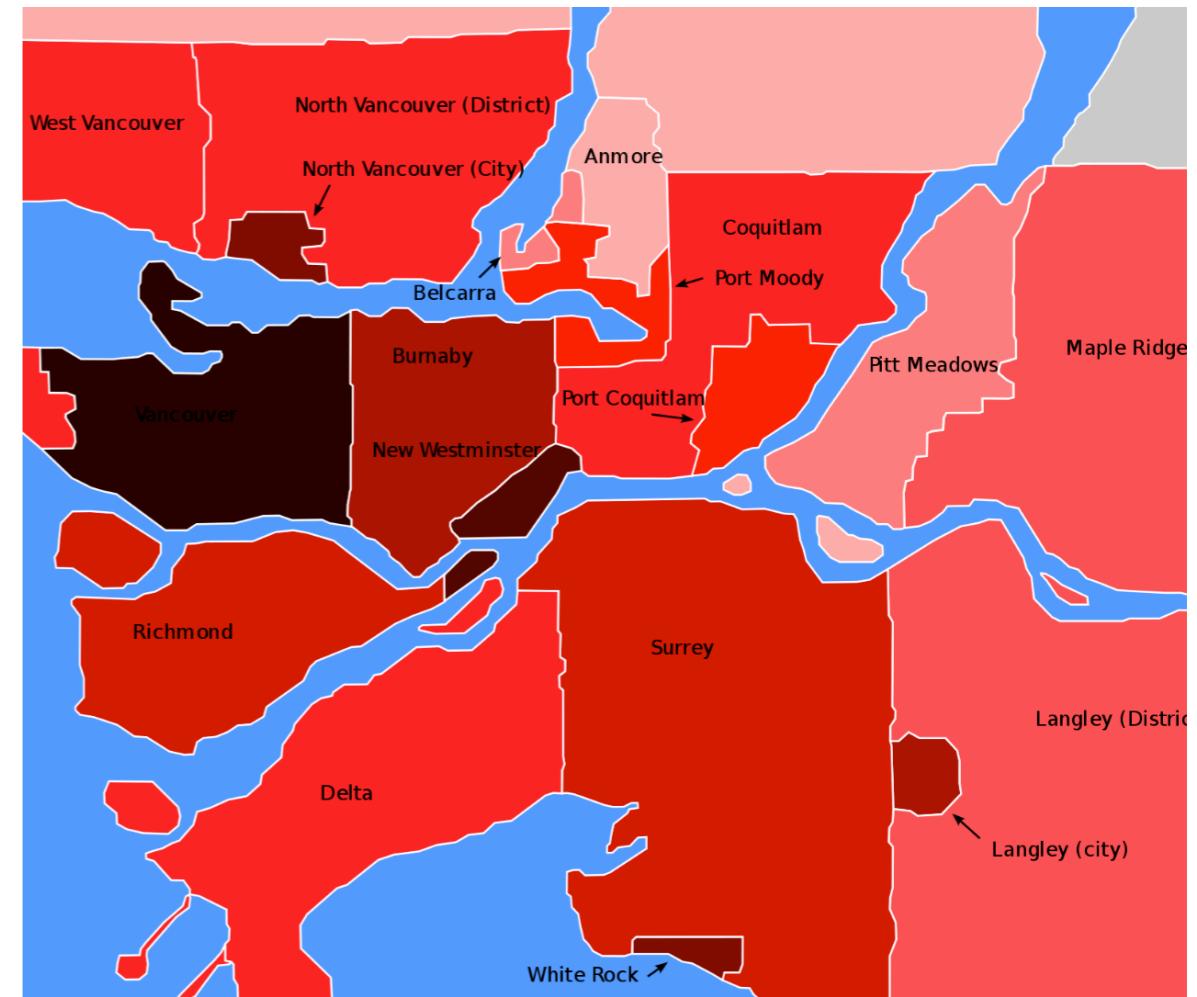


SEARCH A NEW OPTIMAL KOREAN RESTAURANT
LOCATION IN GREATER VANCOUVER

BACKGROUND

- Greater Vancouver is located in the west coast Canada and has the highest population density in Canada, with over 5,400 people per square kilometre.
- The population of Greater Vancouver is about **2.5 million**
- Great Vancouver is one of the most ethnically and linguistically diverse city in Canada
- Great Vancouver has many sub cities.

