

# Insights to Neighborhoods in Providence, RI

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## 1. Introduction

### 1.1 Background

The city is situated at the mouth of the Providence River at the head of Narragansett Bay. Providence was one of the first cities in the country to industrialize and became noted for its textile manufacturing and subsequent machine tool, jewelry, and silverware industries. It is well known for having diverse food, culture, art, and events around the city.

### 1.2 Problem

A local land developer in the Providence, RI area is looking for an area to build luxury apartments. We will be finding the best location(s) in the city to build based on amenities.

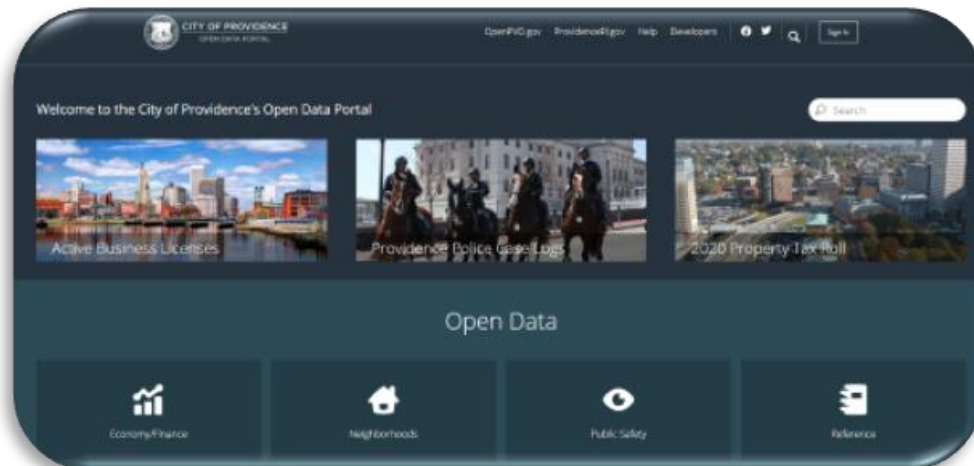
### 1.3 Interest

This information will be of use not only to land developers in the area but also people who may be looking for the best places to live in the city of Providence.

## 2. Data Acquisition and Cleaning

### 2.1 Data sources

Providence, RI has an open data site which has a neighborhood Index laying out the names of all the neighborhoods in the area. From here we created a data table with the neighborhood names and neighborhood codes and added the longitude and latitude coordinates for each neighborhood through a geocoder



## 2.2 Data cleaning

After manipulating the data from the csv file into a pandas dataframe I was able to drop duplicates and rename the columns. From there I was able to add longitude and latitude columns through geocoder to ensure I would be able to map these neighborhoods out using folium. From there I had a dataframe which looked like the following with a total of 33 rows and 4 columns:

	Neighborhood_Code	Neighborhood_Description	Latitude	Longitude
0	1010	Federal Hill	41.821210	-71.42970
1	1020	Armory	41.854455	-71.41474
2	1021	Armory (Historic)	41.823870	-71.41199
3	1200	S. Elmwood	41.783480	-71.41892
4	1210	Washington Park	41.791460	-71.39428

## 3. Methodology

### Exploratory Data Analysis

#### 3.1 Visualization of data through Folium Map

We utilized folium to make it easy to visualize data from the dataframe that we created and turn it into an interactive map. By using longitude and latitude coordinates we were able to map out the neighborhoods of the city of Providence for a better view of the layout of the city.



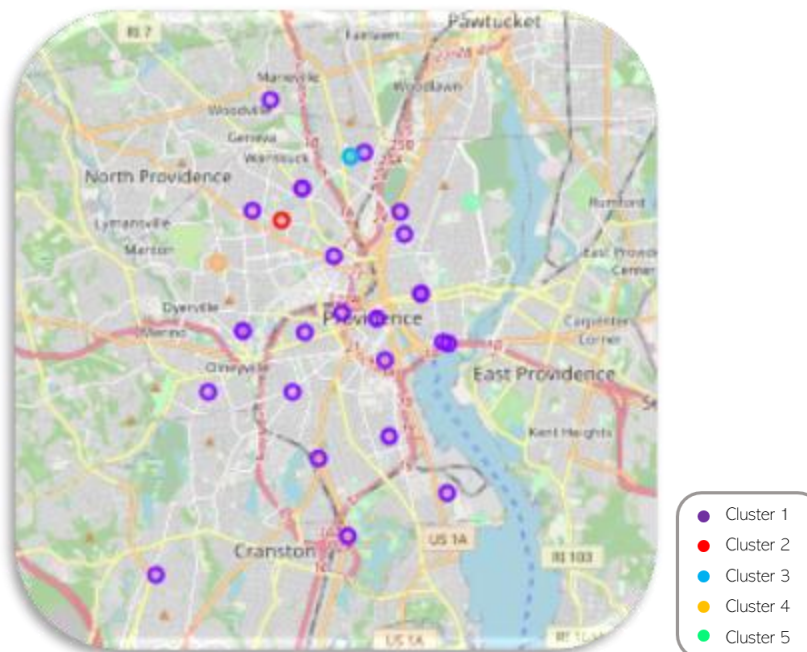
### 3.2 Finding venues through Foursquare API

