Locating an Ideal Neighborhood for Small Business in Atlanta, GA

Sravan Neela

Applied Data Science Capstone

IBM Data Science Professional Certificate

Dec 2020

Executive Summary

Small business often struggles during their initial years (1-5yrs) due to several factors that eventually lead them to failure. Some reasons are more common than others such as market needs, location, demography (Otar, 2018). This analysis will try to increase the odds of business success by considering safety, income, population for ideal placement of a small business from a range of options.

Introduction: The (Small) Business Problem

The objective of this analysis is to find relatively safe and potentially profitable location in the city of Atlanta, GA to start a small business. Venues for small businesses such as restaurants, sports bar, coffee shops, saloon or a spa will be explored. Small business entrepreneurs who are considering opening such venues will be target audience for this report.

The report will try to make a recommendation to identify locations by analyzing key statistics such as crime reports, demographics, such as income, population and real-estate values from datasets made available city's government (APD, 2020) (City of Atlanta, 2020).

Since the target audience are small entrepreneurs to reduce the startup costs, report will try to use publicly (for free to public) available government sources to make location recommendations. Analysis of these datasets will help provide key insights to make informed decisions such that the business is in relatively safe neighborhood and can provide higher business turnover.

The analysis does not assume the individual has a specific venue in mind but will provide several options from the information available from the analysis.

The analysis will aim to provide key insights to potentially avoid leading causes of what causes a small business to fail in their initial year of startup (Otar, 2018).

Data

Per the objectives set for this analysis, the following datasets will be gathered to make location recommendations by analyzing

1. Atlanta city crime data to identify safe locations

2. GIS data from Atlanta Department of City Planning to obtain geographical information

3. Census data from City of Atlanta to get neighborhood demographics such as median income, population and median home values by (Neighborhood planning units) NPU.

4. Finding most common and least common venues in proximity of an ideal location using Foursquare API.

To make these decisions the analysis will use data from Atlanta's official public data sources listed below:

1. Atlanta Police Department (APD): Data repository containing historic crime reports dating back to 2009. These data sets contain information relevant to analysis they are: -

   a) Report Number: PD's Record locator.

   b) Occur Date: Date the crime occurred.

   c) Report Date: Date the crime was reported or recorded in PD's System.

   d) Location: Street address where the crime was reported.

   e) UCR Literal: Nature and type of crime.

   f) Neighborhood: Neighborhood where the crime was reported.

g) Latitude & Longitude: Geographical location of reported crime.

For this analysis data was extracted from APD website for years 2017 to 2020.

Location of Dataset extract:

https://raw.githubusercontent.com/sravann/Coursera_Capstone/master/COBRA_2017-2020.csv

APD official Source:

https://www.atlantapd.org/i-want-to/crime-data-downloads

2. Atlanta Department of City Planning: official GIS information from containing Neighborhood Planning Unit (NPU) information with Neighborhood name and NPU code. These data sets contain information relevant to analysis they are:

a) NAME: Name of the neighborhood

b) NPU: NPU code from A-Z, groups neighborhoods from A to Z.

Location of Dataset:

https://dpcd-coaplangis.opendata.arcgis.com/datasets/npu

3. City of Atlanta- official Website: Website with information on neighborhood demographic information. The data set contains information on:

a) NPU: Atlanta's Neighborhood Planning Unit (NPU) identifier.

b) Region: Relative location of neighborhood group in Atlanta city.

c) Median Age: identify general age group of the neighborhood to cater targeted goods and services.

    d) Median Income: To asses income of general population that will help with

        pricing of goods and services.

    e) Median Home Values: To provide general information on housing and real

        estate.

    f) Population: Total population of the neighborhood.

    g) - Growth: population growth of the neighborhood to asses growing or declining

        neighborhoods.

    Location of consolidated dataset:

        https://raw.githubusercontent.com/sravann/Coursera_Capstone/master/COBRA_2017-2020.csv

4. Foursquare API: Foursquare API will be used to get comprehensive list of venues located in the ideal neighborhood from which the report provides insights into most and least common venues in the neighborhood. Foursquare API will help extract:

    a) The list of venues in the proximity of a narrowed down ideal neighborhood list.

    b) List of venues such as restaurants, ice cream parlors, bars etc.

Methodology

Methodology used for this analysis will include Exploratory Data Analysis and Modelling.