| Canada 2016 Census ^[6] | | Population | % of total population (2016) |
|--|-----------------------------|------------------|------------------------------|
| Visible minority group | Chinese | 474,655 | 19.6% |
| | South Asian | 291,005 | 12% |
| | Filipino | 123,170 | 5.1% |
| | Korean | 52,980 | 2.2% |
| | Southeast Asian | 44,905 | 1.9% |
| | West Asian | 46,010 | 1.9% |
| | Latin American | 34,805 | 1.4% |
| | Japanese | 30,110 | 1.2% |
| | Black | 29,830 | 1.2% |
| | Arab | 16,430 | 0.7% |
| | Visible minority, NIE | 6,490 | 0.3% |
| | Multiple visible minorities | 35,295 | 1.5% |
| Total visible minority population | | 1,185,680 | 48.9% |
| European | | 1,179,100 | 48.6% |
| Aboriginal group | | 61,455 | 2.5% |
| Total population | | 2,426,235 | 100% |



BUSINESS PROBLEM

- Clients want to find an optimal location/city in the Greater Vancouver area for a new Korean restaurant
- Clients who already own a restaurant in the Greater Vancouver area want to move to another location/city
- Location need to be high populated with Asian restaurants but low number of Korean restaurants.

DATA UNDERSTANDING

Based on our Business problem, Factors influencing our decision are:

- Number of existing Asian restaurant in the neighbourhood
- Number of Korean restaurants in the neighbourhood

There are over 1000 Asian restaurants in the Greater Vancouver area.

Two methods are selected for data collection.

- Google Maps API reverse geocoding
- Four square API : Venues Data

<https://api.foursquare.com/v2/venues/explore?>

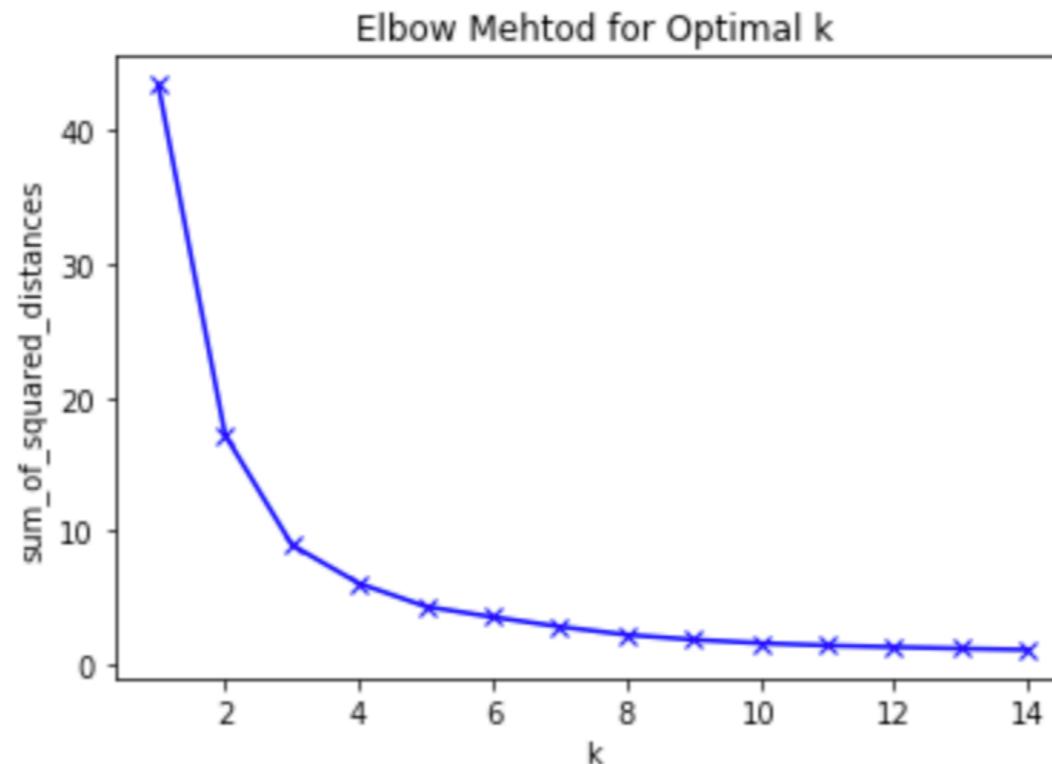
- categoryId = {"Asian Restaurant" : 4bf58dd8d48988d142941735}
- intent = {indicating your intent in performing the search : browse}
- sw = { limits results to the bounding box by south-west corner: 49.00, -123.18}
- ne = { limits results to the bounding box by north-east corner : 49.36, -122.7}