We used an API through Foursquare to collect information about amenities in the area. It is a crowd-sourced data site based on a mobile based application in which users will feed information into the app about places in their communities. By using an API through Foursquare we were able to extract data based on things around specific locations, in this case, neighborhoods in Providence.

#### Modeling

### 3.3 Data clustering through K-means algorithm

We performed clustering on the data we acquired through K-means clustering. K-Means is a type of *partitioning clustering* - it divides the data into non-overlapping subsets or clusters, and it is an unsupervised algorithm. To simplify – objects (in this case neighborhoods) within a cluster are remarkably similar, and objects across different clusters are quite different or dissimilar. Here is a visualization after we have performed the algorithm:



## 4. Results

### 4.1 Cluster 1

Neighborhood_Description	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
Federal Hill	Italian Restaurant	Bar	American Restaurant	Bakery	Pizza Place	Gourmet Shop	Chinese Restaurant	Hookah Bar	Flower Shop	Mexican Restaurant
Armory	Rental Car Location	American Restaurant	Chinese Restaurant	Donut Shop	Tram Station	Convenience Store	Fishing Store	Frozen Yogurt Shop	Fried Chicken Joint	Food Truck
Armory (Historic)	Café	Bar	American Restaurant	Hotel	Gay Bar	Asian Restaurant	Sandwich Place	Greek Restaurant	Clothing Store	Theater
S. Elmwood	Food Truck	Playground	Exhibit	American Restaurant	Park	Pub	Sculpture Garden	Lake	Restaurant	Fast Food Restaurant
Washington Park	Pub	Bus Station	Pizza Place	Liquor Store	Convenience Store	Chinese Restaurant	Harbor / Marina	Hookah Bar	Donut Shop	Dog Run
Resev Triangle	Café	Bar	American Restaurant	Hotel	Gay Bar	Asian Restaurant	Sandwich Place	Greek Restaurant	Clothing Store	Theater
Elmwood	Pizza Place	Lawyer	Pharmacy	Fried Chicken Joint	Asian Restaurant	Gym	Sandwich Place	Food Truck	Food	Flower Shop
Lower South Providence	Bar	Gas Station	Donut Shop	Lounge	Yoga Studio	Furniture / Home Store	Frozen Yogurt Shop	Fried Chicken Joint	Food Truck	Food
Hospital South	Bar	Nightclub	Sandwich Place	Yoga Studio	Shipping Store	Mexican Restaurant	Coffee Shop	Gas Station	Gay Bar	Museum
West End	Liquor Store	Plaza	Donut Shop	Deli / Bodega	Park	Breakfast Spot	Farmers Market	Supermarket	Frozen Yogurt Shop	Fried Chicken Joint
East Pleasant	Gym	Bar	Liquor Store	Coffee Shop	Pizza Place	Electronics Store	Bagel Shop	Theater	Deli / Bodega	Bank
Olneyville Residential	Bakery	Yoga Studio	Tapas Restaurant	Café	Furniture / Home Store	Fried Chicken Joint	Grocery Store	Gym	Food Truck	Restaurant
Olneyville Industrial	Bakery	Yoga Studio	Tapas Restaurant	Café	Furniture / Home Store	Fried Chicken Joint	Grocery Store	Gym	Food Truck	Restaurant
Hart Silver Lake	Italian Restaurant	Asian Restaurant	Liquor Store	Home Service	Restaurant	Food Truck	Taco Place	Pharmacy	Insurance Office	Hockey Arena
Smith Hill	Dive Bar	Donut Shop	Sports Bar	Hot Dog Joint	Chinese Restaurant	Fast Food Restaurant	Convenience Store	Café	Fried Chicken Joint	Gas Station

