

A wide-angle photograph of the Vancouver skyline across a body of water. The city's dense urban landscape, featuring numerous high-rise buildings, is visible under a bright blue sky with scattered white clouds. In the foreground, a paved walkway runs along the water's edge, with several people walking and some greenery on the left.

The Battle of the Neighborhoods

Open a Tea Room in Vancouver

Capstone Project - IBM Data Science Professional Certificate - Coursera

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Business Problem

Find an optimal location for a "Tea Room & Pastries" shop.

Targeted to stakeholders interested in opening a Tea Room in Vancouver, CA.

Find locations:

- Not crowded with tea rooms or similar venues
- Consider the city's neighborhood demographic diversity
- Proximity to tourist attractions

Data sources

The postal codes of British Columbia were web scraped to find Vancouver's neighborhoods names and postal codes using BeautifulSoup library.

To get the center coordinates of each postal code the Geopy library was used.

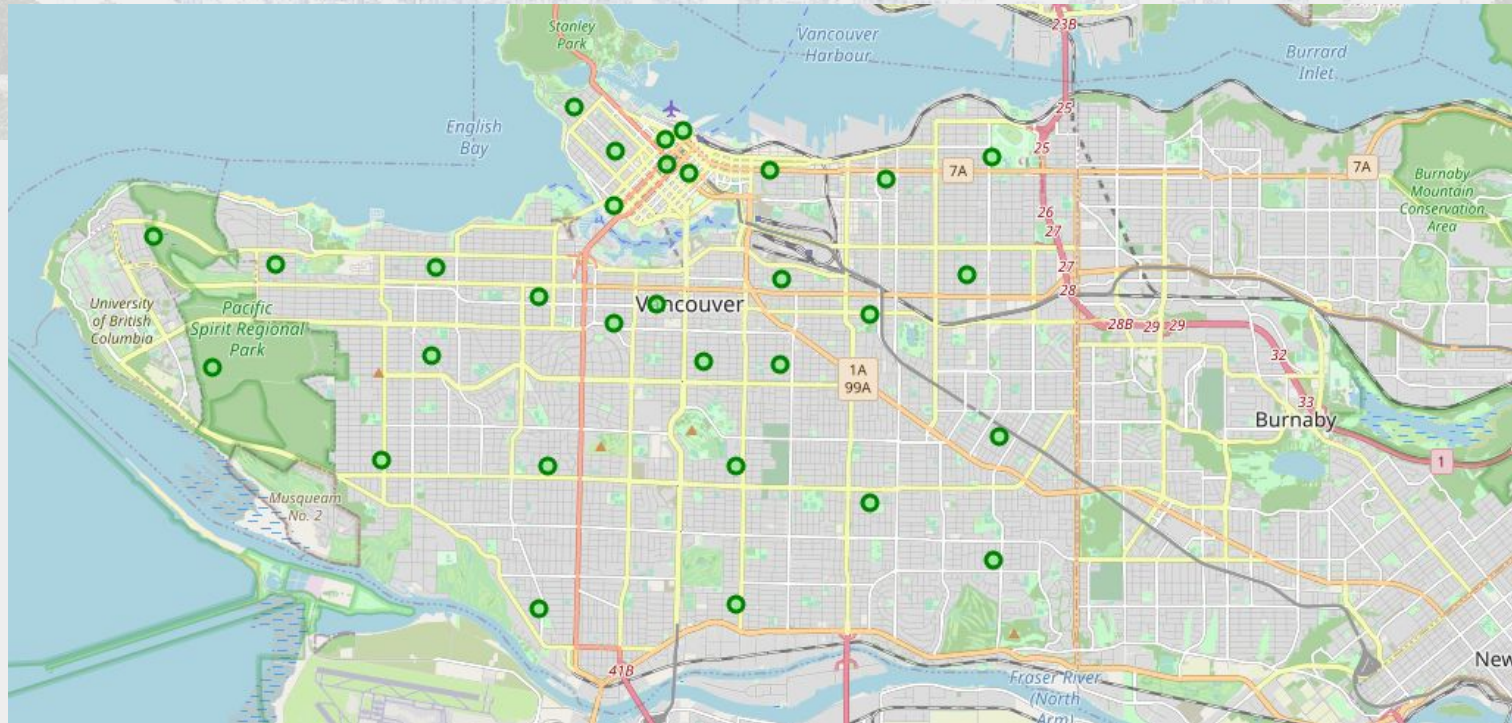
The data about venues (name, type and location) for each neighborhood was obtained using Foursquare API.

