Exploration of Seattle's Neighborhoods

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Introduction

Seattle has always been viewed as a famous city with its unique culture and history. Coffee, movies, big businesses, stunning views of nature, and other features of this city have attracted hundreds of thousands of visitors to come. Every year during March and April, people flock to Seattle to take a look at the gorgeous cherry-blossom at the University of Washington. Not just during spring, according to new data released at Visit Seattle's Annual Meeting, the city and county have welcomed a record of 40.9 million visitors last year in 2018. With a growing number of visitors each year, Seattle is becoming more and more popular.

For a visitor who comes to Seattle for the first time, it's good to know what places worth visiting the most. Information about local stores and their ratings would largely help people to schedule wisely and make better traveling plans. Visitors can, therefore, be more prepared before coming to visit. My exploration starts from cities near Seattle to venues within Seattle and near the University of Washington.

Data Description

- I first explored cities in Washington state according to unique postal codes. Data is collected from the GeoNames geographical database1. I scraped and cleaned the web page to get information about postal codes, city names, their corresponding latitudes and longitudes.
- I used the geocoding library to get the center coordinates of Seattle, University of Washington, and the University Village.

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1 GeoNames geographical database - https://www.geonames.org/postal-codes/US/WA/washington.html
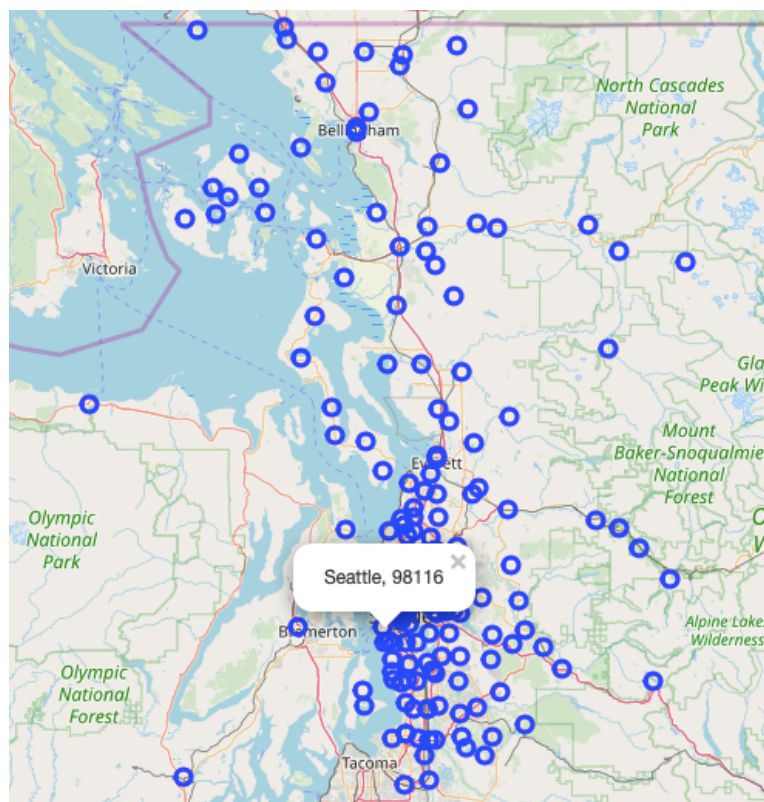
- Nearby venues of given locations, as well as ratings of venues, are all extracted from Foursquare API.

Methodology

First, I web-scraped the data and created a data frame that contains each postal code of Washington state and its corresponding city, latitude, and longitude as below:

	Postal Code	City	Latitude	Longitude
0	98104	Seattle	47.604	-122.326
1	98101	Seattle	47.611	-122.330
2	98001	Auburn	47.310	-122.265
3	98002	Auburn	47.305	-122.207
4	98003	Federal Way	47.320	-122.312

With given latitude and longitude values, I created a map to visualize the geographic location of each place by using the folium library in Python. When you click on the point, it shows you the postal code and its corresponding city. The map looks as below:

I called Foursquare API to explore the nearby venues of each location. Each location returns 50 nearby venues within a 500-meters radius. A data frame was created to show all returned venues with their names, categories, latitudes, and longitudes as below:
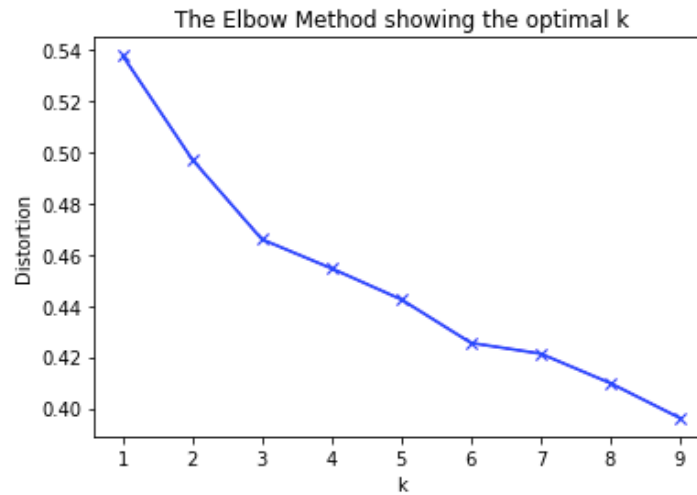
	City	City Latitude	City Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Seattle	47.604	-122.326	Columbia Tower Club	47.604507	-122.330484	Social Club
1	Seattle	47.604	-122.326	Frye Art Museum	47.607051	-122.324326	Art Museum
2	Seattle	47.604	-122.326	Juicy Cafe	47.604329	-122.330958	Café
3	Seattle	47.604	-122.326	Columbia Center Observation Deck (Sky View Obs...	47.604595	-122.330816	Scenic Lookout
4	Seattle	47.604	-122.326	Biscuit B*tch	47.603237	-122.332010	Breakfast Spot

I grouped each city and calculated the frequency of each category that occurs in that city. A data frame was created to show the top 10 most common venues of each city as below:
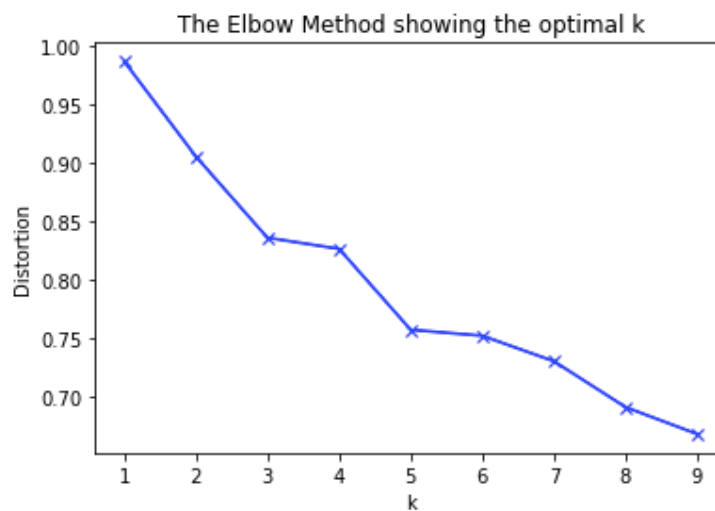
	City	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue
0	Aberdeen	Business Service	Zoo Exhibit	Fried Chicken Joint	Food Court
1	Anacortes	Home Service	Food	Food & Drink Shop	Food Court
2	Arlington	Garden Center	Zoo Exhibit	Fried Chicken Joint	Food Court
3	Auburn	Home Service	Coffee Shop	Café	Restaurant
4	Bainbridge Island	Tree	Zoo Exhibit	Food	Food Court

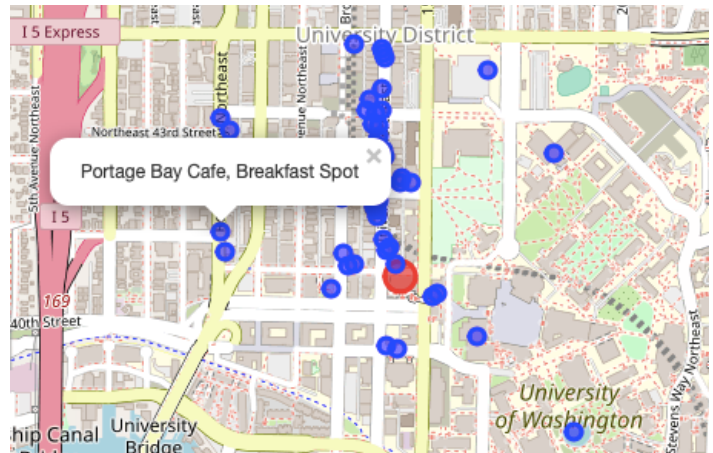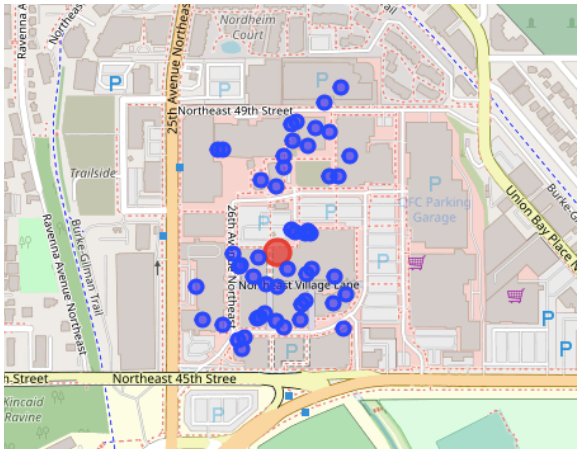| 5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
Food Truck	Football Stadium	Forest	Fountain	French Restaurant	Frozen Yogurt Shop
Food Truck	Football Stadium	Forest	Fountain	French Restaurant	Zoo Exhibit
Food Truck	Football Stadium	Forest	Fountain	French Restaurant	Frozen Yogurt Shop
Grocery Store	Bank	Mexican Restaurant	Theater	Construction & Landscaping	Park
Food Truck	Football Stadium	Forest	Fountain	French Restaurant	Fried Chicken Joint

