

Exploring Neighborhoods of the Happiest and Saddest Cities in America

(IBM Data Science Capstone Project)

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I. Introduction

Background

In March 2019, WalletHub published a study of 182 cities in the United States, ranking them according to the happiness of their residents. Factors considered in this study included depression, suicide rates, average household income, poverty rate, crime rate, weather conditions, in addition to other personal, social and financial factors. The happiest city in America was determined to be Plano, TX while the saddest was determined to be Detroit, MI. (View study results at <https://wallethub.com/edu/happiest-places-to-live/32619/>).

Business Problem

What do the "happiest" and "saddest" cities in America look like? Are they similar or do they reveal differences? In this study, we will analyze the neighborhoods and venues that make up both Plano, TX and Detroit, MI. We will find if the contrasting "happiness" of these cities show any possible relation to their physical makeup.

Interested Audience

This study provides valuable information for city planners and public servants who could make decisions to facilitate a "happier" city for their citizens. Business owners would also benefit from understanding the impact their venues can have on the morale of their neighbors. Lastly, as people are relocating, they can identify the neighborhood types to both embrace and avoid.

II. Data Section

Description of the Data

A list of Neighborhoods in Plano, TX was found on www.neighborhoodscout.com. This list of neighborhoods, along with latitude and longitude coordinates from Google Maps was entered into a spreadsheet for Plano, TX.

Likewise, a list of neighborhoods in Detroit, MI was downloaded from <https://data.detroitmi.gov> and corresponding coordinates were found using Google Maps a spreadsheet of data for Detroit, MI.

By using the Foursquare API, we have downloaded a list of venues in each neighborhood for both Plano, TX and Detroit, MI.

How will the data be used to solve the Business Problem?

By using the Foursquare API interface, we will import the top venues for each neighborhood in Plano, TX and Detroit, MI. Using the top five venues in each neighborhood, we will use k-means clustering to find patterns for neighborhoods in each city. Folium and Matplotlib will be used to visualize these clusters on a map of these cities. We will also determine the top venues categories present and how often these venue types appear in each city. Using this data, we will draw comparisons between these two cities.

Data Collection

For the city of Plano, TX, I compiled a dataset of 4108 venues representing 56 different neighborhoods. These neighborhoods are depicted on a map of Plano, TX as seen below:

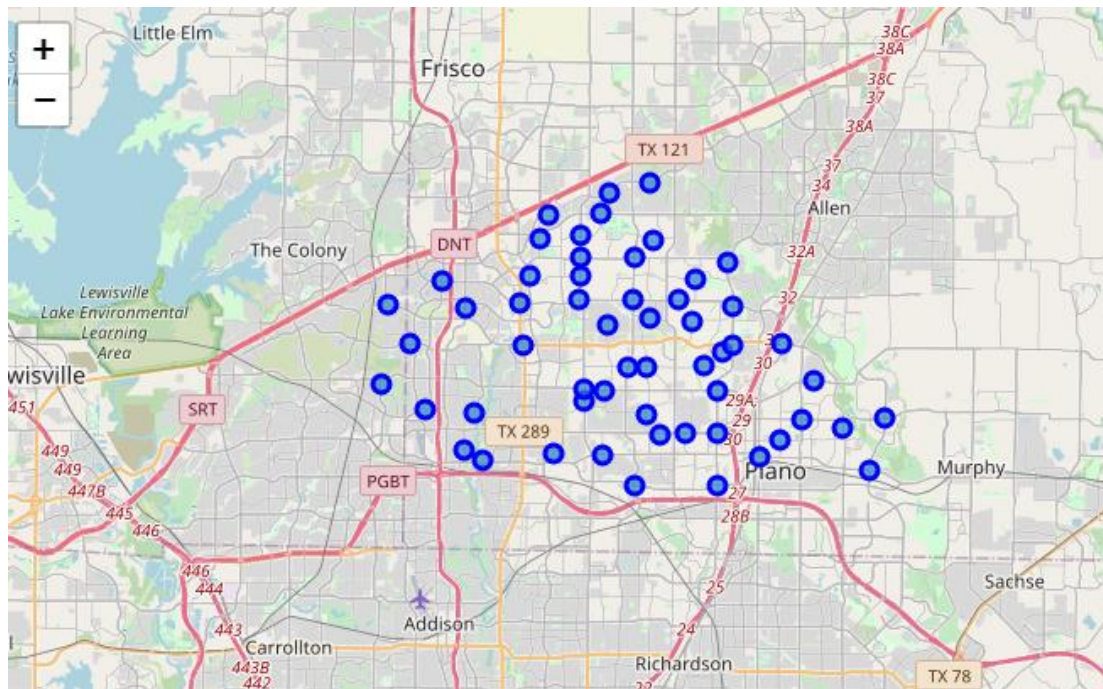


Figure 1 – Map of Neighborhoods in Plano, TX

For the city of Detroit, MI, I compiled a dataset of 6864 venues representing 205 different neighborhoods. These neighborhoods are depicted on a map of Detroit, MI as seen below:

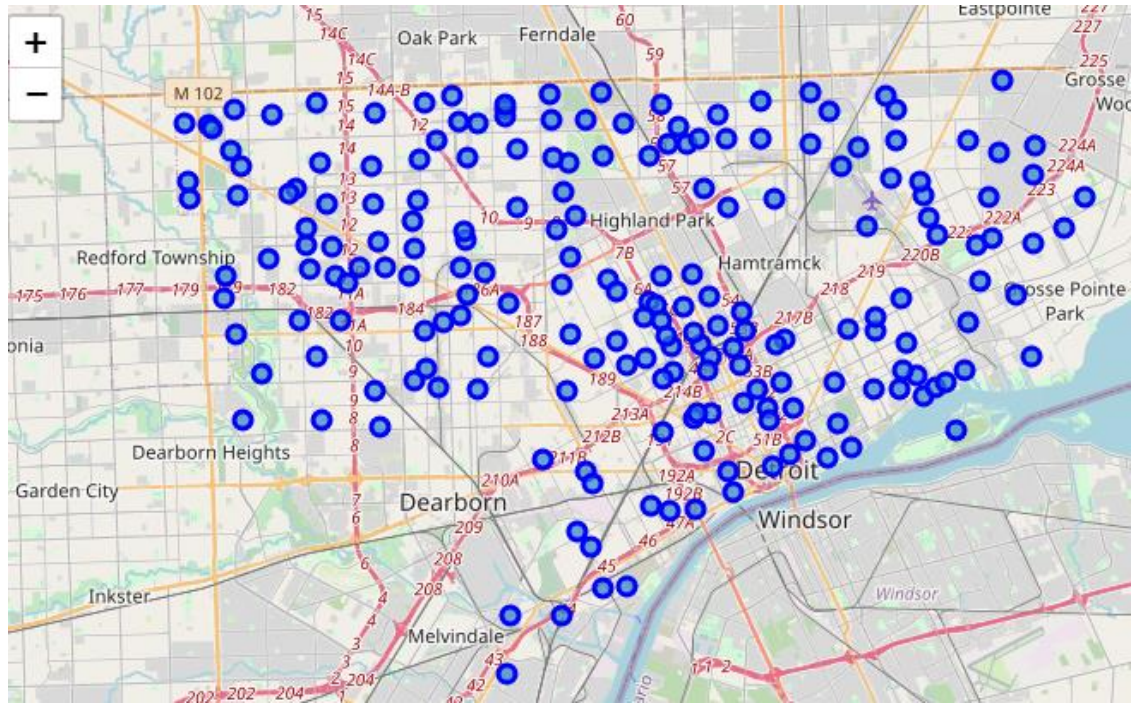


Figure 2 – Map of Neighborhoods in Detroit, MI

III. Methodology

For both cities, we sorted our neighborhoods into similar groupings using the machine learning technique, k means clustering. After these clusters were formed and visualized on a map of the city of Detroit, we looked closely at which venue categories were most prevalent in each cluster of neighborhoods. Lastly, we looked at an overall list of the most common venues in the city of Detroit, MI. Since Detroit, MI is a larger city than Plano, TX and our dataframe consisted of more venues, we convert our list of venue totals in each category to a percentage of all the venues imported from FourSquare API for each city.

IV. Data Analysis

For each city, we sorted our data to show the number of venues in each venue category for each neighborhood. (Figure 3: First 5 rows of dataframe for Plano, TX)

Neighborhood	Zip	Venue	Venue Latitude	Venue Longitude	Venue Category
PLANO, TX (14TH ST / K AVE)	100	100	100	100	100
PLANO, TX (ALMA DR / HEDGCOXE RD)	28	28	28	28	28
PLANO, TX (ALMA DR / LEGACY DR)	76	76	76	76	76
PLANO, TX (ALMA DR / W PARK BLVD)	100	100	100	100	100
PLANO, TX (ALMA DR / W PARKER RD)	100	100	100	100	100

We then calculated the mean of the frequency of the number of venue occurrences for each category using one hot encoding. In order to focus on the most common type of venue in each city neighborhood, we created a new dataframe showing the top 10 types of venues in each neighborhood.