To gather information about the city and it's demographics Vancouver's Wikipedia page, the city of Vancouver's website and Tourism Vancouver's website were consulted.

Web scraping and procuring geospatial data

	PostalCode		City	Neighborhood	Latitude	Longitude
0	V5K	Vancouver		North Hastings-Sunrise	49.283277	-123.043293
1	V5L	Vancouver		North Grandview-Woodland	49.279853	-123.068277
2	V5M	Vancouver		South Hastings-Sunrise / North Renfrew-Colling...	49.265358	-123.049119
3	V5N	Vancouver		South Grandview-Woodland / NE Kensington-Cedar...	49.259254	-123.072063
4	V5P	Vancouver		SE Kensington-Cedar Cottage / Victoria-Fraserview	49.230668	-123.071843

Vancouver's neighborhoods



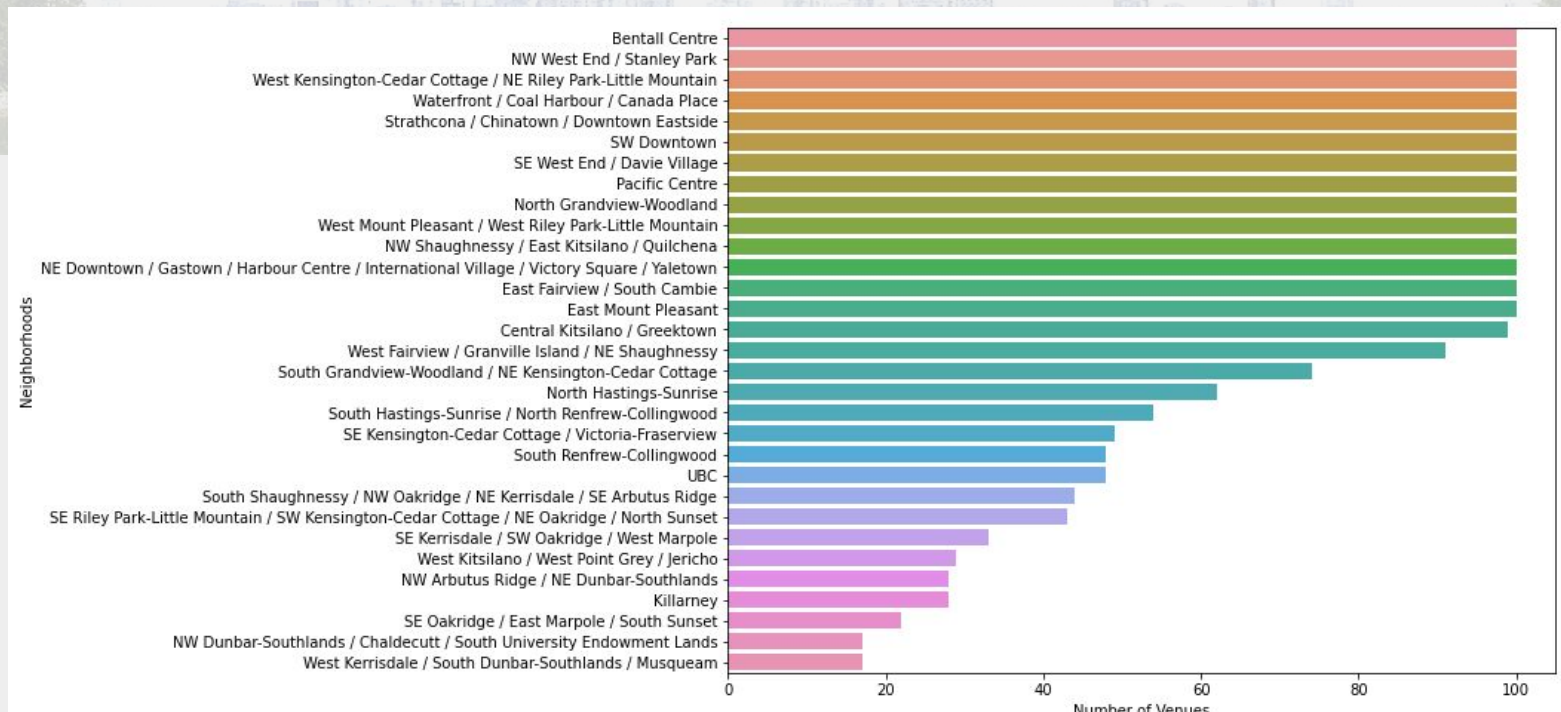
Exploring Vancouver's Neighborhoods

Foursquare API:

- 2186 venues
- 236 unique categories
- 31 postal code-defined areas being covered

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	North Hastings-Sunrise	49.283277	-123.043293	The Fair at the PNE	49.282971	-123.042109	Fair
1	North Hastings-Sunrise	49.283277	-123.043293	Livestock Barns	49.284037	-123.039278	Farm
2	North Hastings-Sunrise	49.283277	-123.043293	Pacific Coliseum	49.285823	-123.042727	Hockey Arena
3	North Hastings-Sunrise	49.283277	-123.043293	Tamam Fine Palestinian Cuisine	49.281070	-123.051438	Middle Eastern Restaurant
4	North Hastings-Sunrise	49.283277	-123.043293	Bao Chau	49.281232	-123.048971	Vietnamese Restaurant

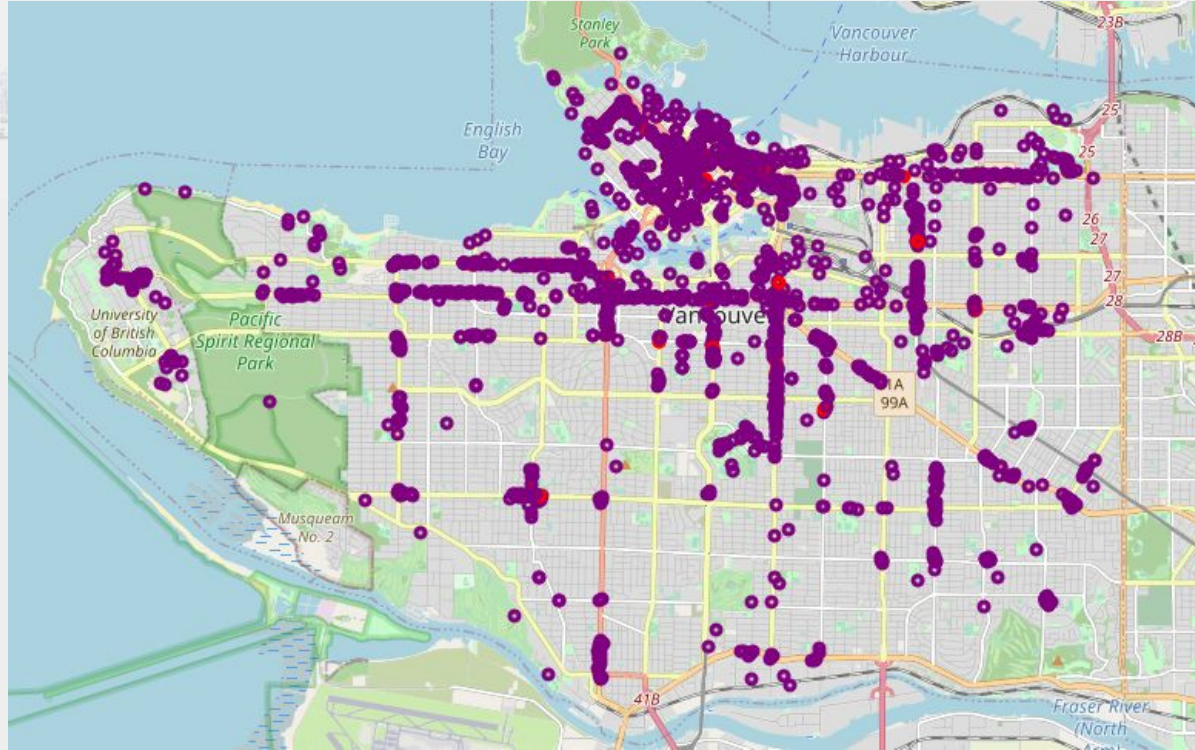
Venues per neighborhood returned by Foursquare API



Most frequent venue categories

Venue Category	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude
Coffee Shop	145	145	145	145	145	145
Café	80	80	80	80	80	80
Japanese Restaurant	76	76	76	76	76	76
Hotel	65	65	65	65	65	65
Park	64	64	64	64	64	64
Bakery	63	63	63	63	63	63
Sushi Restaurant	56	56	56	56	56	56
Chinese Restaurant	52	52	52	52	52	52
Vietnamese Restaurant	51	51	51	51	51	51
Restaurant	50	50	50	50	50	50
Pizza Place	48	48	48	48	48	48
Dessert Shop	42	42	42	42	42	42
Sandwich Place	40	40	40	40	40	40
Grocery Store	35	35	35	35	35	35
Breakfast Spot	34	34	34	34	34	34

