

### Introduction and Problem Statement.

As Covid-19 stay-at-home orders persist in Seattle(1), families are getting more than a little antsy cooped up inside—which makes outdoor activities a great way to get a change of scenery. Moreover, if you choose your destination wisely, it can seriously de-stress you. In a 2020 study published in *Environment and Behavior*, people experiencing chronic life stress who spent 40 minutes walking outside in nature experienced greater decreases in the stress hormone cortisol than those who walked either indoors on a treadmill or who watched nature programming on TV for the same amount of time(2). As the restrictions include a ban on non-essential travel, neighborhood parks provide a way to get outside, without travelling too far from home.

The ideal parks should have a range of activities for the family, and be close to restaurants for getting take-out.

This project will provide an analysis of Seattle parks based on their available amenities and nearby restaurants. The nearby restaurants will further be profiled based on the number and types of restaurants present in an area around the parks.

1. Official Governor Inslee Stay at home order:  
([https://www.governor.wa.gov/sites/default/files/SafeStartWA\\_4May20\\_1pm.pdf](https://www.governor.wa.gov/sites/default/files/SafeStartWA_4May20_1pm.pdf))
2. Olafsdottir, G., Cloke, P., Schulz, A., van Dyck, Z., Eysteinnsson, T., Thorleifsdottir, B., & Vögele, C. (2020). Health Benefits of Walking in Nature: A Randomized Controlled Study Under Conditions of Real-Life Stress. *Environment and Behavior*, 52(3), 248–274. <https://doi.org/10.1177/0013916518800798>

### Data and Tools.

To identify suitable candidate park locations, we use two data sources: Data.gov and Foursquare, listed below. The Data.gov obtained dataset includes a listing of Seattle parks within city limits, including their individual latitude/longitude and amenities(eg: boat ramps, play structures, soccer fields...). This will be used to both geolocate the parks, and identify the parks with the largest variety of different amenities. The geolocation will be used as input for Foursquare to obtain nearby restaurant information and generate the map. This will help families select their park destination.

1. Data.gov (<https://catalog.data.gov/dataset/seattle-parks-and-recreation-parks-features>)
2. Foursquare developer places database which enables searches of restaurants within walking distance of a park, and classification of types of food (<https://developer.foursquare.com/places>)

### Methodology

#### Stage 1 - Requirements Understanding

## **Getting Outdoors with the Family**

As stated in the previous section of this report, our main goal is to find nearby outdoor parks in Seattle with a range of activities to enjoy. Our fictional sponsor is a Queen Anne neighborhood parent group looking for places to go with their kids in Seattle right now.

### **Stage 2 - Analytic Approach**

To decide the ideal parks, we must identify the key factors which drive the attractiveness for families. Factors include:

- 1) Variety of available activities at the park
- 2) Number of activities at the park
- 3) Types of nearby restaurants
- 4) Proximity to nearby restaurants
- 5) Variety of nearby restaurants

After the necessary data preparation (collection, encoding and normalization) the parks will be clustered into five groups using the k-means clustering algorithm. To solve our business problem, the characteristics of each cluster will be further studied.

### **Stage 3 - Data Requirements**

As stated in the Data & Tools section, the data requirements for this research are the park and restaurant information in Seattle. Consequently, information about the restaurants (cuisine and geographical coordinates) are also necessary.

## **Analysis**

### **Data Preparation.**

The next important step is the preparation of the data for the clustering/classification algorithms we are going to use later. Usually, only numeric inputs are valid in these algorithms, so in this section of our Jupyter Notebook the dataframes with venue data collected and classified so far is encoded, creating a bigger dataframe following the model. This data is then grouped for each Neighborhood, resulting in a dataframe with the number of venues in each category for each neighborhood. With this data prepared, we can generate several rich visualizations about the statistical venue makeup of New York and Seattle.