This new dataframe was processed using the machine learning technique, k means clustering to create clusters of neighborhoods for each city. Then, using folium and matplotlib, I created a visual of the clusters on the map of each city (see below).

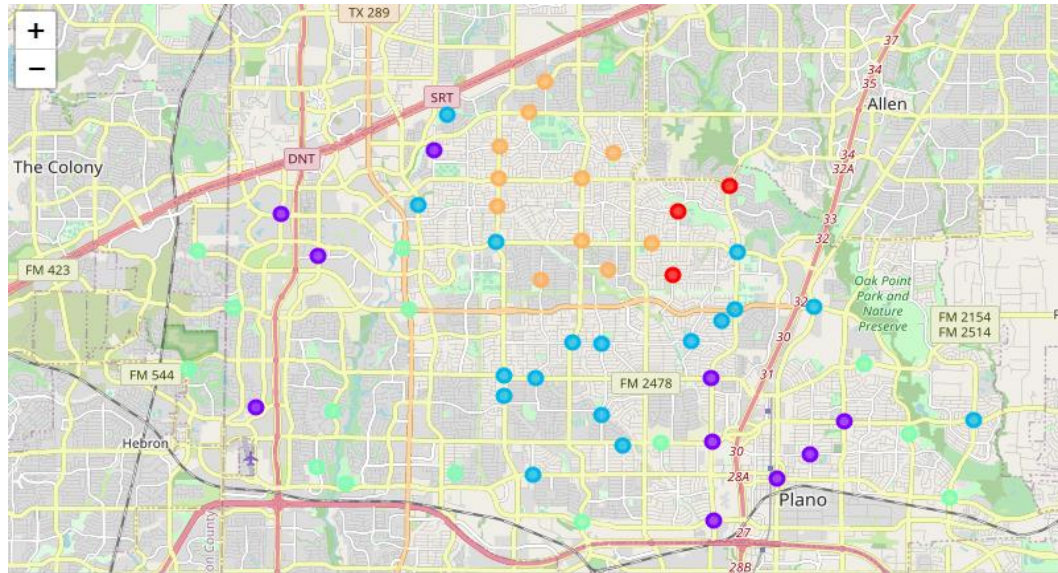
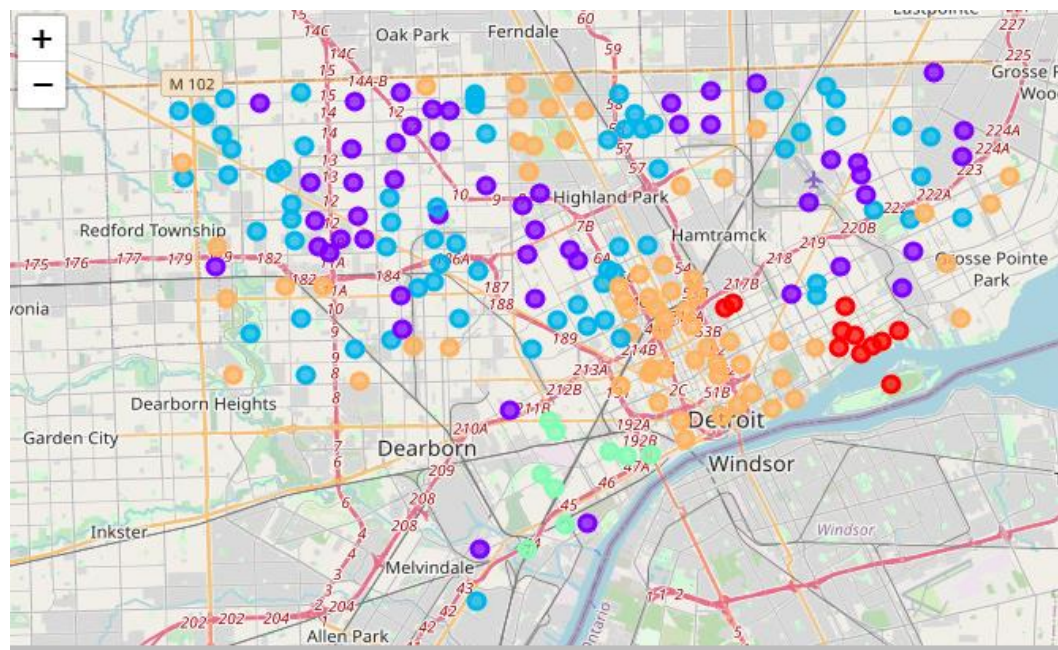


Figure 4: Map of Plano, TX showing neighborhood clusters



We then printed the dataframes for each cluster to see what the top venues were in each grouping of neighborhoods.