EDA

Exploratory Data Analysis was performed to help investors with some key insights into the city. This was done by counting the crime reports across the city's NPUs and their respective neighborhoods.

From the datasets gathered we can look at neighborhoods grouped by NPUs and crime reports.

	NPU	Crime_Reports
0	M	18677
1	E	15542
2	B	15337
3	V	6579
4	D	6261
5	F	5976
6	N	5947
7	Z	5521
8	T	5475
9	W	5383
10	R	5271
11	X	5132
12	L	4121
13	O	4101
14	I	3773
15	S	3683
16	Y	3653
17	H	3566
18	J	3565
19	P	3258
20	K	2471
21	G	2326
22	C	1763
23	A	1213
24	Q	87

And then highest and lowest Crimes reported in neighborhoods

Highest and lowest Crimes Reports by Neighborhood

```
atl_crime_by_neb.head()
```

	Neighborhood	Crime_Reports
0	Downtown	11519
1	Midtown	9005
2	Old Fourth Ward	3886
3	Lindbergh/Morosgo	3292
4	West End	2898

```
atl_crime_by_neb.tail()
```

	Neighborhood	Crime_Reports
236	Old Fairburn Village	2
237	Regency Trace	2
238	Chattahoochee	2
239	State Facility	1
240	Mt. Paran Parkway	1

Visualizing Crime Reports
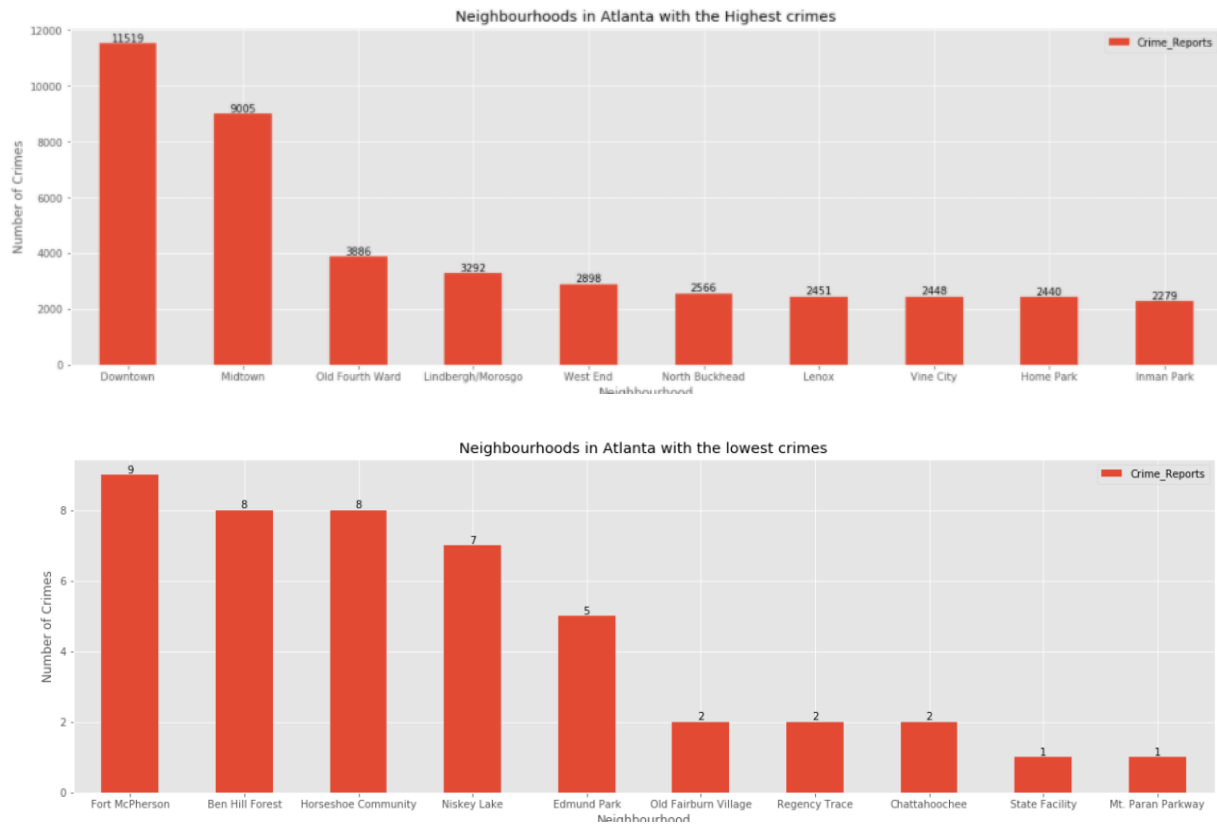
Importing census data to analyze and visualize demographic information
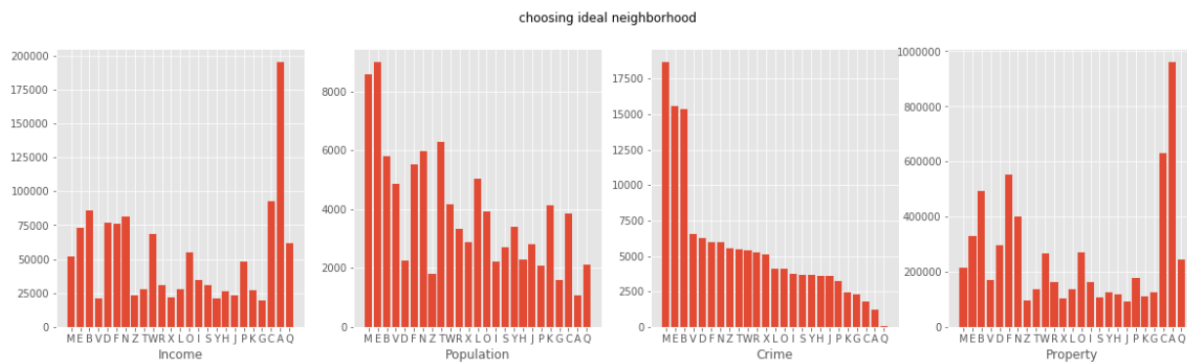
Modelling

