

Investment Property in Minneapolis Neighborhood

Soo Ingrisone
06/02/20

Introduction

DESCRIPTION & DISCUSSION OF THE BACKGROUND

Minneapolis is a city located in Hennepin County, Minnesota, which is along the bank of the Mississippi River, is the largest city in Minnesota with the most recent population of 437,069, and is the 45th largest city in the U.S. It is the 16th largest metropolitan area in the United States. Minneapolis is currently growing at a rate of 1.35% annually. With over 58 square miles, Minneapolis has a population density of 8,094 per square mile. The 2020 census information shows that the Twin Cities area has gained over 60,000 people since 2010 and Minneapolis is leading the growth.

Minneapolis is surrounded by lakes, creeks, and waterfalls, which are connected by parkways in the chain of lakes, and the grand round national scenic byways. Due to its ease of access, the city is ranked by having the best park system in the U.S., it is also known to be the best bike-friendly city in the United States. The city hosts various arts scenes, performing arts venues, and sporting events in three stadiums. The variety of options for cuisine, fine dining, and local foods are all around the city. Minneapolis is the major financial center. It is the 3rd largest economic center in the Midwest. The twin city metropolitan area has the 5th highest concentration of major corporate headquarters in the country which makes it the 15th richest city in the U.S. (See Wikipedia for more information: <https://en.wikipedia.org/wiki/Minneapolis>)

The fact that Minneapolis is a home to big corporations, presents various employment opportunities in the city. Besides, its rich environment makes it a desirable place to work and live. Consequently, the Minneapolis housing market is very competitive which attracts many investors to own investment property, such as a rental unit. The problem is, Minneapolis has 87 neighborhoods and is known to be the 3rd most expensive city in North America. From the investors point of view, it is desired to own a rental property with the following characteristics. Firstly, the location of the property is in a safe neighborhood where a reasonable commute to the center of the city is expected. Next, the property is priced reasonably. Lastly, it would be a plus if a neighborhood consists of assorted venues to accommodate various lifestyles. Many websites offer different aspects to Minneapolis neighborhoods, but it takes a long time for investors to review, analyze, and summarize them. Therefore, this research is an attempt to solve a problem for investors to identify the best Minneapolis neighborhood to own a rental property. The Foursquare location data is utilized to examine the proximity to the center of the city and

the venues of each neighborhood in Minneapolis in conjunction with crime data and home price data obtained from Open Minneapolis and Zillow, respectively.

Data

Four different data sources were used in this study.

1. The data containing its name and geographical coordinates of Minneapolis neighborhoods is retrieved from this Open Minneapolis site: https://opendata.arcgis.com/datasets/055ca54e5fcc47329f081c9ef51d038e_0.geojson
2. The crime rate data per Minneapolis neighborhood in 2018 was retrieved from this Open Minneapolis site: <http://opendata.minneapolismn.gov/datasets/police-incidents-2018-pims/data>
3. The median home price in Minneapolis for 2020 is obtained from the home finding website Zillow: <https://www.zillow.com/minneapolis-mn/home-values/>
4. This Foursquare location data from Minneapolis is found from this site: <https://foursquare.com/developers/apps>

The official name and geographical location of these neighborhoods are obtained from this Open Minneapolis site. The official names of all 87 Minneapolis neighborhoods in this file were used to combine the data.

In order to measure the safety of these neighborhoods, the crime data has been retrieved from Open Minneapolis sites. The 2018 version is the most current data. The crime data is cleaned to include only the necessary information, i.e., description of the offense, longitude, latitude, and the names of all the neighborhoods. During the data inspection, it is found that one neighborhood name in crime data still contains its formal name, CARAG, so it has been updated since then. 11,604 reported incidents across 33 different crime types are observed across the Minneapolis neighborhoods in 2018. It is found that three cases have a missing neighborhood name. Since the missing neighborhood name cannot be identified, these three cases are dropped from any further analysis. Therefore, 11,601 incidents across 33 different crime types are included in the study.

The median home price data in 2020 was retrieved from the site Zillow to understand the housing market across Minneapolis neighborhoods. The home price of all types is used in this study. In the Zillow data, some mismatches of neighborhood names are noticed. Most of them are due to a typo. The data is cleaned to match the official Minneapolis neighborhood names. It is noted that three industrial areas in the city, i.e., Mid-City Industrial, Camden Industrial, and Humboldt Industrial Area, do not have any home price information which is expected. These areas are excluded from the home price analysis.

The cleaned data includes 11,601 total number of incidents dealing with 33 different crime types across 87 Minneapolis neighborhoods and the home prices across 84 Minneapolis neighborhoods. Next, the cleaned data is combined with Foursquare location data to find the

available venues across 87 Minneapolis neighborhoods. It is found that there are 250 different venue categories, which imply that the city offers diverse venues. Many venues are shown less than ten times across neighborhoods. Since the data seems to be too sparse and some of the similar venues are presented with various names, like Café and Coffee Shop, it has been decided to combine features that are similar and to choose them based on the frequency of the popular venues. Subsequently, 29 features are selected. Among them, 11 features are from the Foursquare location data as is. They are a bookstore, brewery, cosmetics, food truck, salon, spa, video store, hotel, home store, home price, and number of crimes. 18 features are combined based on the similarity of the venues. The features with combined venues are listed in Table 1 with the inclusion criteria.

Table 1. Features with combined venues

Features	Features with combined venues: Inclusion criteria
art	Art Gallery, Art Museum
bakery	Bakery, Bagel, Donut, Pastry shops
deli	Deli, Sandwich place
shopping	Clothing, Boutique, Shopping Mall, Dept Store, Discount Store, Toy Store, Optical Store, Shoe Store
coffee	Coffee, Café, Tea, Juice
fastfood	Fast Food Restaurant, Fried Chicken Joint
grocery	Grocery Store, Health Food, Supermarket, Gourmet, Convenience Store, Farmers Market
gym	Gym, Fitness Center, Sports Club, Dance, Pilates and Yoga Studios
icecream	Ice Cream, Dessert shop, Frozen Yogurt shop
music	Concert Hall, Opera House, Rock Club, Music Venue
park	Park, Garden, Outdoors & Recreation, Sculpture Garden, Trail, Playground, Lake, Scenic Lookout, Historic Site
transit	Bus, Rail, Train
theater	Performing Arts Venue, Theater, Comedy Club
restaurant	All types of Restaurants
arena	Baseball, Football, Soccer Fields, Stadiums, Hockey Arena
bar	All types of Bars
alcohol	Beer, Wine, Liquor store
pet	Pet Store, Dog Run