	Zip	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
6	75023	Fast Food Restaurant	Park	Pharmacy	Pizza Place	Indian Restaurant	Chinese Restaurant	Convenience Store	BBQ Joint	Mexican Restaurant	Video Store
23	75025	Park	Fast Food Restaurant	Pizza Place	Pharmacy	Convenience Store	Video Store	Chinese Restaurant	Soccer Field	Salon / Barbershop	Grocery Store
48	75075	Fast Food Restaurant	Park	Baseball Field	Salon / Barbershop	Pizza Place	BBQ Joint	Intersection	Golf Course	Grocery Store	Pharmacy

Figure 6: Plano, TX Cluster #1

	Zip	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
11	75024	Hotel	New American Restaurant	Mexican Restaurant	Pub	Mediterranean Restaurant	Pizza Place	Sushi Restaurant	Gym	Italian Restaurant	Office
15	75024	Hotel	Mexican Restaurant	New American Restaurant	American Restaurant	Italian Restaurant	Steakhouse	Mediterranean Restaurant	Burger Joint	Coffee Shop	Sandwich Place
19	75024	Fast Food Restaurant	Pizza Place	Mexican Restaurant	Coffee Shop	Furniture / Home Store	Burger Joint	Sandwich Place	Salon / Barbershop	Japanese Restaurant	Thai Restaurant
31	75074	Mexican Restaurant	American Restaurant	Coffee Shop	Bar	Furniture / Home Store	Sushi Restaurant	Restaurant	Deli / Bodega	Vietnamese Restaurant	Fast Food Restaurant
32	75074	Mexican Restaurant	Coffee Shop	American Restaurant	Bar	Pizza Place	Fast Food Restaurant	Restaurant	Sandwich Place	Furniture / Home Store	Convenience Store

Figure 7: Plano, TX Cluster #2 (shows first 5 rows)

	Zip	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	75023	Pizza Place	Burger Joint	Grocery Store	Indian Restaurant	Pharmacy	Park	Fast Food Restaurant	Toy / Game Store	Sports Bar	Chinese Restaurant
1	75023	Pizza Place	Fast Food Restaurant	Indian Restaurant	Grocery Store	Chinese Restaurant	Convenience Store	Automotive Shop	Park	Burger Joint	Coffee Shop
2	75023	Chinese Restaurant	Pizza Place	Fast Food Restaurant	Coffee Shop	Pharmacy	Burger Joint	Indian Restaurant	Mexican Restaurant	Thai Restaurant	Hobby Shop
3	75023	Chinese Restaurant	Fast Food Restaurant	Mexican Restaurant	Pharmacy	Video Store	Pizza Place	Coffee Shop	Indian Restaurant	Burger Joint	Restaurant
4	75023	Chinese Restaurant	Mexican Restaurant	Coffee Shop	Indian Restaurant	Grocery Store	Fast Food Restaurant	Japanese Restaurant	Burger Joint	Vietnamese Restaurant	Steakhouse

Figure 8: Plano, TX Cluster #3 (shows first 5 rows)

	Zip	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
9	75024	Bank	Park	Pharmacy	Salon / Barbershop	Sandwich Place	Restaurant	Mexican Restaurant	Convenience Store	Pizza Place	French Restaurant
10	75024	Sandwich Place	Pizza Place	Gym	Mexican Restaurant	Bar	Italian Restaurant	Coffee Shop	Gym / Fitness Center	Bank	Mobile Phone Shop
12	75024	Hotel	Coffee Shop	Furniture / Home Store	Fast Food Restaurant	Convenience Store	Gym	Office	Park	Pizza Place	Shipping Store
13	75024	Playground	Indian Restaurant	Convenience Store	Sandwich Place	Kitchen Supply Store	Bank	Café	Field	Office	General Entertainment
28	75025	Video Store	Convenience Store	Fast Food Restaurant	Mexican Restaurant	Pharmacy	Pizza Place	Sandwich Place	Shipping Store	Gym	Park

Figure 9: Plano, TX Cluster #4 (shows first 5 rows)