Vancouver's venues



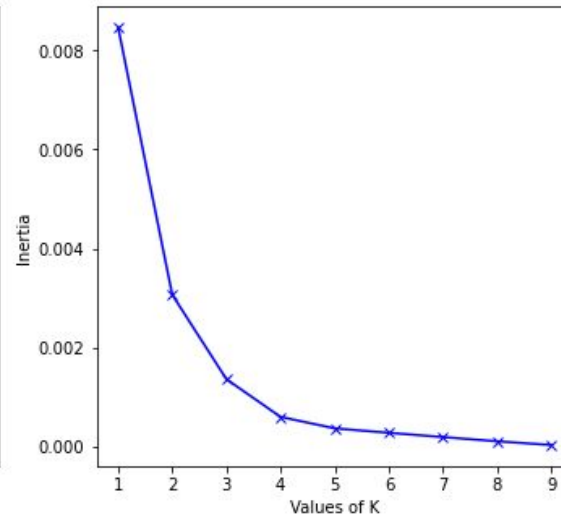
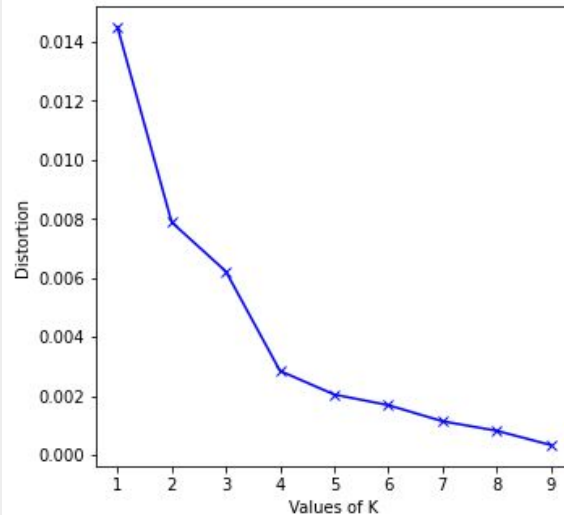
All venues in purple except for 'Tea Room', 'Breakfast Spot' or 'Creperie' categories, shown in red.

k-Means Clustering of Vancouver's Neighborhoods

Elbow Method to determine the optimal value of k

$k = 4$

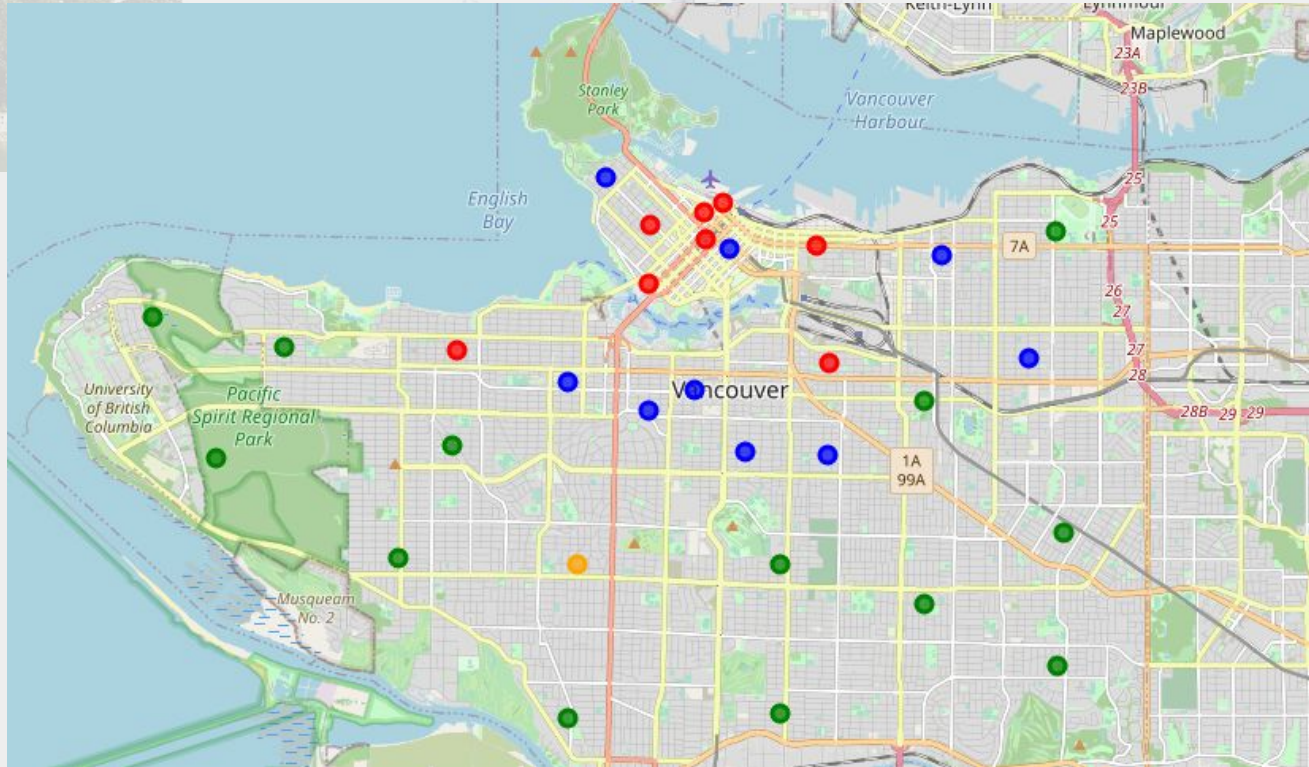
Elbow Method using Distortion and Inertia