METHODOLOGY

- For Data Collection, Foursquare API query option has to be selected carefully due to the restriction of how many Foursquare API result sets can be returned.
Ex) explore - 100, search -50
- Foursquare bounding option(sw coordinates, ne coordinates) is selected since wider range of area to cover.
- Foursquare data is crowded data so the venue categories were not consistently populated. Data was merged, Joined, and cleaned as part of data cleaning process.
- K-Means Clustering algorithm with Elbow method was selected to cluster the restaurants by coordinates.

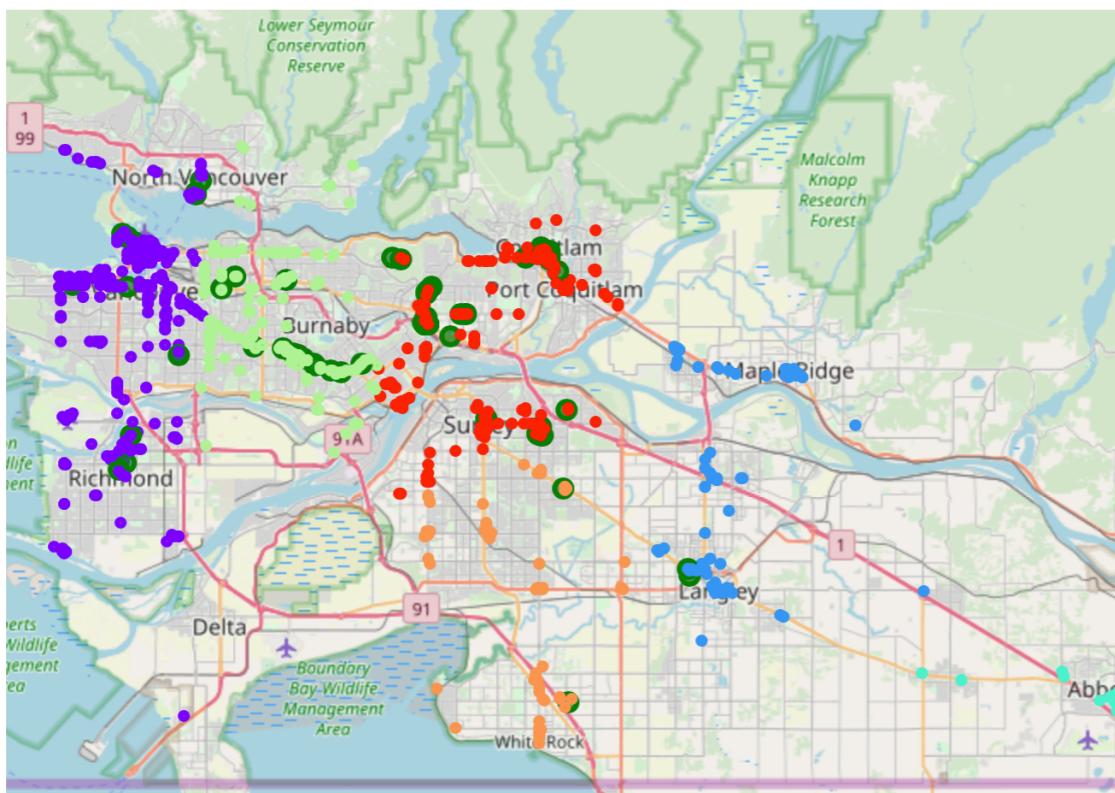
K-MEANS CLUSTERING

- K-Means algorithm is one of the most common clustering method of unsupervised learning.