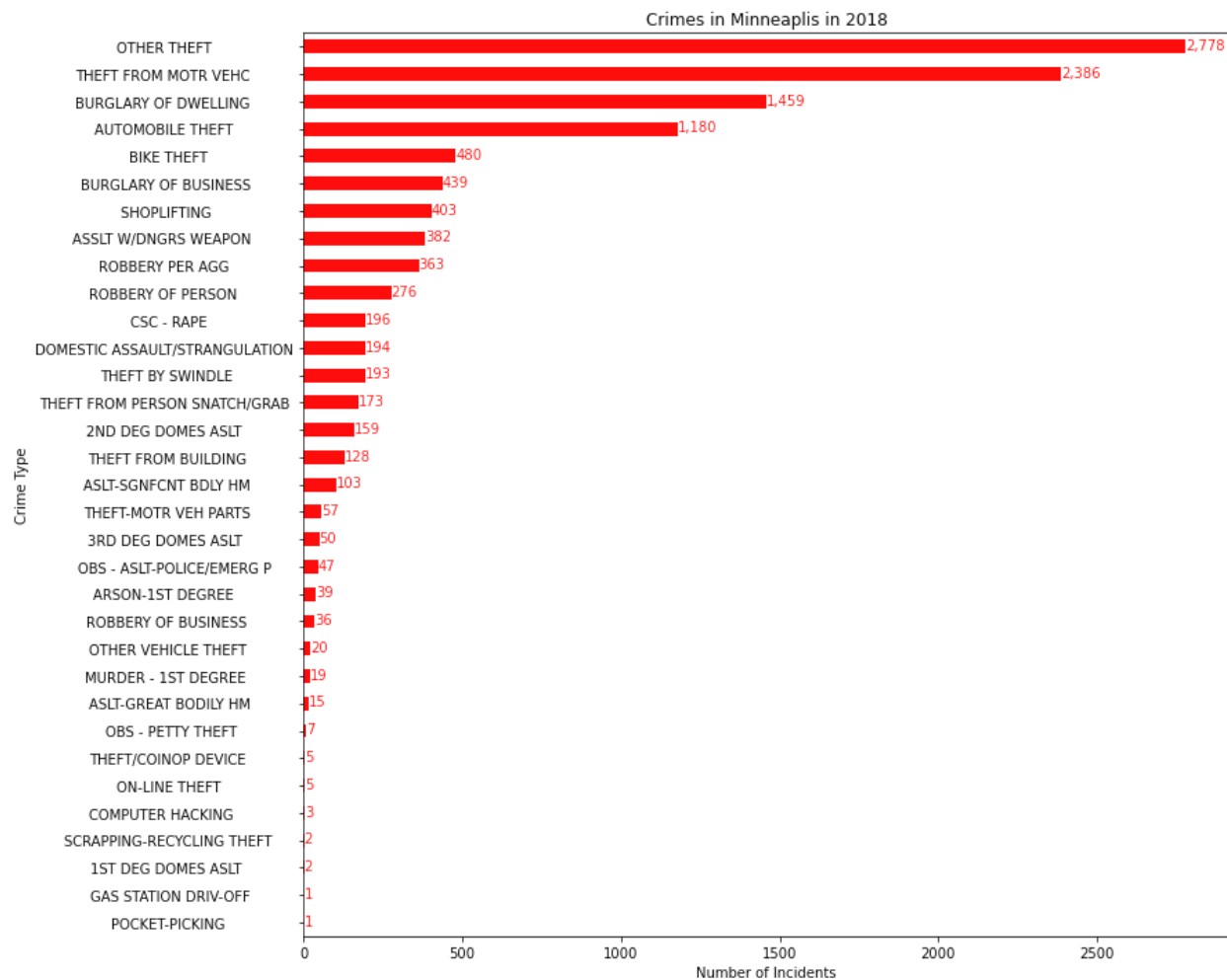
The cleaned data consists of 29 features across 87 Minneapolis neighborhoods.

Method

EXPLORATORY DATA ANALYSIS

The reported 11,601 different crimes across 87 Minneapolis neighborhoods are explored by observing the frequency distribution of the 33 different types of various incidents and the frequency of the incidents by neighborhoods (See Figure 1).

Figure 1. Crimes for Minneapolis in 2018.



Based on the 33 different types of crime frequency distribution in Figure 1, the most frequent crime is other theft, N=2,778. The least frequent crimes are both gas station drive off and pocket picking with N=1, respectively. Most crimes seem to deal with various types of theft, burglary and robbery.

In Figure 2, the incident frequency across Minneapolis neighborhoods is shown. The incidents are most frequently reported in the Downtown West neighborhood with N=1,183 and least frequently in the Humboldt industrial area with N=2. Based on the crime frequency, the top five relatively unsafe neighborhoods in Minneapolis are in the Downtown West areas, Whittier, Marcy Holmes, Lowry Hill East, and Longfellow. It is important to note that the incident reports in the Downtown West areas are far worse than any other Minneapolis neighborhoods. The frequency of incident reports are over two times more than that of the second unsafe neighborhood, Whittier, in the list. About half of the Minneapolis neighborhoods have the reported incidents above 100. 18 out of 87 neighborhoods (20%) have reported incidents less than 50.