The required data is collected in the first parts of the Jupyter Notebook. Seattle park information are pulled from the data.gov file. At this point the data is organized in a Pandas DataFrame like the following:

## Getting Outdoors with the Family

	Name	lng	lat	hours	Feature_Desc
0	12th and Howe Play Park	-122.372985	47.636097	6 a.m. - 10 p.m.	Play Area
1	12th Ave S Viewpoint	-122.317765	47.577953	6 a.m. - 10 p.m.	View
2	14th Ave NW Boat Ramp	-122.373536	47.660775	4 a.m. - 11:30 p.m.	Boat Launch (Hand Carry)

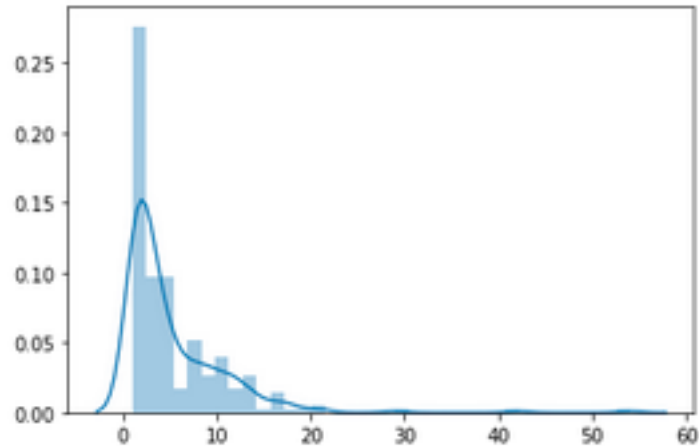
There are 288 parks which include 66 unique categories of amenities. The amenities include:

This reflects the variety of available activities at the parks:

- Play Area
- View
- Boat Launch (Hand Carry)
- Boat Launch (Motorized)
- Waterfront
- Paths
- Fire Pit
- Paths (ADA Compliant)
- Picnic Sites
- Rental Facility
- Restrooms
- Restrooms (ADA Compliant)
- Fishing
- Tennis Court (Outdoor)
- Green Space
- Woods
- Adult Fitness Equipment
- Play Area (ADA Compliant)
- Pesticide Free
- Skatepark
- Wading Pool or Water Feature
- Historic Landmark
- P-Patch Community Garden
- Weddings and Ceremonies
- Dog Off Leash Area
- Community Building
- Garden
- Bike Trail
- Baseball/Softball
- Soccer
- Tennis Lights
- Environmental Learning Center
- Hiking Trails
- Creek
- Picnic Sites (ADA Compliant)
- Basketball (Half)
- Basketball (Full)
- Tennis Backboard (Outdoor)
- Track
- Community Center
- Decorative Fountain
- Golf
- Guarded Beach
- Pool (Indoor)
- Cricket
- Lawn Bowling
- Bike Polo
- Football
- Skatespot
- Model Boat Pond
- Boat Moorage
- Horseshoe Pits
- Pool (Outdoor)
- Disc Golf
- Tidelands
- Marination Ma Kai
- Scuba Diving
- NO Beach Access
- Lacrosse
- Rugby
- Ultimate
- BMX Dirt Jumps
- T-Ball
- Flag Football
- Zipline
- Pickleball Court

With the data collected at this point we can visualize a distribution of the number of parks with different numbers of amenities using Seaborn distribution plot. This reflects the number of activities at each park.

## Getting Outdoors with the Family



**Number of amenities at each park.**

From this we find that there are only 14 parks with more than 15 amenities, that's 4.86%. Further analysis reveals that, the 14 parks which have more than 15 amenities each include:

- Carkeek Park
- Discovery Park
- Jefferson Park
- Golden Gardens Park
- Green Lake Park
- Judkins Park and Playfield
- Lincoln Park
- Mt. Baker Park
- Seward Park
- Warren G. Magnuson Park
- Woodland Park
- Meadowbrook Playfield
- Magnolia Playfield
- Hiawatha Playfield

The next step is to use the park location information to we now use the Foursquare API to collect restaurant data. Using the geographical coordinates of each park, API calls are made requesting the top 100 venues in a radius of 2500 meters. The results are inserted in a new pandas dataframe. We calculate **the proximity of each park to nearby restaurants**. The results are used to create a Pandas Dataframe like the following:

## Getting Outdoors with the Family

	Park	ParkLatitude	ParkLongitude	Venue	VenueLatitude	VenueLongitude	VenueCategory	Distance
0	12th and Howe Play Park	47.636097	-122.372985	Fuji Bakery	47.628231	-122.370457	Bakery	894.991699
1	12th and Howe Play Park	47.636097	-122.372985	S & L	47.639562	-122.364777	Bakery	727.208671
2	12th and Howe Play Park	47.636097	-122.372985	How To Cook A Wolf	47.638649	-122.356932	Italian Restaurant	1239.285194
3	12th and Howe Play Park	47.636097	-122.372985	Taco Time	47.629591	-122.371722	Taco Place	729.560773
4	12th and Howe Play Park	47.636097	-122.372985	Bite Box	47.639423	-122.361439	Bistro	943.157304
5	12th and Howe Play Park	47.636097	-122.372985	Homegrown	47.638472	-122.357048	Sandwich Place	1226.420285
6	12th and Howe Play Park	47.636097	-122.372985	Eden Hill	47.638698	-122.357034	Restaurant	1233.089654
7	12th and Howe Play Park	47.636097	-122.372985	Mezcaleria Oaxaca	47.637899	-122.357230	Mexican Restaurant	1200.807354
8	12th and Howe Play Park	47.636097	-122.372985	Caffe Ladro	47.638644	-122.357090	Café	1227.565810
9	12th and Howe Play Park	47.636097	-122.372985	Pagliacci Pizza	47.648727	-122.378492	Pizza Place	1463.983421

The types of restaurants near the parks include:

The restaurant types near parks include:

- Bakery
- Italian Restaurant
- Taco Place
- Bistro
- Sandwich Place
- Restaurant
- Mexican Restaurant
- Café
- Pizza Place
- Donut Shop
- Seafood Restaurant
- Cajun / Creole Restaurant
- Breakfast Spot
- German Restaurant
- Vietnamese Restaurant
- American Restaurant
- Chinese Restaurant
- Food Truck
- French Restaurant
- Greek Restaurant
- Burger Joint
- Korean Restaurant
- Noodle House
- Thai Restaurant
- Japanese Restaurant
- Salad Place
- New American Restaurant
- Irish Pub
- Sushi Restaurant
- Fondue Restaurant
- Mediterranean Restaurant
- Turkish Restaurant

- Spanish Restaurant
- Taiwanese Restaurant
- Diner
- Dumpling Restaurant
- Vegetarian / Vegan Restaurant
- BBQ Joint
- Asian Restaurant
- Cuban Restaurant
- Caribbean Restaurant
- Ethiopian Restaurant
- Hawaiian Restaurant
- Szechuan Restaurant
- Food Court
- Hotpot Restaurant
- Poke Place
- Deli / Bodega
- South American Restaurant
- Bagel Shop
- Fish & Chips Shop
- Creperie
- Wings Joint
- Hot Dog Joint
- Dim Sum Restaurant
- Tapas Restaurant
- Latin American Restaurant
- Gastropub
- Scandinavian Restaurant
- Indian Restaurant
- Fried Chicken Joint
- Eastern European Restaurant
- Food
- Australian Restaurant
- Middle Eastern Restaurant
- Falafel Restaurant

- Fast Food Restaurant
- Steakhouse
- Ramen Restaurant
- Udon Restaurant
- Southern / Soul Food Restaurant
- African Restaurant
- Soup Place
- Snack Place
- Burrito Place
- Tex-Mex Restaurant
- Moroccan Restaurant
- Food Stand
- Malay Restaurant
- Lebanese Restaurant
- Argentinian Restaurant
- Filipino Restaurant
- Doner Restaurant
- Indonesian Restaurant
- Polish Restaurant
- Comfort Food Restaurant
- Brazilian Restaurant
- Gluten-free Restaurant
- Kebab Restaurant
- Cafeteria
- Peruvian Restaurant
- Russian Restaurant
- Jewish Restaurant
- Peking Duck Restaurant
- North Indian Restaurant
- Pet Café
- Sri Lankan Restaurant