- Latitude and Longitude are used as the features.
- Search for the optimal K using K-Means with Elbow Method
- The result shows that optimal K can be 6 - 10. Studying the results after a few test run with different K numbers, the outcomes were very similar. Therefore optimal K = 6 was selected.

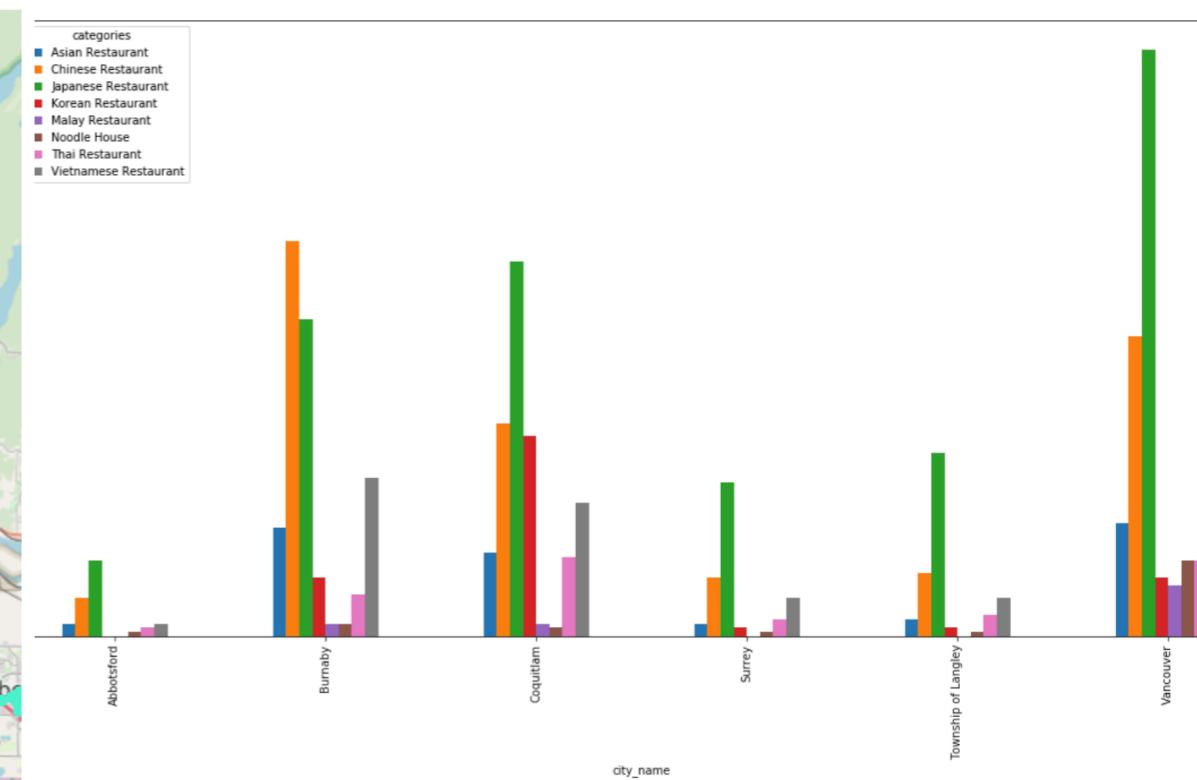


RESULT AND DISCUSSION

- It's worth noting that Foursquare API only returned 25 Korean restaurants without specifying "intent=browse". The default is "intent=checkin"
- This analysis shows that there are 1101 Asian restaurants and 42 different types of Asian restaurant in the Greater Vancouver area.