Figure 2. Crime frequency across Minneapolis neighborhood in 2018

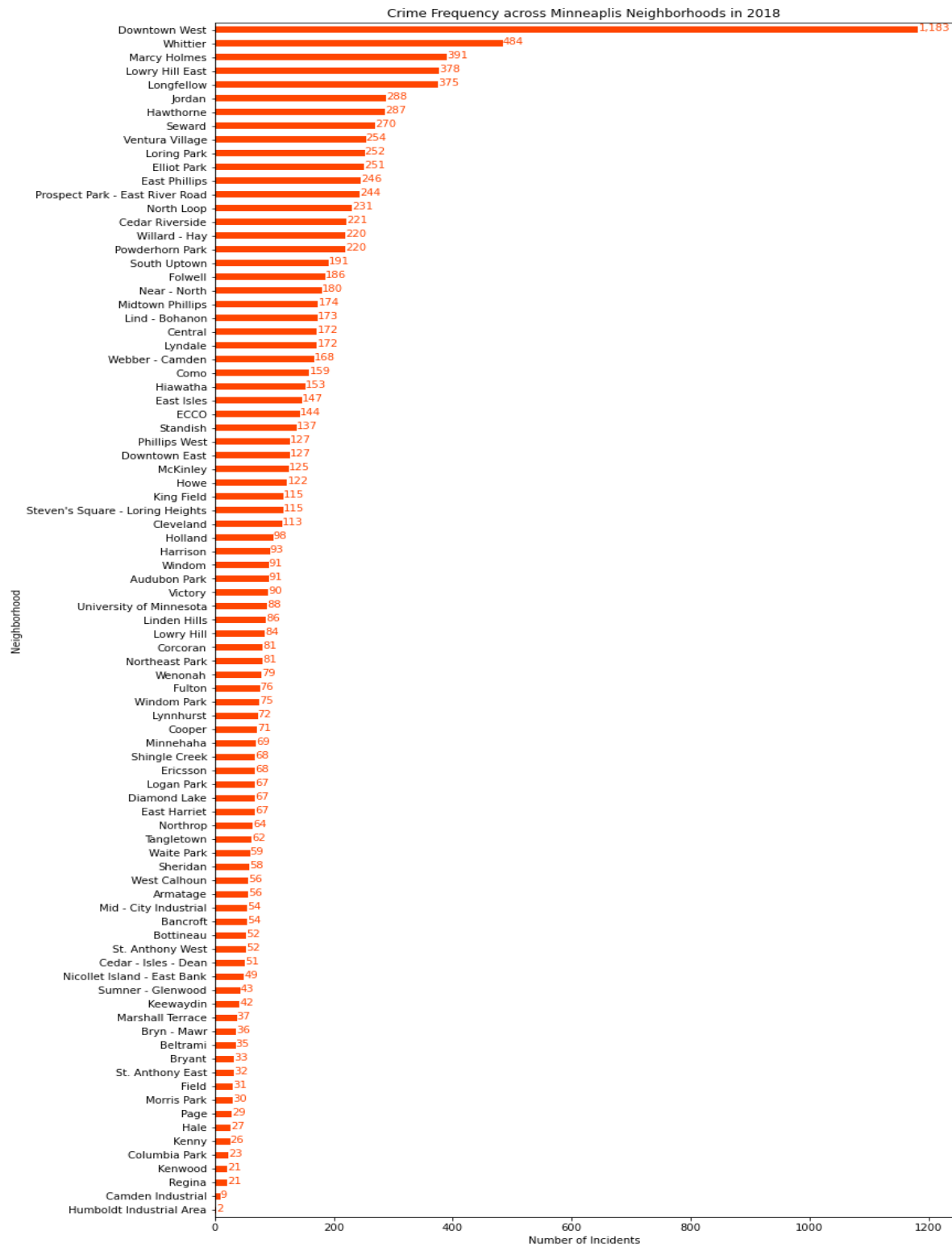
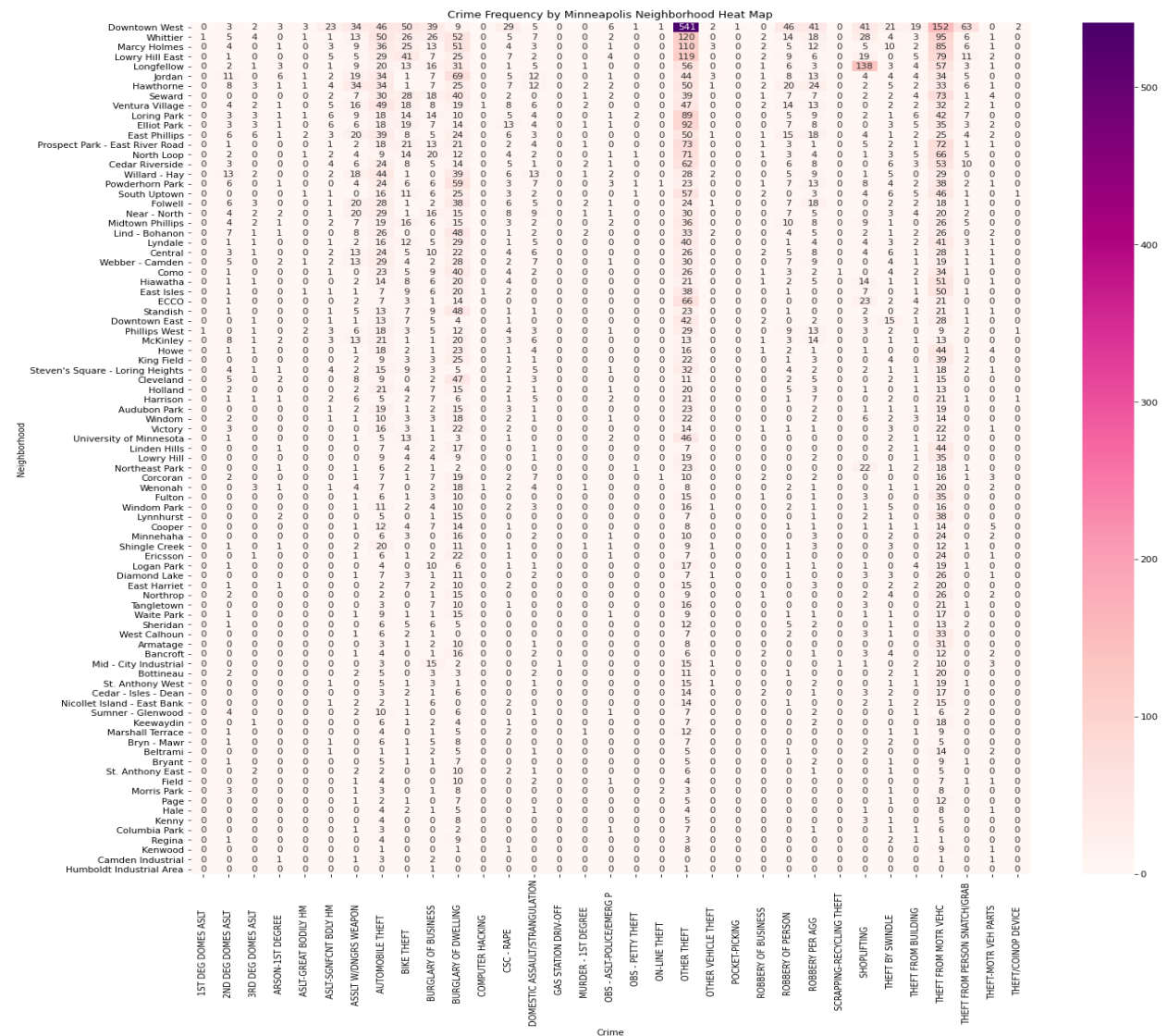


Figure 3. Heat Map: crime frequency by Minneapolis neighborhoods



The heat map in Figure 3 shows that the most frequent crime in the Downtown West neighborhood is other theft with N=541 followed by theft from motor vehicles with N=152. The same trend is observed in the first four unsafe neighborhoods. The Longfellow neighborhood seems to have shoplifting as the most frequent crime which implies a shopping area. Across Minneapolis neighborhoods, ten frequent crimes observed are theft from motor vehicles, other theft, burglary of dwelling, burglary of business, bike theft, automobile theft, assault with a dangerous weapon, robbery of person, robbery per aggression, and shoplifting.

The Minneapolis neighborhoods' geographical information is used to create two maps, i.e., a distribution of the number of crimes by location and another magnitude of crimes per neighborhood.