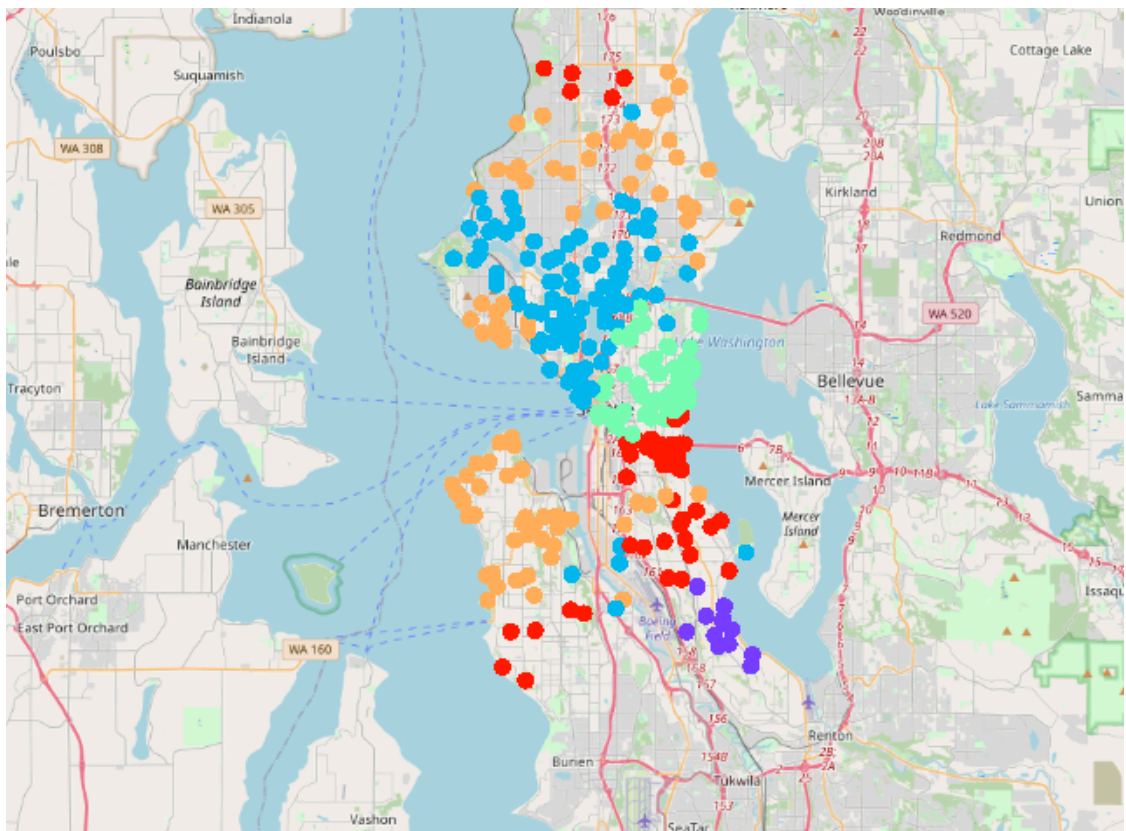
Data Encoding.

## Getting Outdoors with the Family

The next important step is the preparation of the data for the clustering/classification algorithms we are going to use later. Usually, only numeric inputs are valid in these algorithms, so in this section of our Jupyter Notebook the dataframes with venue data collected and classified so far is encoded, creating a bigger dataframe following the model. This data is then grouped for each park, resulting in a dataframe with the number of restaurants in each category around each park. With this data prepared, we can generate several rich visualizations about the statistical venue makeup of Seattle.

### Clustering

We use k-means clustering of the restaurant data to identify 5 major regions of restaurants. We generate an overlay of the clusters onto the park data to show the types of nearby restaurants for each of the parks, and how it corresponds to geographic location within the city. This reveals the **variety of nearby restaurants**, our last criteria.