k-Means Clustering of Vancouver's Neighborhoods

	PostalCode	City	Neighborhood	Latitude	Longitude	Cluster Labels	Breakfast Spot	Tea Room	Creperie
0	V5K	Vancouver	North Hastings-Sunrise	49.283277	-123.043293	2	0.000000	0.00	0.0
1	V5L	Vancouver	North Grandview-Woodland	49.279853	-123.068277	1	0.030000	0.00	0.0
2	V5M	Vancouver	South Hastings-Sunrise / North Renfrew-Collingwood	49.265358	-123.049119	1	0.037037	0.00	0.0
3	V5N	Vancouver	South Grandview-Woodland / NE Kensington-Cedar Cottage	49.259254	-123.072063	2	0.000000	0.00	0.0
4	V5P	Vancouver	SE Kensington-Cedar Cottage / Victoria-Fraserview	49.230668	-123.071843	2	0.000000	0.00	0.0
...
26	V6S	Vancouver	NW Dunbar-Southlands / Chaldecutt / South University	49.251210	-123.225418	2	0.000000	0.00	0.0
27	V6T	Vancouver	UBC	49.271268	-123.239269	2	0.000000	0.00	0.0
28	V6Z	Vancouver	SW Downtown	49.275885	-123.131725	0	0.000000	0.01	0.0
29	V7X	Vancouver	Bentall Centre	49.285967	-123.119531	0	0.010000	0.01	0.0
30	V7Y	Vancouver	Pacific Centre	49.282182	-123.119247	0	0.010000	0.01	0.0