Elmhurst	Pizza Place	Donut Shop	Playground	Sandwich Place	Park	Bakery	Liquor Store	Fried Chicken Joint	Food Truck	Food
W Wanskuck	Pharmacy	Ice Cream Shop	Liquor Store	Pub	Chinese Restaurant	Café	Pizza Place	Discount Store	Health & Beauty Service	Hardware Store
Wanskuck	Pharmacy	Ice Cream Shop	Liquor Store	Pub	Chinese Restaurant	Café	Pizza Place	Discount Store	Health & Beauty Service	Hardware Store
Woodward	Sandwich Place	Italian Restaurant	Bagel Shop	Food	Gas Station	Spa	Boxing Gym	Gym / Fitness Center	Diner	Automotive Shop
Mount Hope	Gym	Bar	Fried Chicken Joint	Pizza Place	Coffee Shop	Deli / Bodega	Theater	Hardware Store	Liquor Store	Flower Shop
Fox Point	Café	Bar	Thai Restaurant	Restaurant	Coffee Shop	Liquor Store	Breakfast Spot	Pizza Place	Ice Cream Shop	Dive Bar
Fox Point West	Italian Restaurant	Clothing Store	Bar	Hotel	American Restaurant	Cosmetics Shop	New American Restaurant	Sports Bar	Hockey Arena	Lingerie Store
College Hill E	Coffee Shop	Pizza Place	Mexican Restaurant	Food Truck	Korean Restaurant	Salon / Barbershop	Jewelry Store	Juice Bar	Clothing Store	Ramen Restaurant
Wayland	Pizza Place	Sports Bar	Liquor Store	Bank	Flower Shop	Furniture / Home Store	Frozen Yogurt Shop	Fried Chicken Joint	Food Truck	Food
College Hill 1	Coffee Shop	Pizza Place	Mexican Restaurant	Food Truck	Korean Restaurant	Salon / Barbershop	Jewelry Store	Juice Bar	Clothing Store	Ramen Restaurant
Hope Street	Café	Bar	Thai Restaurant	Park	Restaurant	Coffee Shop	Liquor Store	Breakfast Spot	Pizza Place	Ice Cream Shop
College Hill 2	Coffee Shop	Pizza Place	Mexican Restaurant	Food Truck	Korean Restaurant	Salon / Barbershop	Jewelry Store	Juice Bar	Clothing Store	Ramen Restaurant

### 4.2 Cluster 2

Neighborhood_Description	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
N Charles	Pizza Place	Fishing Store	Chinese Restaurant	Cosmetics Shop	Rental Car Location	Grocery Store	Flower Shop	Fried Chicken Joint	Food Truck	Food
S Charles	Pizza Place	Fishing Store	Chinese Restaurant	Cosmetics Shop	Rental Car Location	Grocery Store	Flower Shop	Fried Chicken Joint	Food Truck	Food

### 4.3 Cluster 3

Neighborhood_Description	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
W Blackstone	Playground	Gym / Fitness Center	Gastropub	Furniture / Home Store	Frozen Yogurt Shop	Fried Chicken Joint	Food Truck	Food	Flower Shop	Fishing Store
Blackstone	Playground	Gym / Fitness Center	Gastropub	Furniture / Home Store	Frozen Yogurt Shop	Fried Chicken Joint	Food Truck	Food	Flower Shop	Fishing Store

### 4.4 Cluster 4

Neighborhood_Description	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
Manton, Mount Pleasant	Bakery	Italian Restaurant	Massage Studio	Insurance Office	Hotel	Gastropub	Dog Run	Donut Shop	Electronics Store	Exhibit
Mount Pleasant NE	Bakery	Italian Restaurant	Massage Studio	Insurance Office	Hotel	Gastropub	Dog Run	Donut Shop	Electronics Store	Exhibit

### 4.5 Cluster 5

Neighborhood_Description	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
PC Elmhurst	Ice Cream Shop	Donut Shop	Student Center	Theater	Yoga Studio	Flower Shop	Furniture / Home Store	Frozen Yogurt Shop	Fried Chicken Joint	Food Truck

## 5. Discussion

As we can see, the majority of neighborhoods were clustered into 1 cluster, which shows us that most of these neighborhoods are quite similar. As a result, amenities alone will not allow us to narrow down the best place for luxury housing. We will need additional data to be able to understand each neighborhood better, specifically average income per neighborhood. From there we will be able to categorize these neighborhoods by average income and then having the additional information on amenities will allow the land developer to find the best possible location for their project.

## 6. Conclusion

We worked to assist in identifying areas for this developer's next project of building luxury apartments in Providence, RI based on local amenities. Through data manipulation, data visualization and a clustering algorithm we were able to identify some of the top amenities for each neighborhood throughout the city. While we were able to find this information about amenities, because Providence is such a diverse and interesting place clustering by amenities alone did not help us to specify which neighborhood was better than another. Future analysis should focus on demographics based on each neighborhood, specifically average income, to help narrow the best neighborhoods for luxury housing.