	Zip	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
5	75023	Pizza Place	Fast Food Restaurant	Video Store	Sandwich Place	Indian Restaurant	Bank	Convenience Store	Grocery Store	American Restaurant	Mexican Restaurant
7	75023	Pizza Place	Park	Convenience Store	Fast Food Restaurant	Indian Restaurant	Pharmacy	American Restaurant	Video Store	Ice Cream Shop	Kids Store
16	75024	Indian Restaurant	Fast Food Restaurant	Video Store	Pizza Place	Sandwich Place	Bank	Sushi Restaurant	Grocery Store	Halal Restaurant	Pet Store
18	75024	Fast Food Restaurant	Indian Restaurant	Pizza Place	Video Store	Trail	Bank	Donut Shop	Baseball Field	Sandwich Place	Bakery
21	75025	Pizza Place	Pharmacy	Convenience Store	Video Store	Tex-Mex Restaurant	Indian Restaurant	Park	Fast Food Restaurant	Kids Store	Gas Station

Figure 10: Plano, TX Cluster #5 (shows first 5 rows)

	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
5	Harbor / Marina	Zoo	Park	Museum	Food Truck	Beach	Garden	Tennis Court	Lighthouse	Golf Course
48	Harbor / Marina	Gym / Fitness Center	New American Restaurant	Liquor Store	Community Center	Bakery	Convenience Store	Diner	Coffee Shop	Pharmacy
67	Harbor / Marina	Liquor Store	New American Restaurant	Chinese Restaurant	Community Center	Pharmacy	Beach	Fried Chicken Joint	French Restaurant	Bakery
73	Diner	Restaurant	Speakeasy	BBQ Joint	Market	Art Gallery	Seafood Restaurant	Liquor Store	Soup Place	Financial or Legal Service
90	Chinese Restaurant	Coffee Shop	Sporting Goods Shop	French Restaurant	Gas Station	Pharmacy	Bakery	Grocery Store	Gym / Fitness Center	Art Gallery
95	Liquor Store	New American Restaurant	Harbor / Marina	Gym / Fitness Center	Coffee Shop	Sporting Goods Shop	Dance Studio	French Restaurant	Park	Chinese Restaurant
100	Harbor / Marina	Liquor Store	Gym / Fitness Center	New American Restaurant	Chinese Restaurant	Ice Cream Shop	Seafood Restaurant	Beach	Supermarket	French Restaurant
109	Harbor / Marina	Chinese Restaurant	American Restaurant	Ice Cream Shop	Park	Seafood Restaurant	Clothing Store	Pool	Diner	Pharmacy
159	Flea Market	Diner	Speakeasy	Sandwich Place	Chinese Restaurant	Market	Grocery Store	Seafood Restaurant	Art Gallery	Restaurant
191	Harbor / Marina	Chinese Restaurant	Gym / Fitness Center	Ice Cream Shop	Liquor Store	Convenience Store	Diner	Coffee Shop	Pharmacy	Paper / Office Supplies Store

Figure 11: Detroit, MI Cluster #1 (shows first 10 rows)

	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	Intersection	Pizza Place	Fast Food Restaurant	Fried Chicken Joint	Music Store	Pharmacy	Grocery Store	Coffee Shop	Discount Store	Fish & Chips Shop
21	Fast Food Restaurant	Ice Cream Shop	Cafeteria	Bank	Chinese Restaurant	Gas Station	BBQ Joint	Sandwich Place	Market	Pizza Place
24	Discount Store	Grocery Store	Pizza Place	Fast Food Restaurant	American Restaurant	Coffee Shop	Chinese Restaurant	Sandwich Place	Furniture / Home Store	Fried Chicken Joint
27	Grocery Store	Discount Store	Sandwich Place	Fast Food Restaurant	Ice Cream Shop	Pizza Place	Pharmacy	Burger Joint	Mexican Restaurant	Fried Chicken Joint
28	American Restaurant	Pharmacy	Sandwich Place	Fast Food Restaurant	Mobile Phone Shop	Bank	Deli / Bodega	Restaurant	Pizza Place	Scenic Lookout
29	Gay Bar	Intersection	Fast Food Restaurant	Pizza Place	Jazz Club	Hot Dog Joint	Nightclub	American Restaurant	BBQ Joint	Sandwich Place
31	Liquor Store	American Restaurant	Fast Food Restaurant	Discount Store	Ice Cream Shop	Chinese Restaurant	Home Service	Women's Store	Intersection	Gas Station
35	Fast Food Restaurant	American Restaurant	Fried Chicken Joint	Sandwich Place	Liquor Store	Grocery Store	Intersection	Asian Restaurant	Nightclub	Optical Shop
39	Fast Food Restaurant	Liquor Store	Nightclub	Park	Historic Site	Burger Joint	Restaurant	Food Truck	Mexican Restaurant	Travel & Transport
42	Fast Food Restaurant	Fried Chicken Joint	Discount Store	Sandwich Place	Pizza Place	Gym	Liquor Store	Shoe Store	BBQ Joint	Pharmacy