Cluster analysis



Cluster 0: red

Cluster 1: blue

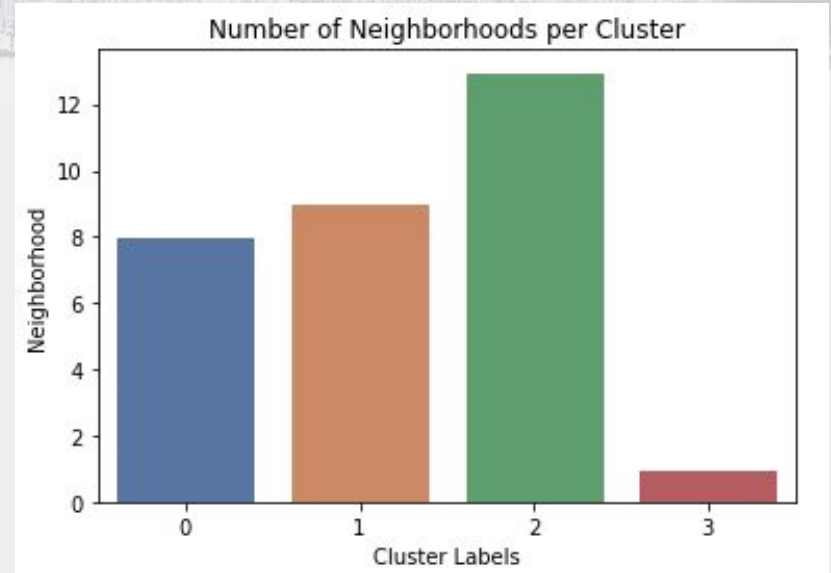
Cluster 2: green

Cluster 3: orange

Cluster analysis

Number of neighborhoods grouped in each cluster

Cluster Labels		Neighborhood
0	0	8
1	1	9
2	2	13
3	3	1



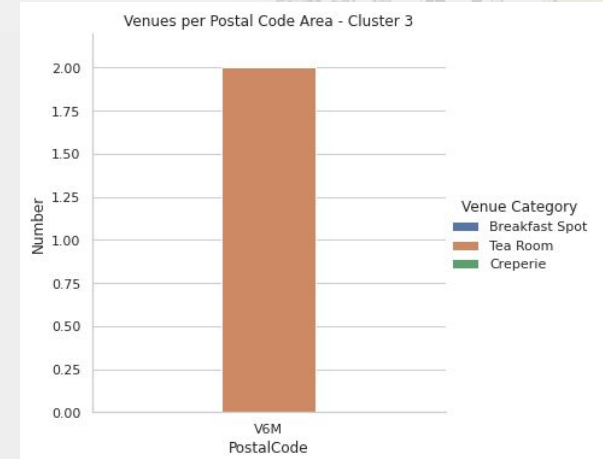
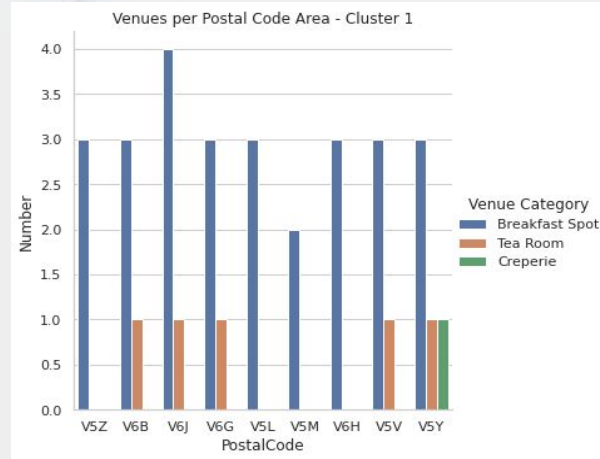
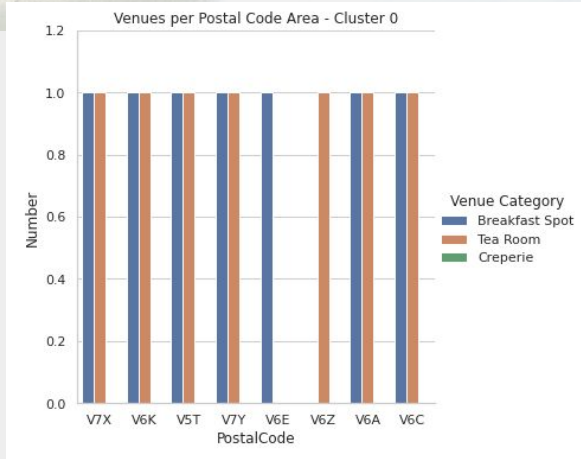
Cluster analysis

Pivot table: Number of venues of each category in each neighborhood

Cluster Labels	Venue Category	Breakfast Spot	Creperie	Tea Room
0	Neighborhood			
	Bentall Centre	1.0	0.0	1.0
	Central Kitsilano / Greektown	1.0	0.0	1.0
	East Mount Pleasant	1.0	0.0	1.0
	Pacific Centre	1.0	0.0	1.0
	SE West End / Davie Village	1.0	0.0	0.0
	SW Downtown	0.0	0.0	1.0
	Strathcona / Chinatown / Downtown Eastside	1.0	0.0	1.0
	Waterfront / Coal Harbour / Canada Place	1.0	0.0	1.0
1	East Fairview / South Cambie	3.0	0.0	0.0
	NE Downtown / Gastown / Harbour Centre / International Village / Victory Square / Yaletown	3.0	0.0	1.0
	NW Shaughnessy / East Kitsilano / Quilchena	4.0	0.0	1.0
	NW West End / Stanley Park	3.0	0.0	1.0
	North Grandview-Woodland	3.0	0.0	0.0
	South Hastings-Sunrise / North Renfrew-Collingwood	2.0	0.0	0.0
	West Fairview / Granville Island / NE Shaughnessy	3.0	0.0	0.0
	West Kensington-Cedar Cottage / NE Riley Park-Little Mountain	3.0	0.0	1.0
	West Mount Pleasant / West Riley Park-Little Mountain	3.0	1.0	1.0
3	South Shaughnessy / NW Oakridge / NE Kerrisdale / SE Arbutus Ridge	0.0	0.0	2.0