Figure 4. Crimes by location

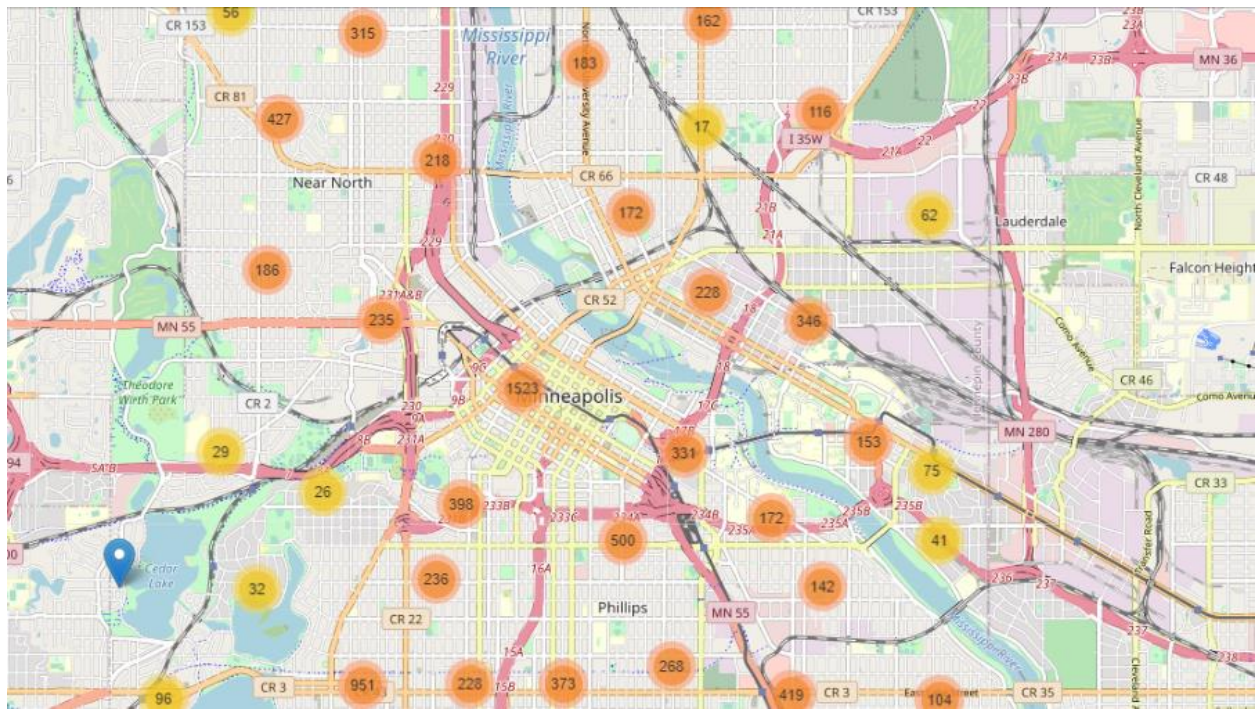
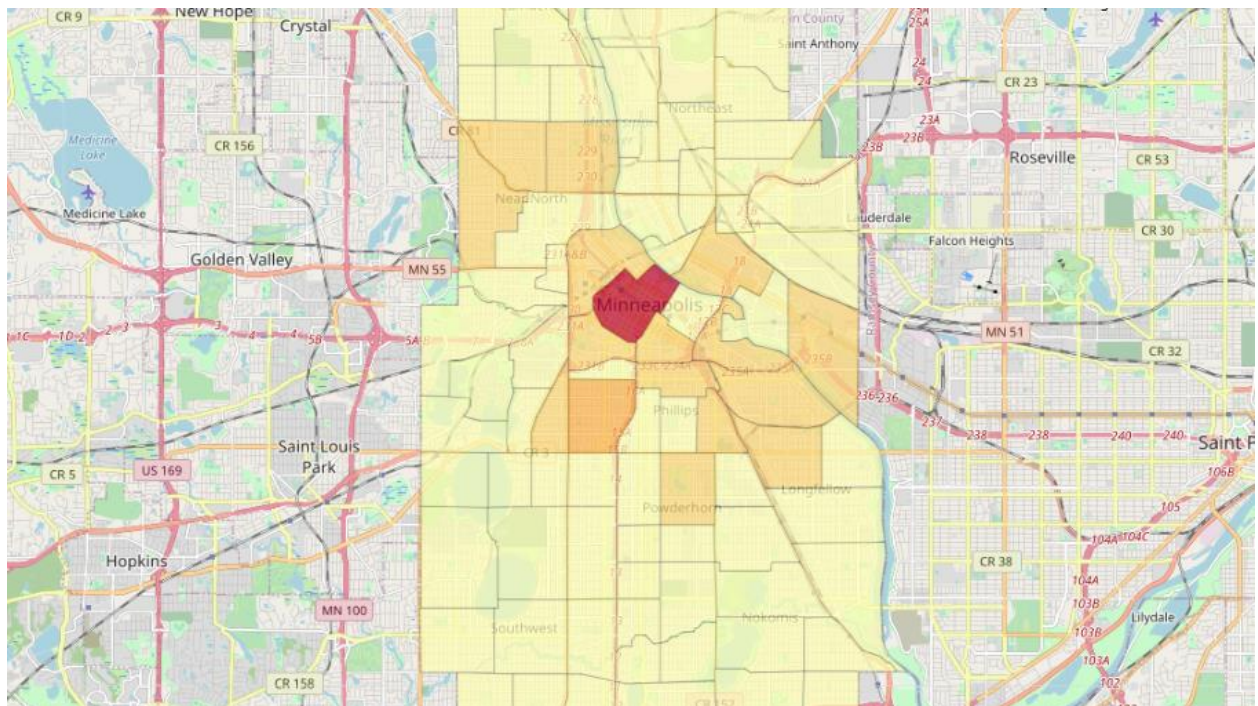


Figure 5. Magnitude of crimes per neighborhood



In Figure 4, the distribution of the number of crimes by location is depicted. The number of crimes seems to be high in downtown Minneapolis and its adjacent vicinity. In Figure 5, the magnitude of number of crimes at the neighborhood level is shown with the intensity of color

spectrum from yellow to red, where yellow represents low number of crimes, i.e. less than 200, and red represents high number of crimes, i.e. more than 986 up to 1,183. The choropleth map shows that Downtown West neighborhood in downtown Minneapolis has the highest number of crimes. One neighborhood located in the south of downtown Minneapolis (orange color on the map), Whittier, shows the second highest number of crimes, around 500. Additional 15 neighborhoods in the vicinity of downtown Minneapolis have the number of crimes ranging from 200 to 400. The rest of the Minneapolis neighborhoods seem to have the number of crimes less than 199. It is about 80% ($87-17=70$) of neighborhoods in Minneapolis.

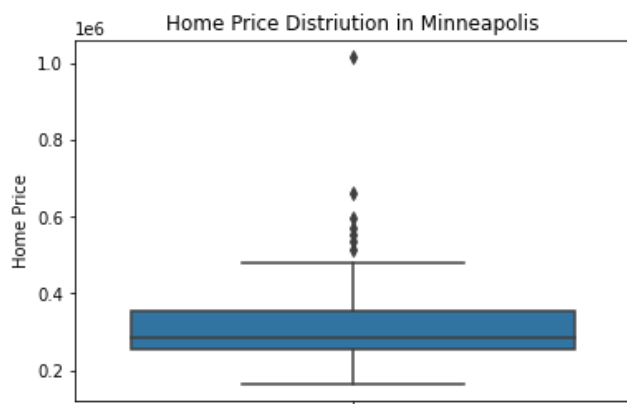
The average home price in 84 Minneapolis neighborhoods is \$318,000 (See Table 2). The median home price is \$283,000. The home prices in Minneapolis range from \$162,000 to over \$1 Million. 75% of the homes are less than \$353,000.