To analyze different cities in Washington, I employed the k-means algorithm to cluster cities into different groups based on venue categories. To find the optimal number of clusters, I used the Elbow method, which tells that the optimal k is 9:

The Elbow Method showing the optimal k

I then analyzed how venues distributed in Seattle with the same method above. The Elbow method for clustering in Seattle shows that the optimal k is also 9:

The Elbow Method showing the optimal k

To explore worth-visiting venues near the University of Washington, mostly located on the 15th Ave NE and at University Village, I first created two maps to show each venue's location with its name and its corresponding category as its label:
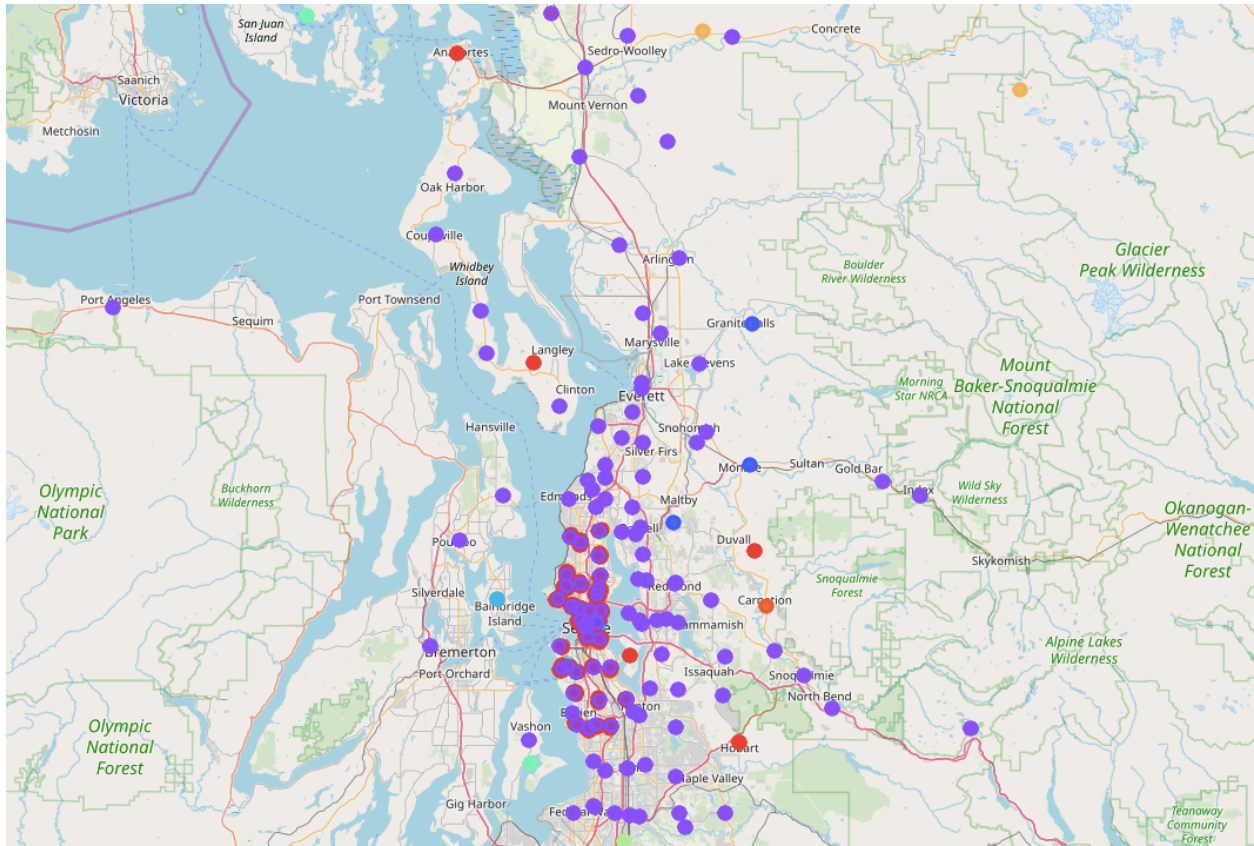
I then called the Foursquare API to get the nearby venues and their ratings. A data frame is created with venues sorted in descending order according to ratings:

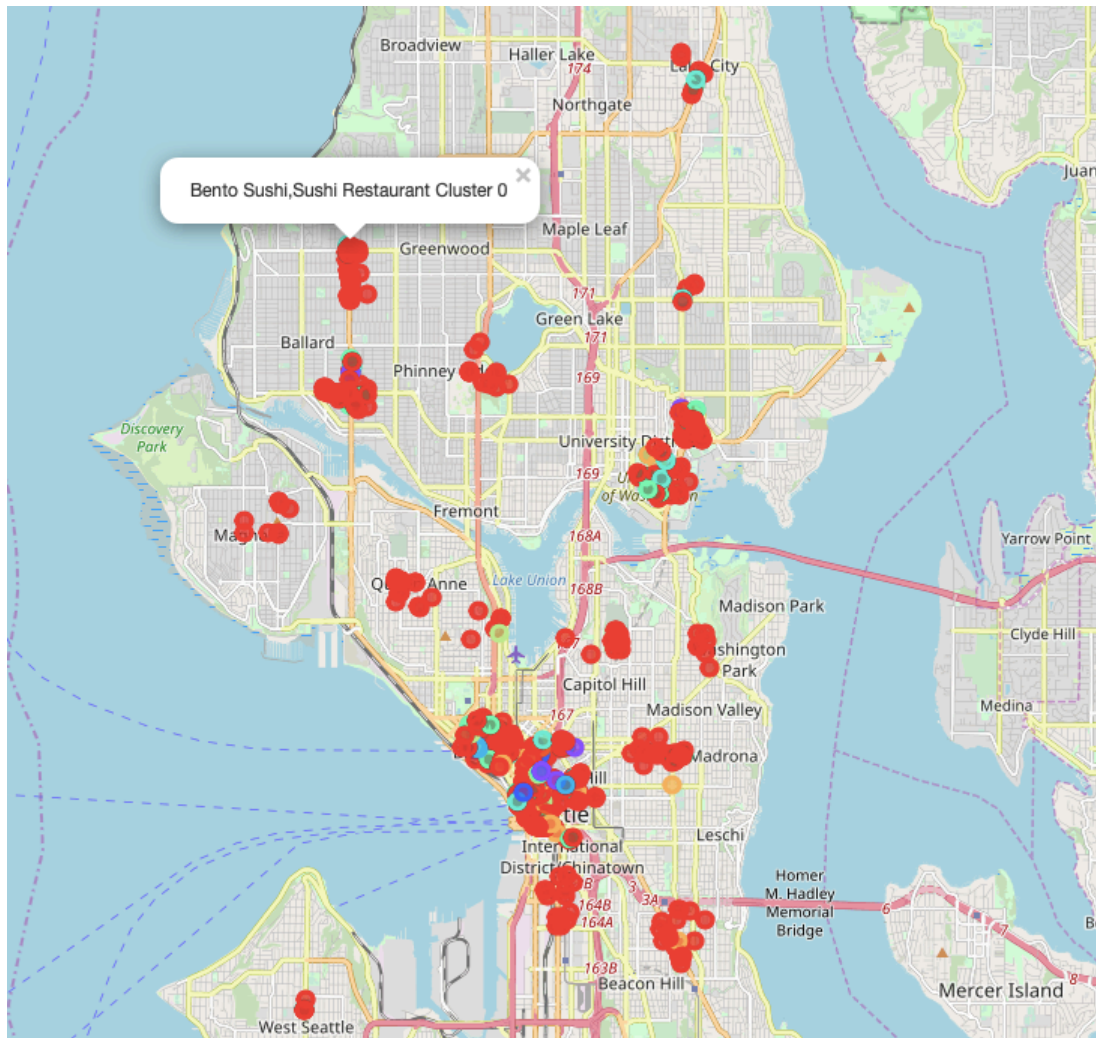|	name	categories	address	rating	id
0	Sweet Alchemy Ice Cream	Ice Cream Shop	4301 University Way NE	8.7	56be08c8498e44ed4192b559
1	Pink Gorilla	Video Game Store	4341 University Way NE	8.5	4b10925ef964a5200c7323e3
2	Shawarma King	Mediterranean Restaurant	4337 University Way NE	8.4	4b6ba134f964a5205c132ce3
3	Neptune Theatre	Music Venue	1303 NE 45th St	8.4	465d9f53f964a52041471fe3
4	Portage Bay Cafe	Breakfast Spot	4130 Roosevelt Way NE	8.4	44e492f5f964a5205f371fe3
5	UW: Henry Art Gallery	Museum	NE Pacific St	8.3	42a63500f964a52008251fe3
6	Sizzle&Crunch	Vietnamese Restaurant	1313 NE 42nd St	8.2	5867284cb6e67d49c183e8cf
7	UW: Drumheller Fountain	Fountain	Drumheller Fountain	8.2	4beb11bf415e20a171d8e5bb
8	Trinity Market	Deli / Bodega	4301 Roosevelt Way NE	8.1	4ae127c0f964a520878521e3
9	Portage Bay Grange Feed & Mercantile	Pet Store	4110 Roosevelt Way NE	8.1	4da8ab66316ae350ac580535
10	Meany Hall Theater	College Theater	1410 NE Campus Pkwy	8.1	4a9de4e9f964a520cc3920e3