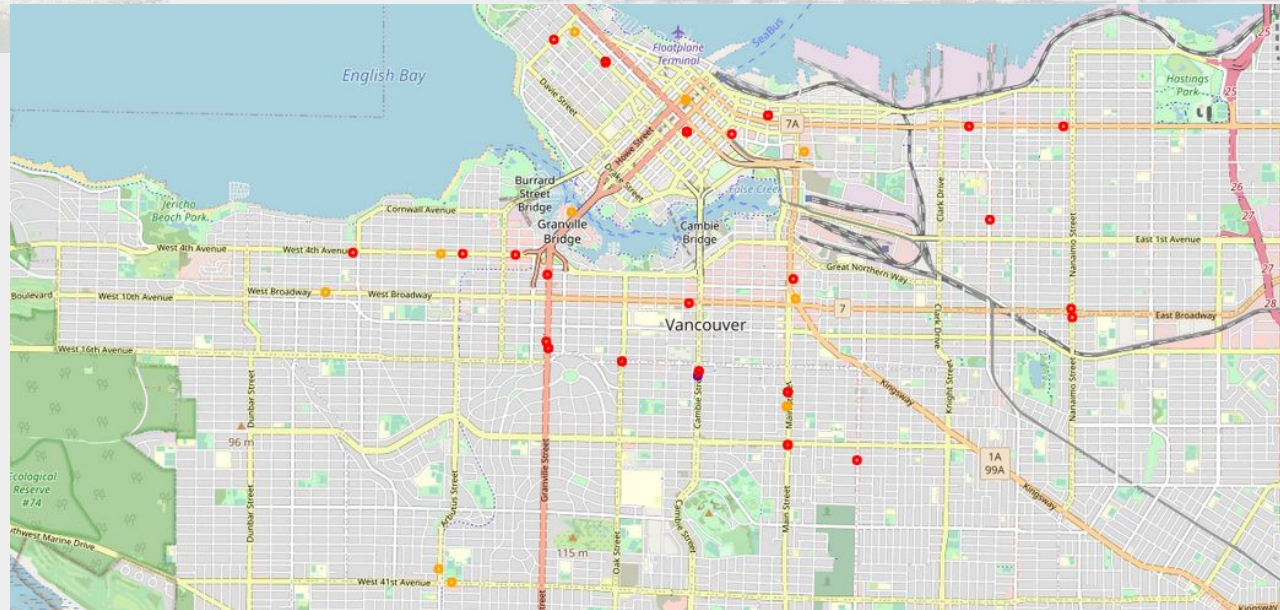
Cluster analysis

Number of venues per postal code area for Cluster 0, 1 and 3



Cluster analysis

'Tea & Pastries' venues of Vancouver



'Breakfast Spots': red

'Tea Rooms': orange

'Creperie': purple

Cluster analysis

Top 10 most common venues

	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	Bentall Centre	Hotel	Dessert Shop	American Restaurant	Café	Restaurant	Coffee Shop	Cosmetics Shop	Japanese Restaurant	Steakhouse	Plaza
1	Central Kitsilano / Greentown	Coffee Shop	Café	Sushi Restaurant	Pub	Japanese Restaurant	Grocery Store	Vegetarian / Vegan Restaurant	Park	Bakery	Convenience Store
2	East Fairview / South Cambie	Coffee Shop	Japanese Restaurant	Café	Park	Pharmacy	Sushi Restaurant	Chinese Restaurant	Mexican Restaurant	Indian Restaurant	Breakfast Spot
3	East Mount Pleasant	Brewery	Coffee Shop	Bakery	Vietnamese Restaurant	Pizza Place	Mexican Restaurant	Ice Cream Shop	Taco Place	Sushi Restaurant	Music Venue
4	Killarney	Grocery Store	Shopping Mall	Bus Stop	Pharmacy	Coffee Shop	Italian Restaurant	Restaurant	Burger Joint	Cosmetics Shop	Liquor Store
5	NE Downtown / Gastown / Harbour Centre / Inter...	Hotel	Coffee Shop	Taco Place	Restaurant	Sandwich Place	Concert Hall	Dessert Shop	Café	Italian Restaurant	Breakfast Spot
6	NW Arbutus Ridge / NE Dunbar-Southlands	Italian Restaurant	Japanese Restaurant	Sushi Restaurant	Bank	Coffee Shop	Dessert Shop	Pharmacy	Pizza Place	Park	Sandwich Place
7	NW Dunbar-Southlands / Chaldecutt / South Univ...	Shopping Mall	Bakery	Noodle House	Coffee Shop	Frozen Yogurt Shop	Sushi Restaurant	Farmers Market	Park	Supermarket	Bank
8	NW Shaughnessy / East Kitsilano / Quilchena	Coffee Shop	Bakery	Furniture / Home Store	Restaurant	Japanese Restaurant	Breakfast Spot	Yoga Studio	Vegetarian / Vegan Restaurant	French Restaurant	Grocery Store
9	NW West End / Stanley Park	Coffee Shop	Dessert Shop	Japanese Restaurant	Café	Sushi Restaurant	Korean Restaurant	Sculpture Garden	Grocery Store	Ramen Restaurant	Vietnamese Restaurant