Table 2. Descriptive statistics on the home price

Statistics	Home Price
Mean	\$318,010
Std	\$128,357
Min	\$162,000
25%	\$253,275
50%	\$283,350
75%	\$352,975
Max	\$1,017,600

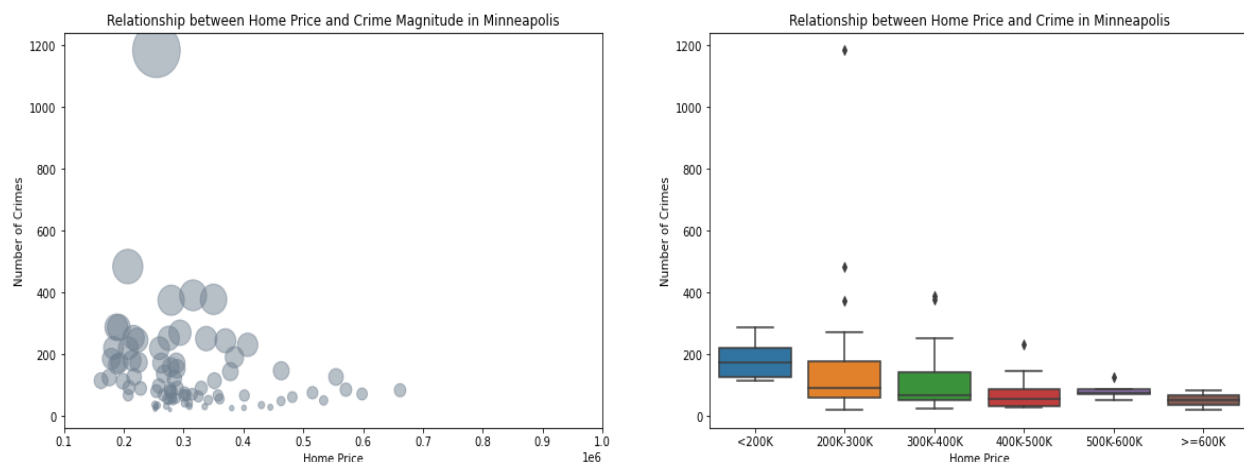
Figure 6 shows that the home price above \$500,000 seems to be outliers in Minneapolis neighborhoods.

Figure 6. Home price distribution in Minneapolis



The obtained Pearson correlation coefficient between home price and number of crimes is -0.219 with associated p-value of 0.045 (at $\alpha < .05$ level) which indicates a significant negative linear relationship. It means that the neighborhood with a high median home price has less frequent number of crimes. The trend can be visually inspected by the bubble plot and box plot (See Figure 7), and regression plot (See Figure 8).

Figure 7. Bubble plot and Box plot: number of crimes vs home price



The neighborhoods are grouped by home price into six groups, i.e. less than 200K, 200K-300K, 300K-400K, 400K-500K, 500K-600K and above 600K. The grouped neighborhoods are used in the box plot. Based on bubble plot and box plot, the crime incidents are frequently observed in the neighborhoods with home prices less than \$300K. The highest median number of crimes seem to be close to 200 for the neighborhoods with home prices below \$200K, where the number of crimes range from about 150 to 300. The neighborhoods in this group have the highest interquartile range of number of crimes compared with other neighborhoods. It is followed by the neighborhoods with home prices between \$200K to \$300K where the reported median number of crimes are around 100. However, the neighborhoods in this group include three neighborhoods with unusually high numbers of crimes, around 1200, 500 and 380, respectively. The median number of crimes seems to be around 100 for home price between \$300K to \$400K neighborhoods. However, it also includes a couple of high crime areas with a number of crimes around 400. The median number of crimes is somewhat similar across the neighborhoods with home price above \$400K, which is below 100. The interquartile range of crimes is the tightest in the neighborhoods with home price between \$500K and \$600K. The lowest median number of crimes is observed to the neighborhoods with home price above \$600K dollars. The range of the number of crimes seems to be within 100 incidents. Overall, the number of crimes seems to reduce as the home price goes up in Minneapolis neighborhoods. In general, Minneapolis neighborhoods with home prices higher than \$400K seem to be relatively safe.

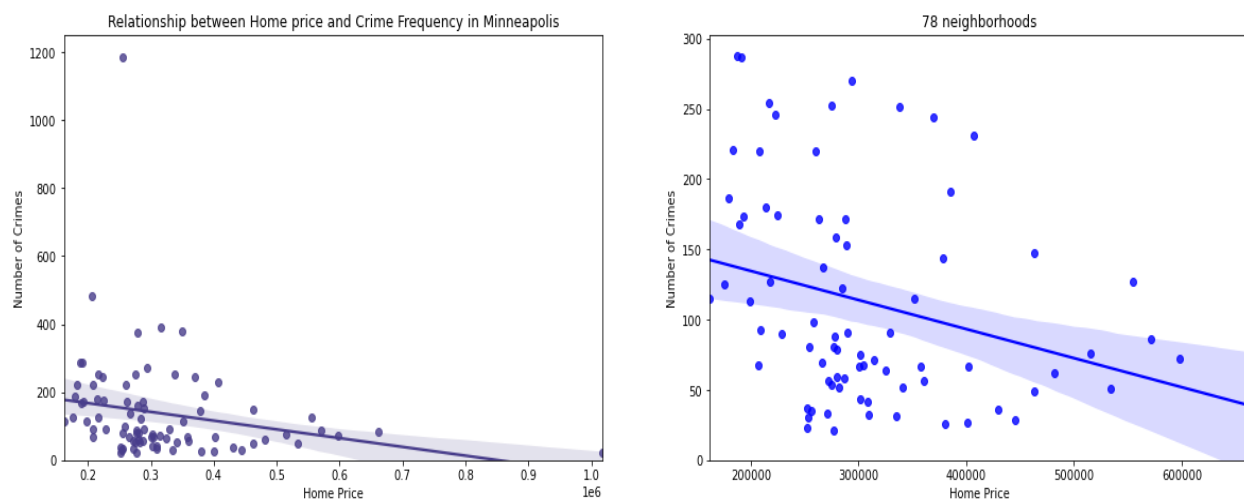
The simple regression analysis in Figure 8 (left) shows that there is a negative relationship between number of crimes and home price which is consistent with Pearson correlation

coefficient value above. Downtown West with a number of crimes, $N=1,183$, seems to be an outlier. Also, Kenwood neighborhood with the home price over \$1 million seems to be an outlier.

In sum, the top five unsafe neighborhoods are excluded from further analysis because they are undesirable areas to own a rental property. Three city industrial areas are excluded because they do not have any house for sale. Finally, the Kenwood neighborhood is excluded because its high home price is unfavorable for investors. That results in excluding nine neighborhoods in total. Thus, 78 neighbors are included in the further analysis.

After dropping those neighborhoods, the obtained Pearson correlation coefficient between home price and number of crimes is $-.294$ with associated p -value < 0.01 at $\alpha < .05$ level which indicates a significant negative linear relationship that is a bit stronger than the previous value. The regression plot without those neighbors are depicted in Figure 8 (right).

Figure 8. Relationship between home price and crime frequency in Minneapolis (84 neighborhoods vs 78 neighborhoods)



At the exploratory analysis phase, the data is further reduced, and the final data consists of 29 features across 78 neighborhoods.