Figure 12: Detroit, MI Cluster #2 (shows first 10 rows)

	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
1	Discount Store	Convenience Store	Bank	Café	Grocery Store	Sandwich Place	Bath House	Garden Center	Hardware Store	Fried Chicken Joint
3	American Restaurant	Pizza Place	Pharmacy	Discount Store	Grocery Store	Cosmetics Shop	Intersection	Seafood Restaurant	Optical Shop	Liquor Store
4	Convenience Store	Liquor Store	Discount Store	Sandwich Place	American Restaurant	Diner	Burger Joint	Food	Market	Lounge
6	Fried Chicken Joint	Discount Store	Shoe Store	Grocery Store	Music Venue	Intersection	Southern / Soul Food Restaurant	Pharmacy	Clothing Store	Fast Food Restaurant
7	Intersection	Fast Food Restaurant	Fried Chicken Joint	Shipping Store	Furniture / Home Store	Golf Course	Liquor Store	Chinese Restaurant	Skating Rink	Bar
10	Grocery Store	Discount Store	Pizza Place	Liquor Store	Convenience Store	Sandwich Place	Chinese Restaurant	Park	Fast Food Restaurant	Fried Chicken Joint
11	Convenience Store	Pizza Place	Seafood Restaurant	Mobile Phone Shop	Public Art	Storage Facility	Intersection	Liquor Store	Discount Store	Yoga Studio
13	Intersection	Burger Joint	Construction & Landscaping	Soup Place	Baseball Field	Seafood Restaurant	Gas Station	Farm	Electronics Store	Event Service
16	Grocery Store	Storage Facility	Wings Joint	Home Service	Restaurant	Intersection	Discount Store	Burger Joint	Farmers Market	Electronics Store
17	Grocery Store	Shoe Store	Intersection	Hot Dog Joint	Nightclub	Boutique	Fast Food Restaurant	Skating Rink	Liquor Store	Clothing Store

Figure 13: Detroit, MI Cluster #3 (shows first 10 rows)

	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
20	Diner	Bridge	Deli / Bodega	Intersection	Italian Restaurant	Bakery	Financial or Legal Service	Event Service	Event Space	Farm
22	Mexican Restaurant	Fast Food Restaurant	Food Truck	Gas Station	Bank	Pharmacy	Discount Store	Bakery	Park	Bar
23	Mexican Restaurant	Liquor Store	Bar	Grocery Store	Sandwich Place	Convenience Store	Latin American Restaurant	Lounge	Supermarket	Fried Chicken Joint
91	Mexican Restaurant	Bakery	Food Truck	Taco Place	Pizza Place	Supermarket	Park	Bar	Nightclub	Fried Chicken Joint
92	Mexican Restaurant	Bar	Park	Coffee Shop	Taco Place	Bakery	Cocktail Bar	New American Restaurant	Music Venue	Burger Joint
117	Mexican Restaurant	Bakery	Food Truck	Bar	Taco Place	Discount Store	Bank	Fast Food Restaurant	Pizza Place	Soccer Field
118	Mexican Restaurant	Liquor Store	Sandwich Place	Food Truck	Bar	Lounge	Soccer Field	Taco Place	Supermarket	Fried Chicken Joint
180	Mexican Restaurant	Fast Food Restaurant	Pizza Place	Pharmacy	Grocery Store	Bank	Bakery	Food Truck	Taco Place	Italian Restaurant
195	Mexican Restaurant	Diner	Intersection	Park	Market	Fast Food Restaurant	Italian Restaurant	Bar	Burger Joint	Restaurant

Figure 14: Detroit, MI Cluster #4 (shows first 10 rows)