**Clusters of parks, based on the types of restaurants in their vicinity**

Analysis of the clusters indicates relative prevalence of certain restaurant types in each cluster, in this case, Mexican and fast food restaurants in the purple cluster to the far

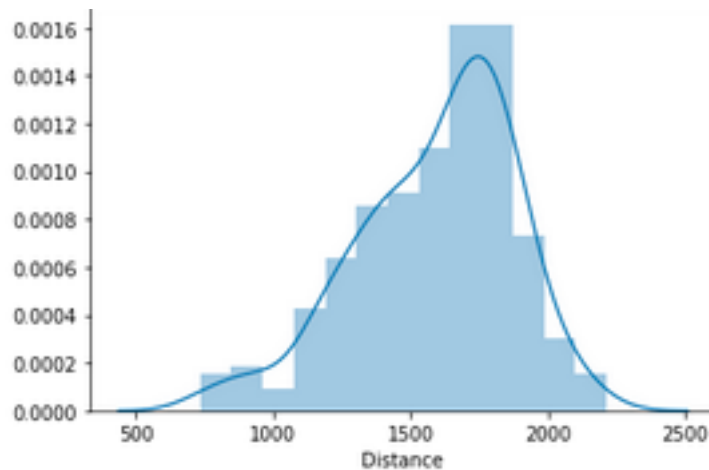
## Getting Outdoors with the Family

southeast, while the tan cluster consists of a large number of pizza restaurants on the outskirts of the city in the north. As might be expected, the cyan cluster near the city center is more diverse cuisine,

	Park	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
872	Atlantic City Boat Ramp	1	Mexican Restaurant	Vietnamese Restaurant	Café	Fast Food Restaurant	Food
1320	Beer Sheva Park	1	Mexican Restaurant	Vietnamese Restaurant	Fast Food Restaurant	Café	Food
2619	Chinook Beach Park	1	Mexican Restaurant	Food	Fast Food Restaurant	Café	Vietnamese Restaurant
8103	Kubota Garden	1	Fast Food Restaurant	Mexican Restaurant	Café	Bakery	Restaurant
8582	Lakeridge Park	1	Vietnamese Restaurant	Fast Food Restaurant	Mexican Restaurant	Sandwich Place	Café
8606	Lakeridge Playfield	1	Vietnamese Restaurant	Fast Food Restaurant	Food	Sandwich Place	Mexican Restaurant
13316	Pritchard Island Beach	1	Mexican Restaurant	Vietnamese Restaurant	Café	Fast Food Restaurant	Food
13663	Sturtevant Ravine	1	Vietnamese Restaurant	Mexican Restaurant	Bakery	Café	Fast Food Restaurant
18944	Benefit Playground	1	Mexican Restaurant	Café	Vietnamese Restaurant	Bakery	Fast Food Restaurant
20443	Hutchinson Playground	1	Mexican Restaurant	Ethiopian Restaurant	Fast Food Restaurant	Food	Sandwich Place

### Filtering

To identify park recommendations, we filter the parks based on which parks have the closest food. There are 130 parks less than a mile from restaurants, that's 45.14%, but only 3 parks are less than a 1/2 mile from restaurants, that's 1.04%. Again, we visualize with a distribution plot.



**Restaurant distance from each park.**

The 3 parks which are less than a half mile from restaurants include:

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----Cal Anderson Park and Bobby Morris Playfield----

	venue	freq
0	Café	7.0
1	Bakery	7.0
2	Italian Restaurant	6.0
3	Ramen Restaurant	5.0
4	American Restaurant	4.0

----Regrade Park----

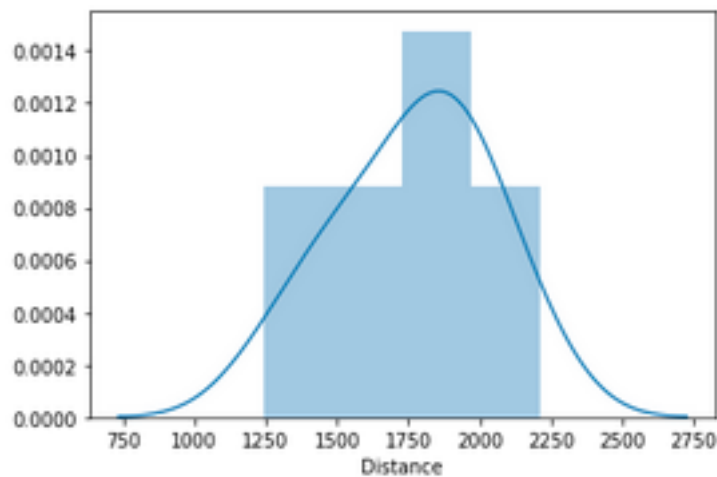
	venue	freq
0	Breakfast Spot	8.0
1	Bakery	6.0
2	Seafood Restaurant	6.0
3	Italian Restaurant	6.0
4	Pizza Place	5.0