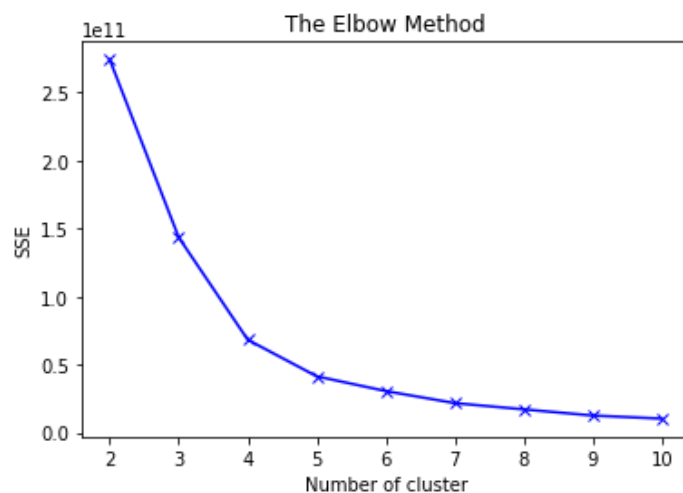
K-MEANS

The decision is made to use the K-means for neighborhood segmentation in this study to discover insights from unlabeled data, i.e. Minneapolis neighborhoods. The crime and home price data along with the Foursquare neighborhood data are used for neighborhood segmentation. As mentioned, the final data is used in K-Means.

In order to find the optimal number of clusters, two methods are used, i.e., the Elbow method, and Silhouette analysis. The Elbow method is to help select the optimal number of clusters by fitting the model with a range of values for K . It is a judgmental call to determine the elbow of the curve, which indicates the best fit of the underlying model at that point. Silhouette analysis

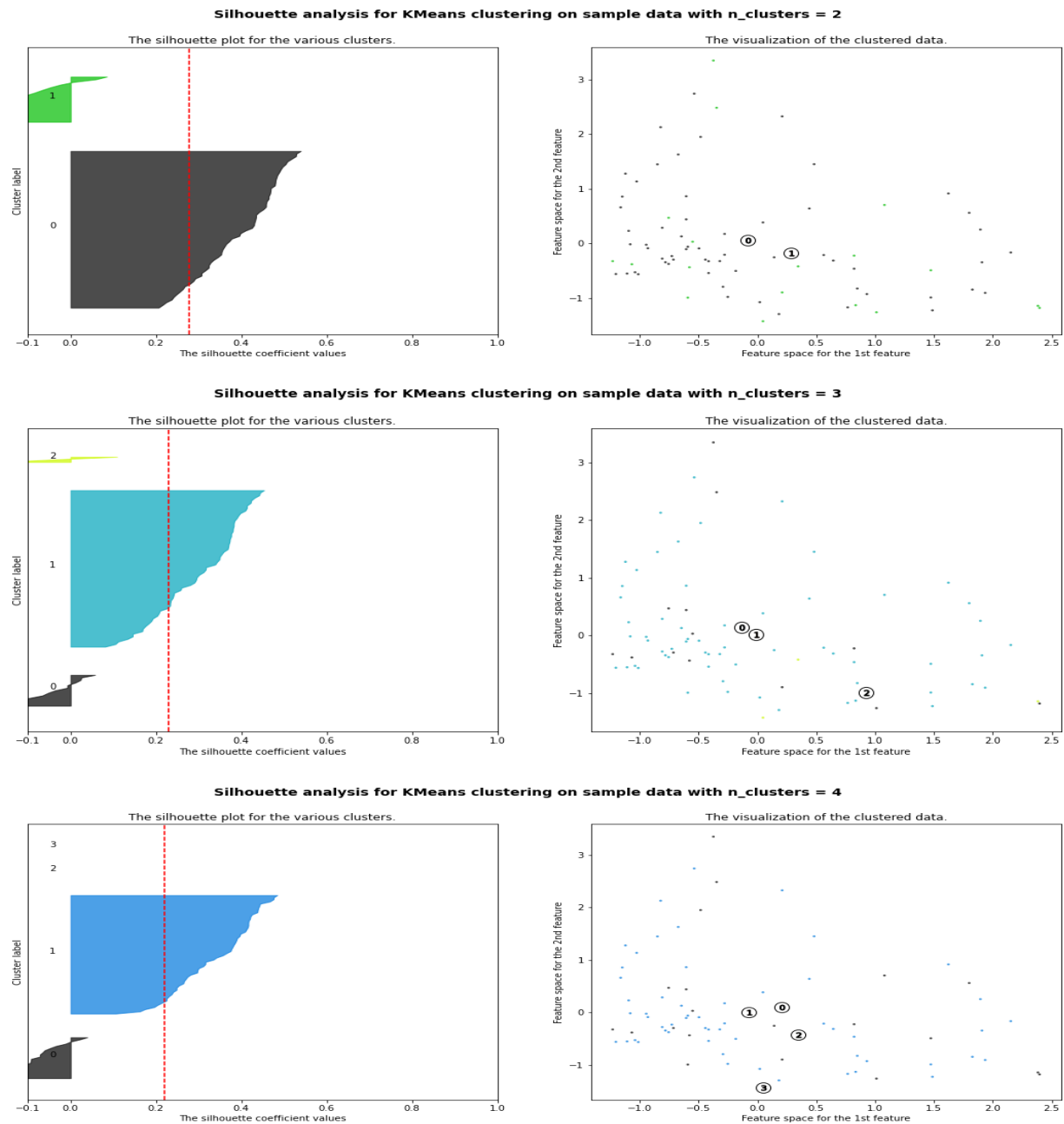
shows the separation distance between the resulting clusters. The silhouette plot displays a measure of how close each point in one cluster is to points in the neighboring clusters and thus provides a way to assess parameters like number of clusters visually. The Silhouette coefficient value ranges from -1 to 1. The value near 1 indicates that the sample is far away from the neighboring clusters. A value of 0 indicates that the sample is on or very close to the decision boundary between two neighboring clusters and negative values indicate that those samples might have been assigned to the wrong cluster.