Results

After applying the k-means algorithm to cities in Washington State as well as venues in Seattle, I mapped venues again with different colors indicating different clusters. Here's a clustered map of cities:

There are 86 unique cities and 287 unique categories. As you can see, purple venues, which are scattered all around the cities, represent multiple social venues, such as restaurants, cafes, stores, hotels, etc. And red venues that are mainly located in Seattle belong to the cluster of home services. Blue venues, which are located in the surrounding areas, represent mountains, forests, and fountains. Examples are Granite Falls and Monroe, which are some of the perfect cities in Washington to experience nature.

Let's narrow down our focus to Seattle, a clustered map is shown below. The label of each venue shows the name, category, and the cluster number.
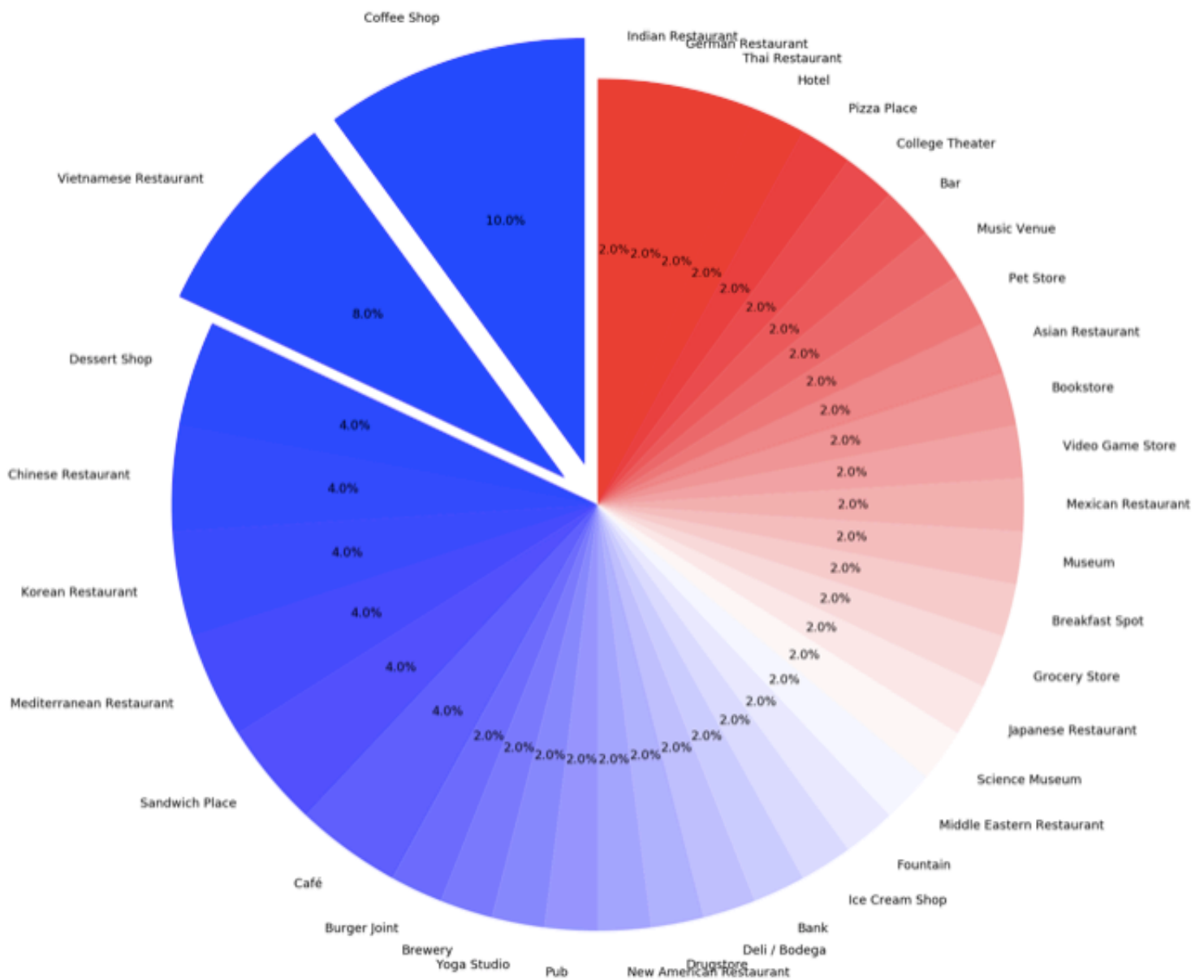
According to the map, most venues are centered at Downtown Seattle and University District, the others are scattered around Ballard, Capitol Hill, and so on. Here's what each cluster represents:
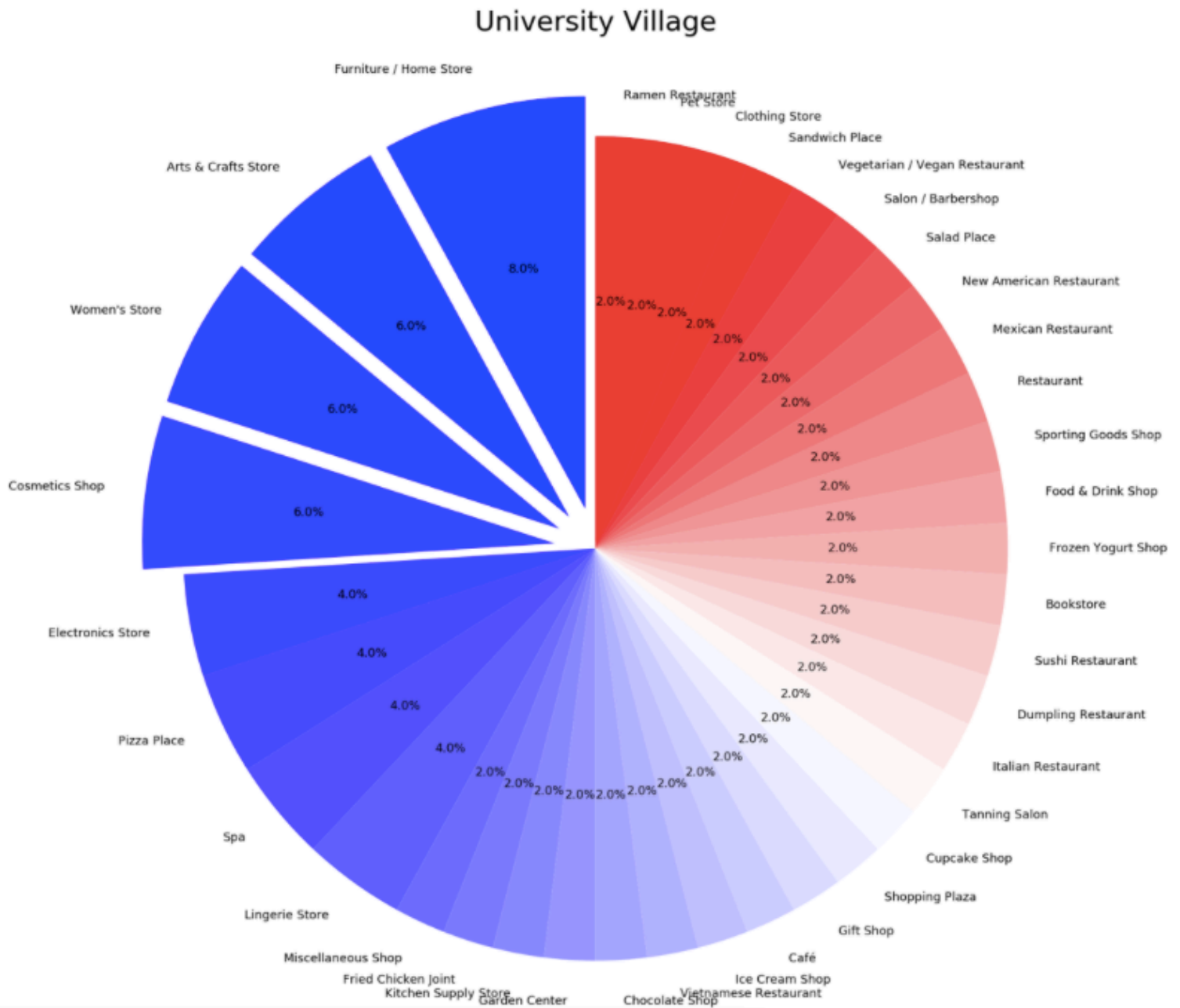
Cluster Label	Color	Venue Category
0	0	red	Multiple Social Venues
1	1	purple	Italian Restaurant
2	2	light blue	Seafood & Steak
3	3	dark blue	Lounge
4	4	cyan	Pizza Place
5	5	light green	Coffee Shop
6	6	light yellow	Gym
7	7	yellow	Café
8	8	orange	Hotel