Also, to help investors use the right neighborhood within an NPU we will be clustering similar neighborhoods using K - means clustering using datasets based on predefined cluster size. K-Means clustering will be used to a group data based on existing venues which will provide insights to make informed decisions.

Preliminary data description

	Crime_Reports	2017_Pop	Median_Age	Income	Median_Home_Value	2010_Pop	2000_Pop	Acres	Sqmiles	population_density
count	25.000000	25.000000	25.000000	25.000000	25.000000	25.000000	25.000000	25.000000	25.000000	25.000000
mean	5547.240000	19487.480000	35.244000	51998.040000	259364.240000	16800.960000	16697.000000	3500.475600	5.469493	3907.889040
std	4474.543164	13062.988894	4.540382	38429.533908	208604.790911	10020.895197	7866.354826	1804.460484	2.819470	2072.295660
min	87.000000	3522.000000	24.700000	19185.000000	90516.000000	1770.000000	1024.000000	846.170000	1.322141	1068.095225
25%	3565.000000	12212.000000	32.200000	26147.000000	124171.000000	11111.000000	11997.000000	2204.430000	3.444422	2249.874716
50%	4121.000000	15385.000000	36.400000	34658.000000	168387.000000	14198.000000	15825.000000	3448.140000	5.387719	3387.704533
75%	5947.000000	21310.000000	38.000000	72766.000000	296014.000000	18122.000000	20095.000000	4089.690000	6.390141	5044.092795
max	18677.000000	59094.000000	46.200000	195259.000000	961111.000000	47292.000000	38645.000000	7317.400000	11.433438	8993.708629

Once required datasets were imported, merging and then sorting the data set with the following criteria

1. Median income >$65000/yr
2. Population density > 3000/sq-mile
3. Crime Reports for the last 3 yrs. <6000

	NPU	Crime_Reports	Major neighborhoods	Region	2017_Pop	Median_Age	Income	Median_Home_Value
5	F	5976	Virginia-Highland/ Morningside/Lenox Park	Northeast / East	33198.0	33.5	76277.0	554154.0
6	N	5947	Inman Park/ Candler Park/ Poncey-Highland/ Rey...	Northeast / East	20561.0	35.3	81614.0	401754.0
9	W	5383	Grant Park/ East Atlanta/ Ormewood Park/ Bente...	Northeast / East	22655.0	36.4	68598.0	266044.0
22	C	1763	Collier Hills/Peachtree Battle/Arden/Habersham...	Buckhead	23236.0	38.0	92615.0	630175.0

Acres	Sqmiles	population_density
3842.11	6.003297	5529.961401
2204.43	3.444422	5969.361694
3488.54	5.450844	4156.237280
3873.74	6.052719	3838.936015

After applying the criteria, NPU C was selected due to lowest crime reports in the group.