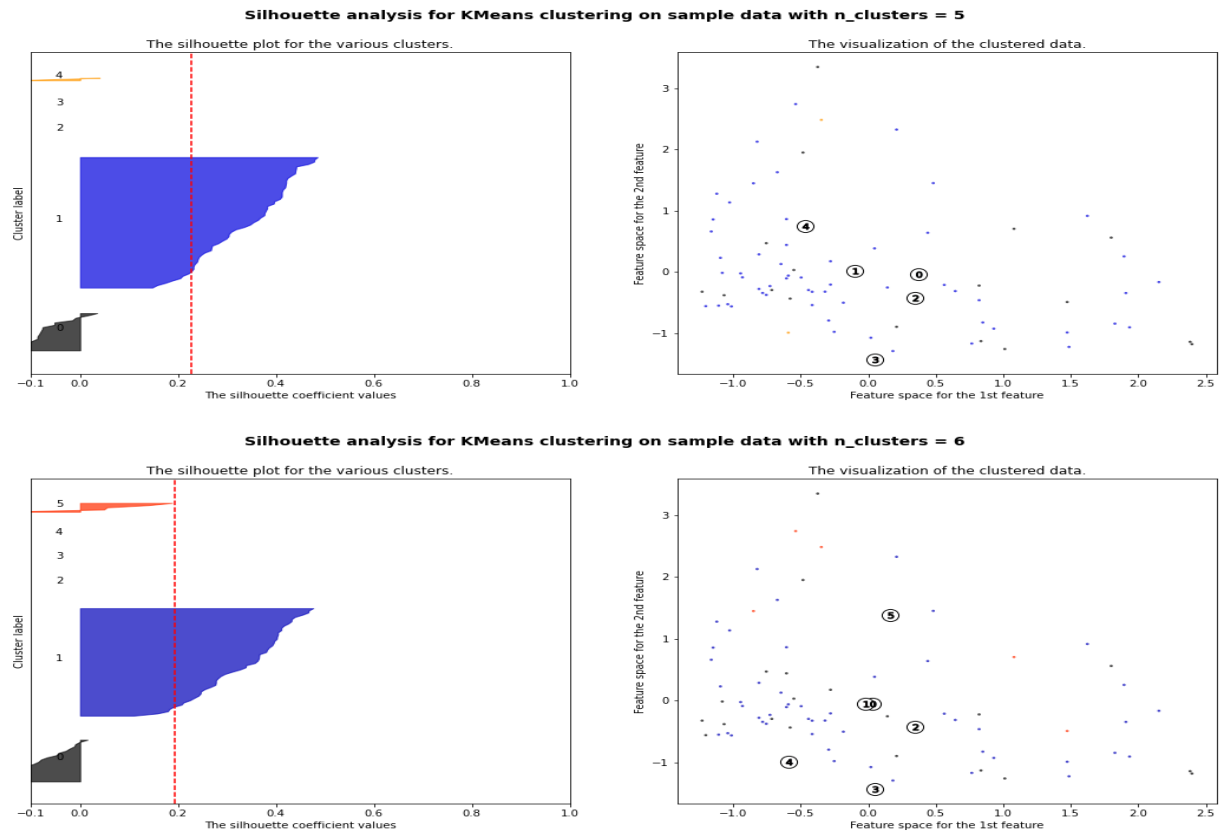
Figure 9. The Elbow method



Based on the visual inspection in Figure 9, the optional K based on the Elbow method seems to suggest K=3. N clusters ranging from 2 to 6 are used in the Silhouette method. The obtained average Silhouette scores are, .28, .23, .22, .23 and .19, respectively. According to the Silhouette method, K=2 clusters seems to be the best fit for the underlying model with the average Silhouette score of .28 (See Figure 10).

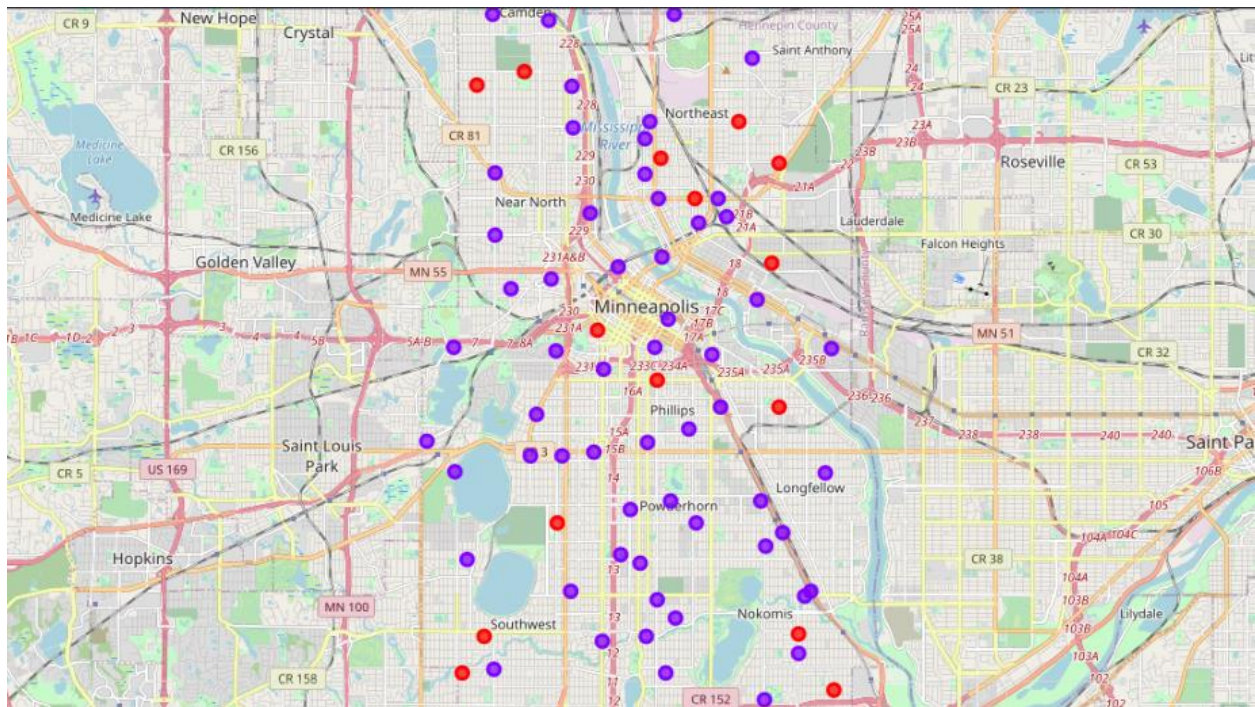
Figure 10. Silhouette analysis





The K-Means clustering is performed using $K=2$. The neighborhoods are divided into two groups of 59 and 19, respectively. After the clustering labels are applied to the data, two clustered neighborhoods are illustrated in Figure 11.

Figure 11. Two clusters of Minneapolis neighborhoods



Results

VENUES IN TWO CLUSTERS: A & B

Each cluster is examined and determined the discriminating venue categories that distinguish each cluster using the top ten common venues retrieved from Foursquare API. For convenience, two clustered areas are called as A and B areas. The frequency of common venues per area show that A (N=15) and B (N=63) areas share several common venues, such as restaurants, coffee shops, grocery stores, parks, and yoga studios. Compared to area A, area B seems to present more restaurant options including fast food, pizza and food trucks, which are desirable for a rental property.

POTENTIAL NEIGHBORHOODS FOR A RENTAL PROPERTY

The distance from the center of Minneapolis to each neighborhood is computed using its latitude and longitude to find out the proximity of every neighborhood. First, the neighborhoods are sorted by the distance from the center of the city. Then, potential neighborhoods for a rental property are selected based on two criteria: distance from the center of the city ≤ 1.5 miles and number of the crimes ≤ 50 .