Now let's narrow down our focus further to the University of Washington. 15th Ave NE and the University Village are the most popular areas near campus. Each area returns 50 venues and 37 categories. Two individual pie charts show the proportion of each category in these two areas.
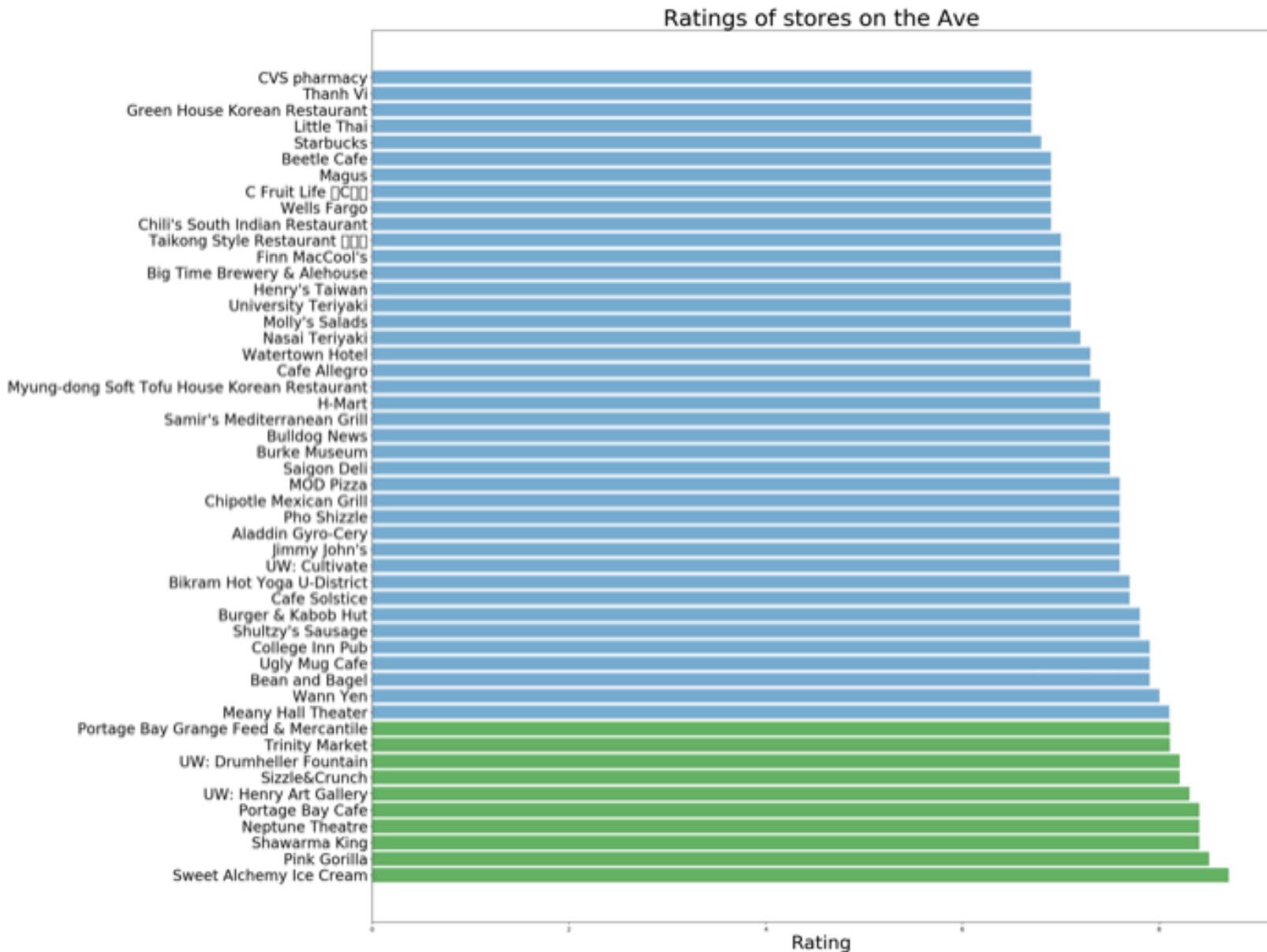