	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
2	Middle Eastern Restaurant	Discount Store	Pharmacy	Fast Food Restaurant	Sandwich Place	Ice Cream Shop	Spa	Smoke Shop	Bowling Alley	Farmers Market
8	Bar	Sandwich Place	Fast Food Restaurant	Pizza Place	Discount Store	Fried Chicken Joint	Clothing Store	Art Gallery	History Museum	Building
9	Fried Chicken Joint	Furniture / Home Store	Dance Studio	Rental Car Location	Caribbean Restaurant	Liquor Store	Gas Station	Sandwich Place	Chinese Restaurant	Seafood Restaurant
12	American Restaurant	Coffee Shop	Brewery	Farmers Market	Yoga Studio	Deli / Bodega	Concert Hall	Bar	Clothing Store	Theater
14	Coffee Shop	American Restaurant	Farmers Market	Concert Hall	Restaurant	Lounge	Deli / Bodega	Clothing Store	Pizza Place	Music Venue
15	Art Gallery	Gas Station	Discount Store	Bar	Burger Joint	Indian Restaurant	Grocery Store	Liquor Store	Butcher	Skate Park
19	Pizza Place	Bar	Bakery	Grocery Store	Gas Station	Intersection	Convenience Store	Baseball Field	American Restaurant	Discount Store
26	Golf Course	Discount Store	Seafood Restaurant	Pet Store	Fried Chicken Joint	Beach	Sandwich Place	Pizza Place	Diner	Deli / Bodega
32	Deli / Bodega	Art Gallery	Mexican Restaurant	Café	Mediterranean Restaurant	Fast Food Restaurant	Liquor Store	Sandwich Place	BBQ Joint	Grocery Store
33	Lounge	Hotel	Bar	Coffee Shop	New American Restaurant	Restaurant	Sports Bar	Park	Brewery	Diner

Figure 15: Detroit, MI Cluster #5 (shows first 10 rows)

Not only did I look at the most common venues in each cluster of neighborhoods for each city, but I create a table of the most common venues in each city as a whole. Each table showed the total number of venues in each category. Factoring in the varying number of venues for each city, I converted the tables to show the percent each category is represented in the number of venues as a whole.

% Venues		% Venues		% Venues	
Venue Category		Venue Category		Venue Category	
Pizza Place	3.846154	Park	1.850049	Sushi Restaurant	1.265823
Fast Food Restaurant	3.651412	Grocery Store	1.825706	Gym / Fitness Center	1.265823
Mexican Restaurant	3.383642	American Restaurant	1.777020	Hotel	1.168452
Chinese Restaurant	2.872444	Burger Joint	1.777020	Furniture / Home Store	1.119766
Coffee Shop	2.823759	Bank	1.679649	Salon / Barbershop	1.119766
Sandwich Place	2.750730	Gas Station	1.460565	Pet Store	1.022395
Video Store	2.361246	Ice Cream Shop	1.411879	Vietnamese Restaurant	1.022395
Indian Restaurant	2.336904	Italian Restaurant	1.387537	Cosmetics Shop	0.998053
Pharmacy	2.263875	Bakery	1.363194	Asian Restaurant	0.973710
Convenience Store	2.215190	Gym	1.290166	Trail	0.949367

Figure 16: % Prevalence of Top 30 Venues in Plano, TX

% Venues		% Venues		% Venues	
Venue Category		Venue Category		Venue Category	
Fast Food Restaurant	4.370629	Coffee Shop	2.534965	Bank	1.092657
Discount Store	4.093823	Pharmacy	2.447552	Art Gallery	1.063520
American Restaurant	4.006410	Chinese Restaurant	1.893939	Park	1.048951
Pizza Place	3.948135	Mexican Restaurant	1.500583	Clothing Store	0.961538
Intersection	3.248834	Diner	1.369464	Lounge	0.917832
Sandwich Place	3.044872	Convenience Store	1.340326	Deli / Bodega	0.888695
Liquor Store	3.044872	Seafood Restaurant	1.325758	Café	0.859557
Bar	2.928322	Bakery	1.325758	New American Restaurant	0.786713
Grocery Store	2.899184	Gas Station	1.165501	Hot Dog Joint	0.757576
Fried Chicken Joint	2.797203	Restaurant	1.150932	Cosmetics Shop	0.743007

Figure 17: % Prevalence of Top 30 Venues in Detroit, MI

Additional values needed for the proper comparison of cities is listed below.

City	Venue Category	% Venues
Detroit, MI	Video Store	0.014569
	Indian Restaurant	0.058275
	Gym	0.320513
	Gym / Fitness Center	0.626457
Plano, TX	American Restaurant	1.77702
	Liquor Store	0.413827
	Bar	0.827653
	Fried Chicken Joint	0.827653

Figure 18: % Prevalence of Specific Venue Categories in Plano, TX and Detroit, MI

V. Results and Discussion

Listed below are the most common venues found in each of the five clusters of neighborhoods formed through our machine learning technique for Plano, TX.