----Westlake Park----

	venue	freq
0	Breakfast Spot	7.0
1	Bakery	6.0
2	Italian Restaurant	5.0
3	Sandwich Place	5.0
4	Seafood Restaurant	5.0

They include the following

Since we were looking for parks with the largest variety of activities and the closest restaurants, we further filter for the union of these two criteria. Of the 14 total parks with 15 or more amenities, there are 4 parks less than a mile from restaurants, that's 28.57%.



**Restaurant distance from the larger parks.**

The 4 parks which have more than 15 amenities and within a mile of food are:



## Getting Outdoors with the Family

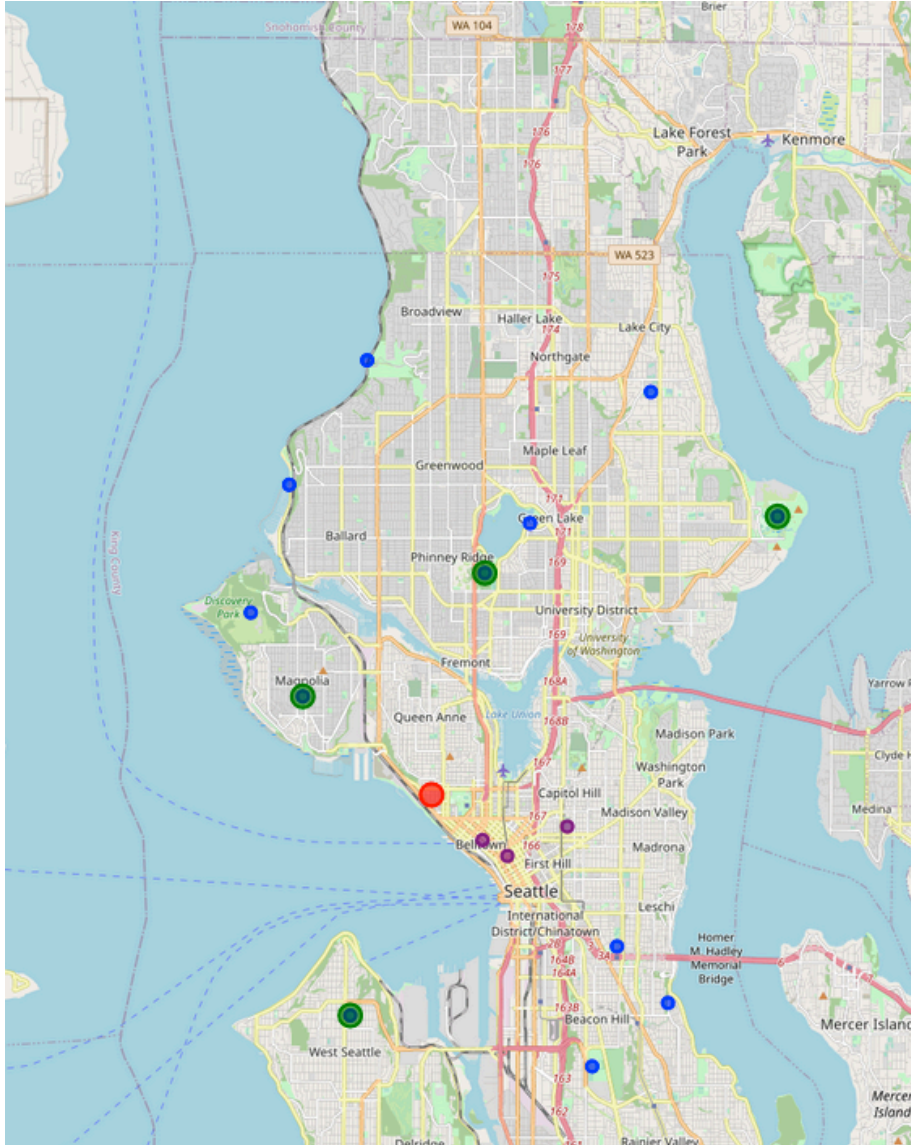
----Warren G. Magnuson Park----			----Magnolia Playfield----		
	venue	freq		venue	freq
0	American Restaurant	25.0	0	Sandwich Place	13.0
1	Food Truck	25.0	1	Pizza Place	13.0
2	Café	12.0	2	Japanese Restaurant	9.0
3	Pizza Place	12.0	3	Café	6.0
4	Greek Restaurant	12.0	4	Asian Restaurant	4.0