	Neighborhood	NPU	Latitude	Longitude
0	Brandon	C	33.829827	-84.415484
1	Ridgewood Heights	C	33.827883	-84.445763
2	Fernleaf	C	33.821157	-84.439727
3	Westminster/Milmar	C	33.836506	-84.427529
4	Arden/Habersham	C	33.717013	-84.418103
5	Woodfield	C	33.951066	-84.299632
6	Springlake	C	33.811694	-84.414768
7	Channing Valley	C	33.806033	-84.409749
8	Collier Hills	C	33.812103	-84.429471
9	Colonial Homes	C	33.813283	-84.395535
10	Westover Plantation	C	33.823161	-84.441040
11	Cross Creek	C	33.815133	-84.425245
12	Castlewood	C	33.834735	-84.409932
13	Argonne Forest	C	33.771908	-84.377724
14	Wyngate	C	33.831412	-84.399595
15	Peachtree Battle Alliance	C	33.820079	-84.389349
16	Memorial Park	C	33.871215	-84.391038
17	Wildwood (NPU-C)	C	33.590902	-84.493133
18	Collier Hills North	C	33.812103	-84.429471
19	Hanover West	C	33.820580	-84.432473
20	Wesley Battle	C	33.755388	-84.337313

Plotting the neighborhoods in NPU C
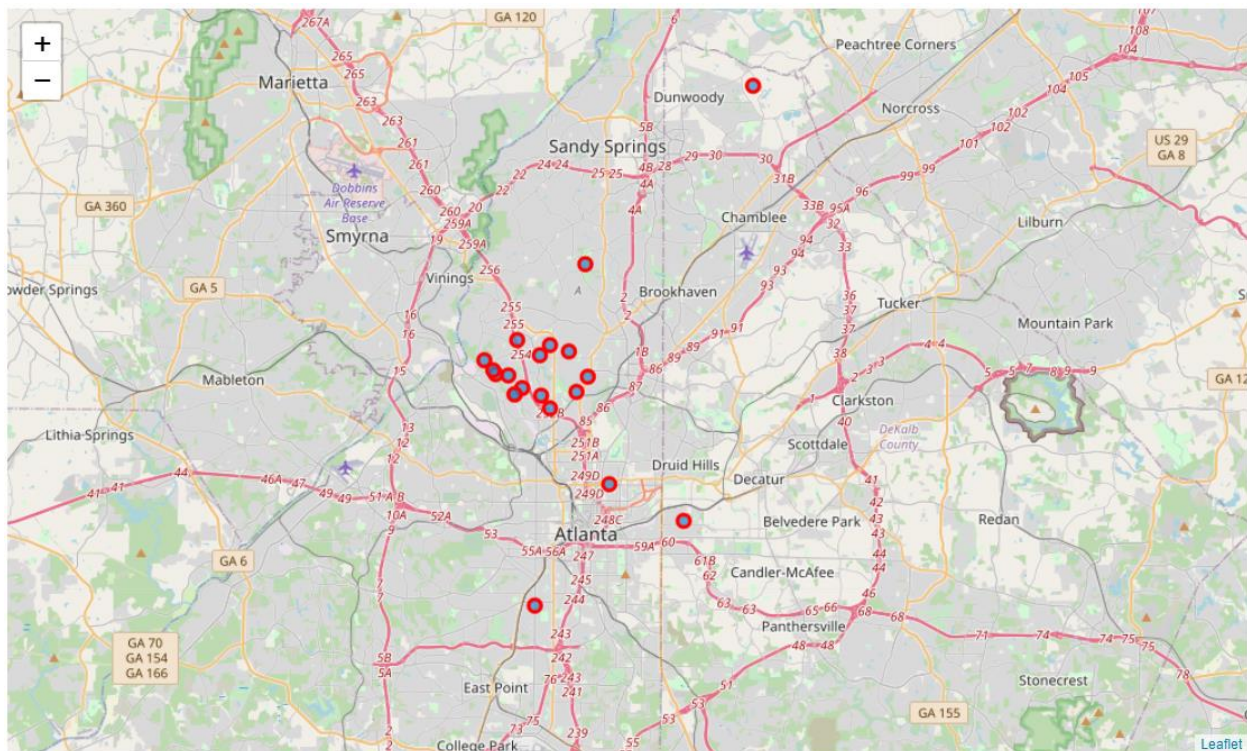
Number of venues in each neighborhood