Asian Restaurants in Greater Vancouver. Green - Korean restaurants

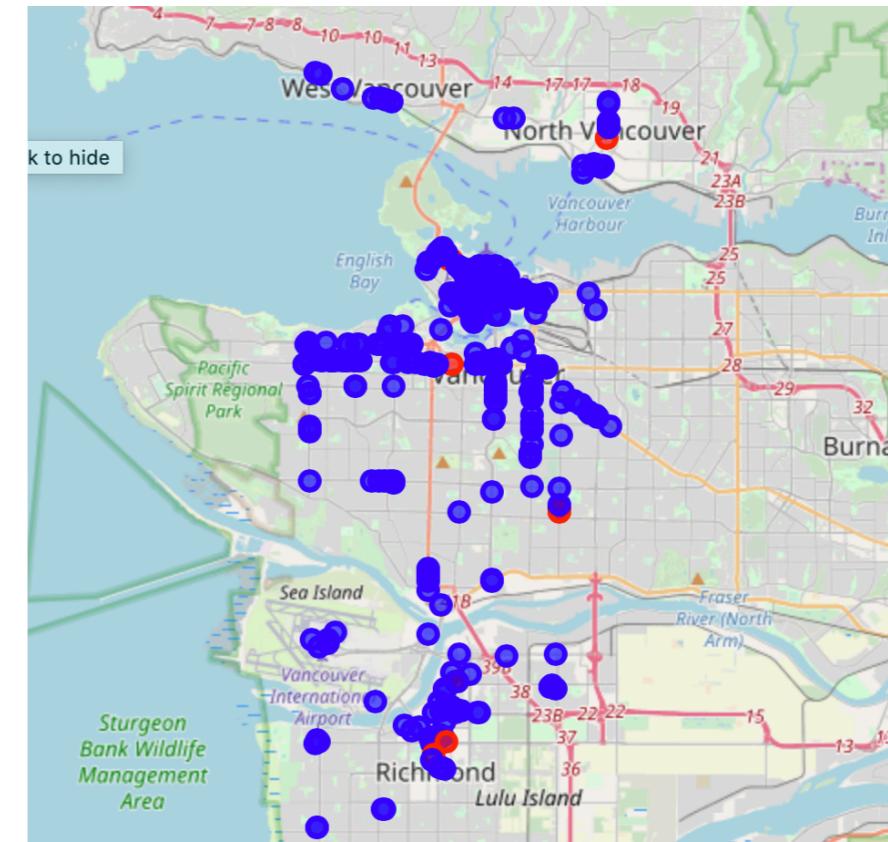


Bar chart for number of restaurant by type

RESULT AND DISCUSSION – CONTINUED

- Burnaby and Coquitlam showed very similar number of total Asian restaurants but Coquitlam has 3.4 times more Korean restaurants than Burnaby.
- Vancouver city offers the best location for the new Korean restaurant venue

| | | |
|-----------|--------------------------|-----------|
| Burnaby | Chinese Restaurant | 95 |
| | Japanese Restaurant | 76 |
| | Vietnamese Restaurant | 38 |
| | Asian Restaurant | 26 |
| | Korean Restaurant | 14 |
| | Thai Restaurant | 10 |
| | Malay Restaurant | 3 |
| | Noodle House | 3 |
| Coquitlam | Japanese Restaurant | 90 |
| | Chinese Restaurant | 51 |
| | Korean Restaurant | 48 |
| | Vietnamese Restaurant | 32 |
| | Asian Restaurant | 20 |
| | Thai Restaurant | 19 |
| | Malay Restaurant | 3 |
| | Noodle House | 2 |



Asian restaurant in Vancouver -
Korean in red circle

CONCLUSION

- Purpose of this project was to identify an optimal city/neighbourhood in the Greater Vancouver region for a new Korean restaurant.
- By calculating restaurant density distribution from Foursquare data, we narrowed down the candidates to 6 cities.
- With further study of the clustering data, we recommend Vancouver as the final city/location
- Final decision for the optimal location will be made by stakeholders based on additional factors like attractiveness of each location, proximity to major roads, real estate availability, price, social and economic dynamics of the neighbourhood.