Cluster analysis

Top 10 most common venues - Cluster 0

```
neighborhoods_venues_sorted[neighborhoods_venues_sorted['PostalCode'] == 'V6E']
```

	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	PostalCode	City
17	SE West End / Davie Village	Hotel	Japanese Restaurant	Dessert Shop	Bakery	Sushi Restaurant	Ramen Restaurant	Restaurant	Café	Sandwich Place	Park	V6E	Vancouver

Cluster analysis

Top 10 most common venues - Cluster 1

```
neighborhoods_venues_sorted[neighborhoods_venues_sorted['PostalCode'] == 'V5Z']
```

	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	PostalCode	City
2	East Fairview / South Cambie	Coffee Shop	Japanese Restaurant	Café	Park	Pharmacy	Sushi Restaurant	Chinese Restaurant	Mexican Restaurant	Indian Restaurant	Breakfast Spot	V5Z	Vancouver

```
neighborhoods_venues_sorted[neighborhoods_venues_sorted['PostalCode'] == 'V5L']
```

	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	PostalCode	City
10	North Grandview-Woodland	Coffee Shop	Brewery	Café	Pizza Place	Sushi Restaurant	Grocery Store	Japanese Restaurant	Italian Restaurant	Indian Restaurant	Breakfast Spot	V5L	Vancouver

```
neighborhoods_venues_sorted[neighborhoods_venues_sorted['PostalCode'] == 'V5M']
```

	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	PostalCode	City
20	South Hastings-Sunrise / North Renfrew-Collingwood	Pizza Place	Vietnamese Restaurant	Furniture / Home Store	Breakfast Spot	Chinese Restaurant	Bus Stop	Sandwich Place	Park	Dim Sum Restaurant	Pet Store	V5M	Vancouver

```
neighborhoods_venues_sorted[neighborhoods_venues_sorted['PostalCode'] == 'V6H']
```

	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	PostalCode	City
26	West Fairview / Granville Island / NE Shaughnessy	Coffee Shop	Furniture / Home Store	Japanese Restaurant	Bank	Sandwich Place	Café	Breakfast Spot	Pizza Place	Pharmacy	Park	V6H	Vancouver

Cluster analysis

Top 10 most common venues - Cluster 3

```
neighborhoods_venues_sorted[neighborhoods_venues_sorted['PostalCode'] == 'V6M']
```

	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	PostalCode	City
22	South Shaughnessy / NW Oakridge / NE Kerrisdal...	Chinese Restaurant	Coffee Shop	Sushi Restaurant	Japanese Restaurant	Bus Stop	Asian Restaurant	Vietnamese Restaurant	Pharmacy	Tea Room	Dessert Shop	V6M	Vancouver

Results

- **V5L - North Grandview-Woodland** → may be visited by residents and tourists, "Commercial Drive", proximity to Downtown.
- **V5Z - East Fairview / South Cambie** → proximity to Downtown, not many competitors.
- **V6H - West Fairview / Granville Island / NE Shaughnessy** → close to many areas of interest, not many competitors.
- **V6M - South Shaughnessy / NW Oakridge / NE Kerrisdale / SE Arbutus Ridge** → not the first option but could have potential if further analysis were to show that there is enough market demand among the areas' residents.

Conclusion

k-Means clustering analysis was performed to identify an optimal location for a "Tea Room & Pastries" shop in Vancouver, Canada.

The analysis of the four clusters obtained revealed areas where no Tea Rooms are located, which were studied in more detail.

As a result, 4 areas of Vancouver can be presented to potential stakeholders as the most promising neighborhoods to open a Tea Room in Vancouver.

Resources

- The postal codes of British Columbia (https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_V)
- Geopy (<https://pypi.org/project/geopy/>)
- Foursquare (<https://foursquare.com/>)
- Vancouver's Wikipedia page (<https://en.wikipedia.org/wiki/Vancouver>)
- The city of Vancouver's website (<https://vancouver.ca/>)
- Tourism Vancouver's website (<https://www.tourismvancouver.com/>)