Neighborhood	Venue
Arden/Habersham	3
Argonne Forest	23
Brandon	1
Castlewood	5
Channing Valley	30
Collier Hills	13
Collier Hills North	13
Colonial Homes	26
Cross Creek	17
Fernleaf	4
Hanover West	7
Memorial Park	10
Peachtree Battle Alliance	30
Springlake	27
Wesley Battle	7
Westminster/Milmar	2
Westover Plantation	3
Wildwood (NPU-C)	2
Woodfield	1

Filtering the top five venues in each neighborhood.

```
----Arden/Habersham----
                 venue  frequency
0              Juice Bar       0.33
1         Scenic Lookout       0.33
2             Food Truck       0.33
3    American Restaurant       0.00
4               Pharmacy       0.00


----Argonne Forest----
                              venue  frequency
0   Southern / Soul Food Restaurant       0.09
1                   Ice Cream Shop       0.04
2                          Brewery       0.04
3                       Food Truck       0.04
4                          Gay Bar       0.04


----Brandon----
             venue  frequency
```

```
0         Ice Cream Shop        1.0
1     American Restaurant       0.0
2              Pet Store        0.0
3     Rental Car Location       0.0
4       Recreation Center       0.0


----Castlewood----
            venue   frequency
0          Dog Run        0.2
1        Wine Shop        0.2
2        Ski Trail        0.2
3     Boat or Ferry        0.2
4              Gym        0.2


----Channing Valley----
              venue   frequency
0        Food Truck        0.10
1   Mexican Restaurant       0.07
2     Department Store       0.07
3       Sandwich Place       0.07
4                Pub       0.03


----Collier Hills----
              venue   frequency
0   Italian Restaurant       0.15
1          Taco Place       0.15
2         Pizza Place       0.08
3        Cupcake Shop       0.08
4         Gas Station       0.08


----Collier Hills North----
              venue   frequency
0   Italian Restaurant       0.15
1          Taco Place       0.15
2         Pizza Place       0.08
3        Cupcake Shop       0.08
4         Gas Station       0.08


----Colonial Homes----
                      venue   frequency
0              Pizza Place        0.08
1                 Pharmacy        0.04
2           Doctor's Office        0.04
3   Financial or Legal Service       0.04
4               Food Truck        0.04


----Cross Creek----
                 venue   frequency
```

```
0          Italian Restaurant        0.12
1                 Golf Course        0.06
2                  Playground        0.06
3                        Gym        0.06
4  Cajun / Creole Restaurant        0.06


----Fernleaf----
               venue  frequency
0          Dog Run       0.25
1     College Track       0.25
2              Pool       0.25