15th Ave NE

On 15th Ave NE, coffee shops and Vietnamese restaurants are more usual, the following categories are dessert shop, Chinese restaurant, Korean restaurant, Mediterranean restaurant, and sandwich place.
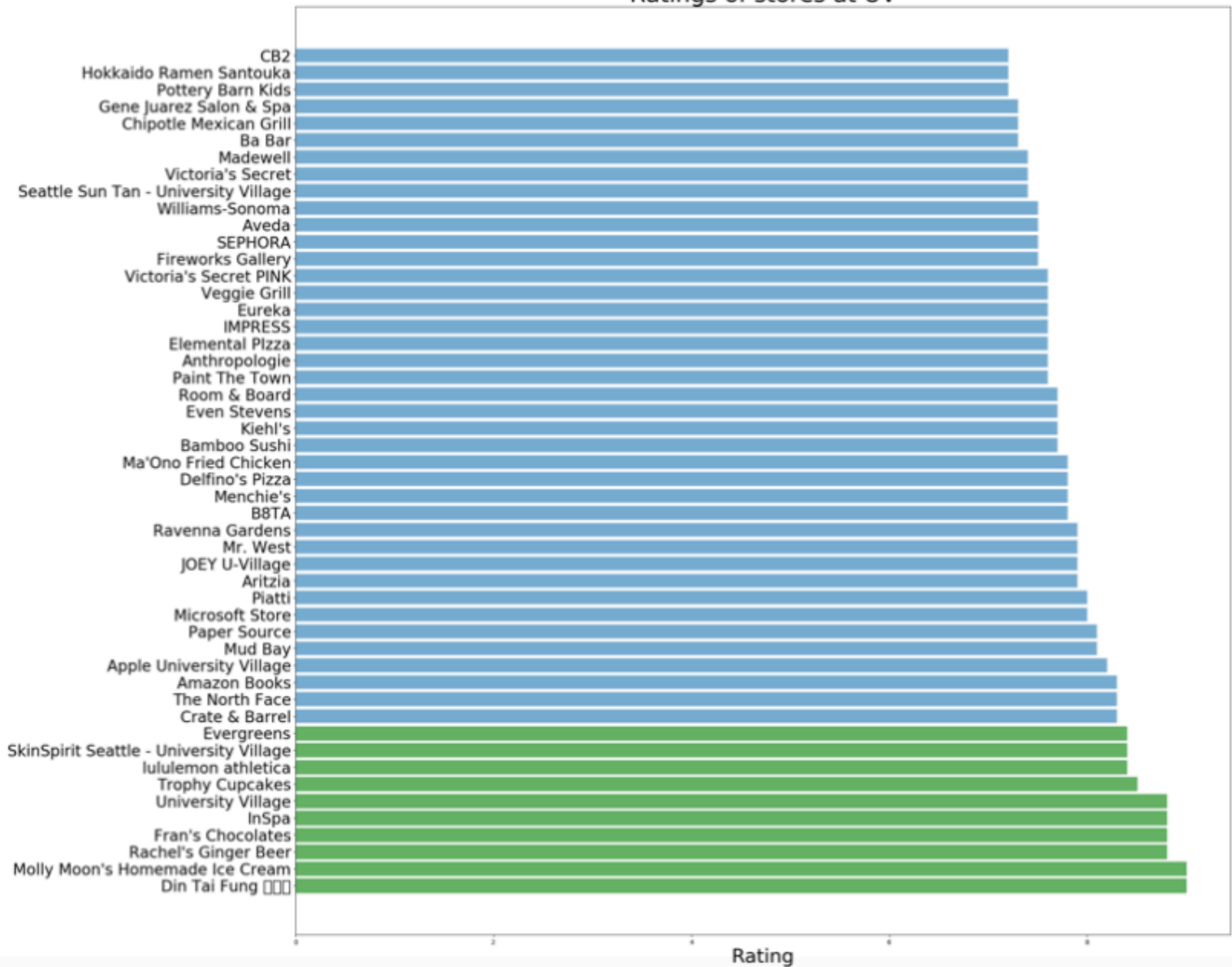

University Village

At University Village, most frequent stores are furniture/home stores, crafts stores, women's stores, and cosmetics shops. The followings are electronic stores, pizza places, and spa.

Let's see how stores are ranked based on their ratings.

Ratings of stores on the Ave

The top 10 places on the Ave are Sweet Alchemy Ice Cream, Pink Gorilla, Shawarma King, Neptune Theater, Portage Bay Cafe, Henry Art Gallery, Sizzle & Crunch, Drumheller Fountain, Trinity Market, Portage Bay Grange Feed & Mercantile.

Ratings of stores at UV

The top 10 places at University Village are Din Tai Fung, Molly Moon's Ice Cream, Rachel's Ginger Beer, Fran's Chocolates, InSpa, Trophy Cupcakes, Lululemon, SkinSpirit Seattle, Evergreens, Crate & Barrel.

Discussion

Seattle is a metropolitan city surrounded by nature. Most services and stores are centered around Seattle and scatter through other cities. If you want to hike or breathe in some fresh air during weekends, places around Seattle, such as Snoqualmie forest, will be good choices. Within Seattle, Downtown Seattle and University Districts are the most popular districts. You can also check out places near Lake Union, Washington Park, Ballard, etc. Information about venues near the University of Washington also gives us an idea of what to expect near campus. University Village is a good place to shop and walk around, while 15th Ave is a good place to eat with more choices of cafes and restaurants.

In future studies, more detailed analysis can be done by examining venues in each district and find top-rated places in each. More information about venues, such as reviews, can also be added to the data frame. Except for shops and restaurants, parks and trails in Seattle should be discussed as well.

Conclusion

As one of the most popular cities in the U.S., there are abundant services provided for both residents and visitors. Exploring neighborhoods around Seattle gives us a better understanding of how this city is like. Not only visitors benefit from the information, people who are interested in opening a business in Seattle can also employ it to think of a better plan, including what business to do and where to do it.

References

1. GeoNames geographical database - https://www.geonames.org/postal-codes/US/WA/washington.html
2. Foursquare API - https://developer.foursquare.com