----Woodland Park----			----Hiawatha Playfield----		
	venue	freq		venue	freq
0	Pizza Place	11.0	0	Pizza Place	13.0
1	Burger Joint	5.0	1	Mexican Restaurant	9.0
2	Japanese Restaurant	5.0	2	Italian Restaurant	5.0
3	Café	5.0	3	Asian Restaurant	5.0
4	Indian Restaurant	4.0	4	American Restaurant	5.0

Finally, to help visualize these recommendations, we again call on Folium. The small blue dots correspond to the 14 parks with greater than 15 amenities each. The larger green dots correspond to the subset of those parks which also are within 1 mile of restaurants. Finally the small purple dots represent the parks within  $\frac{1}{2}$  mile of restaurants.

## Getting Outdoors with the Family



**Map of Seattle Parks based on number of activities in the park and proximity to restaurants**

## Results and Discussion:

Our analysis shows that although there are a lot of parks spread throughout the Seattle metropolitan area, most are small parks with less than 15 amenities. As families will want to know of food options to help them select the park they visit, we pulled lists of restaurants around each park from Foursquare, then clustered them to identify potential park areas of interest. There are a range of food options available, but there are some areas in the city with some bias towards certain types of cuisine vs others. For

## **Getting Outdoors with the Family**

example, the central southeast part of the city has more Vietnamese food options, while as you move to the far north, you get more pizza restaurant options. The preliminary segmentation was helpful to provide some general guidance to families searching for food options around their choice of park, but further analysis would be necessary to suss out deeper patterns, perhaps with street-level walkability indices as well to help decide on where to take their outdoor outing.

Further analysis broke into two different subtypes of families. For the families who don't want to walk very far from the park to find food, we filtered to 3 parks with less than 1/2 mile walking distance to restaurants. For such families, they might be better served to focus on the parks in central Seattle, near the Belltown and Capitol Hill neighborhoods. This correlates to a number of museums and attractions in the area, but during Covid, most of these are closed. As we move into later Phases of reopening, these parks might also offer additional venues, besides parks for a blend of indoor and outdoor activities. The types of restaurants tended included a blend of quick-snack and restaurant options, as expected for city-parks. For families looking for more options of things to do within the parks, the search radius was expanded to 1 mile around the parks. Since the parks with more amenities also tend to be larger, this is probably comparable distance from the perimeter of the park. There were 4 parks which met these criteria. They were a bit longer commute for families, to Green Lake, West Seattle, or up to Lake Washington. Most of the nearby restaurants were bigger-meal take out restaurants, and all had a lot of pizza options.

## **Conclusions:**

The purpose of this project was to identify park locations around the Queen Anne neighborhood in order to aid a group of families in narrowing down the search for something to do to get outside, despite current restrictions. By calculating restaurant distances from Foursquare data we have first identified several options for families, including by type of food to eat after they finish their outing. We found 3 options for those wanting a more casual outing in the city parks, and 4 options for those looking for more variety of activities. This doesn't imply these are the only outdoor options, nor does it take into account the relative walkability indices of the neighborhoods around the parks. Recommended parks should therefore be considered only as a starting point for more detailed analysis, perhaps also considering the bike and running trails around the city and including criteria for types of activities suitable to different age children and family activity levels.