3          Speakeasy       0.25
4  American Restaurant       0.00


----Hanover West----
                  venue  frequency
0                  Gym       0.14
1        Shop & Service       0.14
2              Wine Bar       0.14
3         College Track       0.14
4  Gym / Fitness Center       0.14


----Memorial Park----
                  venue  frequency
0                  Park        0.2
1           Golf Course        0.1
2  Gym / Fitness Center        0.1
3          Tennis Court        0.1
4               Theater        0.1


----Peachtree Battle Alliance----
                    venue  frequency
0        American Restaurant       0.07
1         Mexican Restaurant       0.07
2  Mediterranean Restaurant       0.07
3                   Pharmacy       0.07
4              Tanning Salon       0.03


----Springlake----
              venue  frequency
0        Pizza Place       0.07
1     Massage Studio       0.07
2     Sandwich Place       0.07
3  Salon / Barbershop       0.07
4          Pet Store       0.07


----Wesley Battle----
                  venue   frequency
```

```
0            Grocery Store        0.14
1          Automotive Shop        0.14
2        Recreation Center        0.14
3  Construction & Landscaping     0.14
4                    Park         0.14
```

```
----Westminster/Milmar----
                                        venue  frequency
0                               Jewelry Store        0.5
1                                 Beer Garden        0.5
2                         American Restaurant        0.0
3                                    Pharmacy        0.0
4  Residential Building (Apartment / Condo)        0.0
```

```
----Westover Plantation----
                  venue  frequency
0        Baseball Field       0.33
1                  Pool       0.33
2  Outdoors & Recreation      0.33
3    American Restaurant      0.00
4              Pharmacy       0.00
```

```
----Wildwood (NPU-C)----
                                        venue  frequency
0                         Rental Car Location        0.5
1                                        Pool        0.5
2                         American Restaurant        0.0
3                   Latin American Restaurant        0.0
4  Residential Building (Apartment / Condo)        0.0
```

```
----Woodfield----
                                        venue  frequency
0                                  Campground        1.0
1                         American Restaurant        0.0
2                                    Pharmacy        0.0
3  Residential Building (Apartment / Condo)        0.0
4                         Rental Car Location        0.0
```
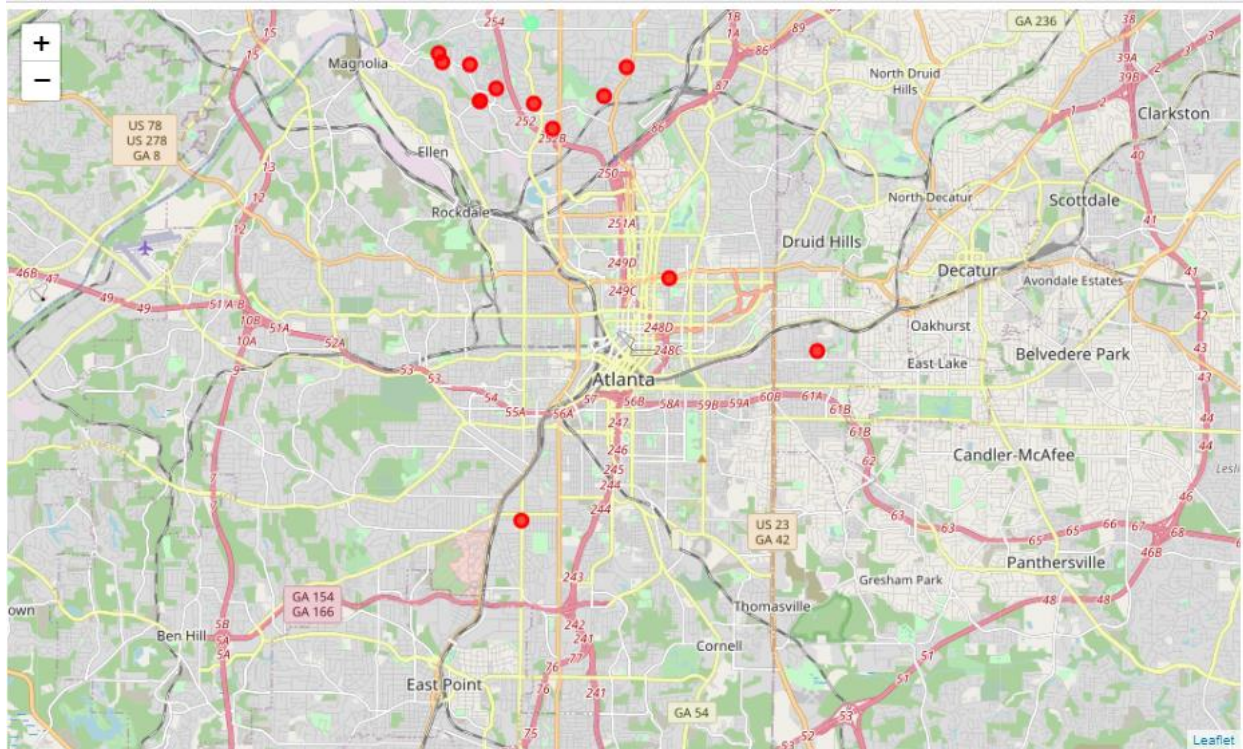
Top 10 venues in NPU C neighborhoods.