Table 3. Potential neighborhoods for rental property

Neighborhood	Home Price	No of Crime	Distance from Downtown (in miles)
Nicollet Island - East Bank	\$462,900	49	0.72
St. Anthony East	\$309,600	32	1.35
Sumner - Glenwood	\$302,000	43	1.37

The results show that there is no neighborhood in area A that meets the criteria but three in area B, namely, St. Anthony East, Sumner-Glenwood and Nicollet Island-East Bank (See Table 3). Among them, Nicollet Island-East Bank neighborhood is the closest from downtown (less than 1 mile). However, the home price in Nicollet Island-East Bank neighborhood, \$462,900, is higher than the other two, so it is eliminated from the potential neighborhoods for a rental property.

The surrounding neighborhoods around these two neighborhoods are further examined to determine whether these areas are safe in general. The distances are computed using the latitudes and longitudes of two neighborhoods, St. Anthony East and Sumner-Glenwood, respectively, to identify the adjacent neighborhoods.

Table 4. Adjacent neighborhoods: St. Anthony East vs Sumner-Glenwood

Statistic	St. Anthony East		Sumner - Glenwood	
	Number of Crime	Distance (in miles)	Number of Crime	Distance (in miles)
N	5	5	5	5
mean	57	0.50	176	0.89
std	18	0.16	81	0.18
min	35	0.34	84	0.57
25%	49	0.40	93	0.94
50%	52	0.42	220	0.95
75%	67	0.66	231	0.98
max	81	0.69	252	0.99

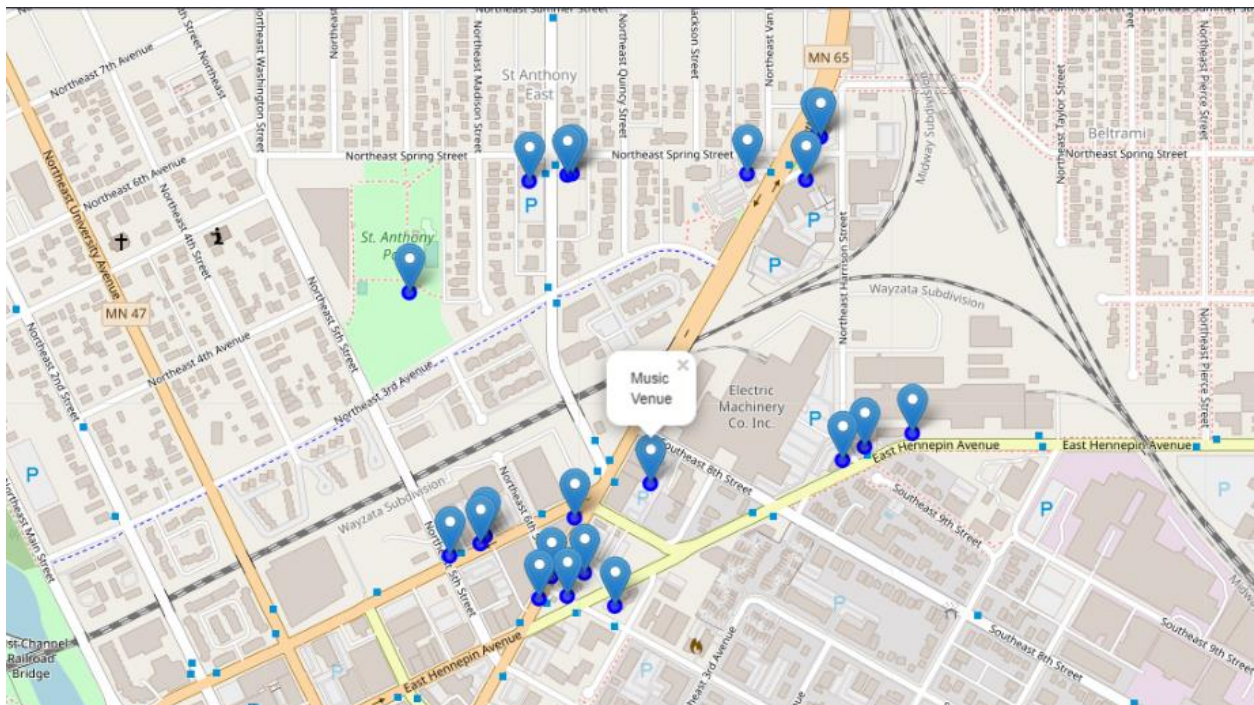
Within 1-mile distance from St. Anthony East, there are 5 adjacent neighborhoods. The number of crimes ranges from 35 to 81 where the median crime frequency is 52. It is concluded that the whole neighborhood is safe. Within 1-mile distance from Sumner - Glenwood, there are 5 adjacent neighborhoods. The number of crimes ranges from 84 to 252 where the median crime frequency is 220. This neighborhood is not as safe as the St. Anthony East neighborhood (See Table 4). Therefore, the best neighborhood to own a rental property in the Minneapolis neighborhood is St. Anthony East neighborhood.

Discussion

ST. ANTHONY EAST NEIGHBORHOOD

According to Foursquare location data, the St. Anthony East neighborhood contains 21 different venues. As seen in Figure 12, many of the venues are close to each other. The neighborhood offers seven different restaurants including one fast food restaurant, 3 bars, 2 music venues, 2 karaoke bars, a donut shop, a butcher, a park and a skate park. It is surprising to find that the neighborhood has low crime rates even though it has 3 bars and 2 music venues. However, the neighborhood seems to be suited for a young adult or visitors rather than a family.

Figure 12. St. Anthony East neighborhood venues



The overall ratings of the restaurants in the St. Anthony East neighborhood are reviewed via Foursquare API. The ratings are 8.8 for Brasa Premium Rotisserie, 6.9 for Beast Barbecue, 6.7 for Domo Gastro, 8.8 for Lu's sandwich, 8.4 for Red Stag Supper club, and 7.8 for Glam Doll Donuts. This area offers two good breakfast options as well as nice restaurants with high ratings. It concludes that it is a nice place to be.

As a final point, it is recommended to own a rental property in the St. Anthony East neighborhood which is away from bars, music venues, train, roads, commercial properties and electric machinery due to noise and traffic (see Figure 12). If possible, it would be best that a rental property can be located in a residential area.

Conclusion

This study is an attempt to identify the best neighborhood in Minneapolis to own a rental property among 87 neighborhoods. The safety measure via crime rates, home price in each neighborhood, and proximity to the downtown are the main characteristics to pinpoint the best neighborhood to invest in, namely, St. Anthony East neighborhood. The St. Anthony East neighborhood is close to downtown (about 1.35 miles from downtown). The home price in this neighborhood is around \$300K which is the lower end of the price point in Minneapolis. It is one of the safest neighborhoods in Minneapolis. In addition, it offers various venues to accommodate the different lifestyles. Indeed, it is a nice place to live. It is the best Minneapolis neighborhood for investors to own a rental property.

It is noted that the neighborhood clustering results via K-Means clustering are rather ambiguous. It is hard to uncover what are the deciding factors for two clustered areas. It is possible that the Minneapolis neighborhoods are very similar indeed so it may be difficult to sort it out. It is suggested that the future study can be done including more data, such as ethnicity, gender, employment status, and school performance, to distinguish the neighborhoods better.