1. Fast Food Restaurants, Parks, Pizza Joints, and Pharmacies
2. Mexican Restaurants, Coffee Shops, and American Restaurants
3. Restaurants, primarily Chinese, Fast Food, Indian, Pizza Joints and Burger Shops
4. Convenience Stores, Gyms/Fitness Centers, Sandwich Shops, Banks and Parks
5. Video Stores, Convenience Stores, and Fast Food Restaurants

Likewise, below is a list of the most common venues found in each of the five clusters of neighborhoods in Detroit, MI.

1. Harbor/Marina, Chinese Restaurants, Liquor Stores, and gyms/Fitness Centers
2. Fast Food Restaurants, Pizza Joints, and Sandwich Places
3. Discount Stores, Liquor Stores, and Grocery Stores
4. Mexican Restaurants, Bars and Bakeries
5. Bars, Discount Stores, and Coffee Shops

In comparing the neighborhood clusters from these cities, we do not see a lot in common between them. Both Plano, TX (in cluster no.3) and Detroit, MI (in cluster no.2) have neighborhoods where the number of restaurants dominates that of other types of venues. Also, we see each city has a cluster of neighborhoods where Mexican restaurants are very prevalent. Other than these two similarities, the neighborhood makeup of Plano, TX and Detroit, MI appear very different.

Our analysis also looks at the venues of these cities as a whole. Here we find striking difference between Plano, TX and Detroit, MI. As expected, based on the differences in location and demographics, different types of restaurants are more prevalent in one city versus another. (The values below were calculated by comparing the percentage of venues from each city that fit in the following categories.)

- Mexican Restaurants are 2.25x's more common in Plano, TX than in Detroit, MI.
- Chinese Restaurants are 1.5x's more common in Plano, TX than in Detroit, MI.
- Indian Restaurants are 40x's more common in Plano, TX than in Detroit, MI.
- American Restaurants are 2.2x's more common in Detroit, MI than in Plano, TX.
- Fried Chicken Joints are 3.38x's more common in Detroit, MI than in Plano, TX.

Also, notice that Detroit, MI has several art galleries whereas Plano, TX has none. This can be expected as Detroit, MI is a much larger city than Plano, TX.

There is also a difference in the number of grocery stores in each city. Grocery stores in Detroit, MI are 1.59x's more prevalent than grocery stores as Plano, TX.

Other major differences are seen in the prevalence of recreational venues in these cities:

- Video Rentals (aka. Redbox) are 162x's more common in Plano, TX than in Detroit, MI.
- Parks are 1.76x's more common in Plano, TX than in Detroit, MI.
- Gyms / Fitness Centers are 2.70x's more common in Plano, TX than in Detroit, MI.
- Discount Stores are 6.23x's more common in Detroit, MI than in Plano, TX.
- Liquor Stores are 7.36x's more common in Detroit, MI than in Plano, TX.
- Bars are 3.54x's more common in Detroit, MI than in Plano, TX.

VI. Conclusion

As seen in the study conducted by WalletHub back in 2019, there are many differences between America's "happiest" and "saddest" cities. Our analysis has revealed even more disparities, namely the prevalence of certain venue types in these cities. Detroit, MI, which was named America's "saddest" city has significantly more Discount Stores, Liquor Stores and Bars than its happier counterpart. Plano, TX, America's "happiest" city was found to have a significantly higher percentage of Parks, Gyms/Fitness Centers, and Video Rental (aka. Redbox) venues than Detroit.

In a study published by WebMd, researchers confirm that "one-third of people with depression also have an alcohol problem" (<https://www.webmd.com/depression/guide/alcohol-and-depresssion>). In another interesting article, researchers claim that discount stores target poverty-stricken areas and actually "contribute to declines in economic and public health" (<https://progressive.org/magazine/dollar-stores-prey-on-the-poor-sainato-191001/>).

It is no mistake that the "saddest" city in America is riddled with bars, liquor stores and an abundance of discount stores. As city planners approve business licenses and new development within their neighborhoods, it is vital that they consider how each new venue can affect the mental, physical and financial health of their residents. Likewise, business owners should consider the impact their endeavors have on the lives of those around them and not just their income.

In comparing these cities, it is apparent which type of neighborhoods people should seek to live in. From this study, we can see that parks, gyms/fitness centers, and other health-promoting, recreational venues create a "happier" atmosphere than neighborhoods full of bars and liquor stores.