	Cluster Label	Neighborhood	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	0	Arden/Habersham	Juice Bar	Scenic Lookout	Food Truck	Gastropub	Cupcake Shop	Department Store	Doctor's Office	Dog Run	Donut Shop	Fast Food Restaurant
1	0	Argonne Forest	Southern / Soul Food Restaurant	Breakfast Spot	Donut Shop	Cuban Restaurant	Racetrack	Cosmetics Shop	Ice Cream Shop	Fast Food Restaurant	Park	Clothing Store
2	3	Brandon	Ice Cream Shop	Yoga Studio	Gastropub	Cupcake Shop	Department Store	Doctor's Office	Dog Run	Donut Shop	Fast Food Restaurant	Financial or Legal Service
3	0	Castlewood	Wine Shop	Dog Run	Gym	Ski Trail	Boat or Ferry	Yoga Studio	Gas Station	Cupcake Shop	Department Store	Doctor's Office
4	0	Channing Valley	Food Truck	Sandwich Place	Mexican Restaurant	Department Store	Pizza Place	Chinese Restaurant	Clothing Store	Coffee Shop	Pub	Cosmetics Shop
5	0	Collier Hills	Italian Restaurant	Taco Place	Sandwich Place	Pizza Place	Chinese Restaurant	Cajun / Creole Restaurant	Smoke Shop	Burger Joint	Cupcake Shop	Gas Station
6	0	Collier Hills North	Italian Restaurant	Taco Place	Sandwich Place	Pizza Place	Chinese Restaurant	Cajun / Creole Restaurant	Smoke Shop	Burger Joint	Cupcake Shop	Gas Station
7	0	Colonial Homes	Pizza Place	Yoga Studio	Shipping Store	Rental Car Location	Pool	Pharmacy	Lounge	Japanese Restaurant	Gym	Grocery Store
8	0	Cross Creek	Italian Restaurant	Burger Joint	Pizza Place	Smoke Shop	Chinese Restaurant	Gas Station	Taco Place	Sandwich Place	Cajun / Creole Restaurant	Outdoors & Recreation
9	0	Fernleaf	College Track	Dog Run	Pool	Speakeasy	Yoga Studio	Gas Station	Department Store	Doctor's Office	Donut Shop	Fast Food Restaurant
10	0	Hanover West	College Track	Wine Bar	Gym / Fitness Center	Gym	Shop & Service	General Travel	Brewery	Fried Chicken Joint	Cupcake Shop	Department Store
11	0	Memorial Park	Park	Theater	Basketball Court	Recreation Center	Gym / Fitness Center	Gym	Golf Course	Tennis Court	Baseball Field	Financial or Legal Service
12	0	Peachtree Battle Alliance	American Restaurant	Pharmacy	Mexican Restaurant	Mediterranean Restaurant	Shopping Plaza	Salon / Barbershop	New American Restaurant	Women's Store	Italian Restaurant	Ice Cream Shop
13	0	Springlake	Pet Store	Salon / Barbershop	Sandwich Place	Massage Studio	Pizza Place	American Restaurant	Breakfast Spot	Post Office	Pub	Gym / Fitness Center
14	0	Wesley Battle	Recreation Center	Construction & Landscaping	Automotive Shop	Gym	Grocery Store	Candy Store	Park	Gas Station	Department Store	Doctor's Office
15	4	Westminster/Milmar	Jewelry Store	Beer Garden	Gay Bar	Department Store	Doctor's Office	Dog Run	Donut Shop	Fast Food Restaurant	Financial or Legal Service	Food Truck
16	0	Westover Plantation	Outdoors & Recreation	Pool	Baseball Field	Gay Bar	Department Store	Doctor's Office	Dog Run	Donut Shop	Fast Food Restaurant	Financial or Legal Service
17	2	Wildwood (NPU-C)	Rental Car Location	Pool	Cuban Restaurant	Cupcake Shop	Department Store	Doctor's Office	Dog Run	Donut Shop	Fast Food Restaurant	Financial or Legal Service
18	1	Woodfield	Campground	Yoga Studio	Cuban Restaurant	Department Store	Doctor's Office	Dog Run	Donut Shop	Fast Food Restaurant	Financial or Legal Service	Food Truck

Now using K means Clustering using K=5, create clusters for neighborhoods in NPU C

Results

Examining the cluster results

Cluster 1

	NPU	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	C	College Track	Dog Run	Pool	Speakeasy	Yoga Studio	Gas Station	Department Store	Doctor's Office	Donut Shop	Fast Food Restaurant
4	C	Juice Bar	Scenic Lookout	Food Truck	Gastropub	Cupcake Shop	Department Store	Doctor's Office	Dog Run	Donut Shop	Fast Food Restaurant
6	C	Pet Store	Salon / Barbershop	Sandwich Place	Massage Studio	Pizza Place	American Restaurant	Breakfast Spot	Post Office	Pub	Gym / Fitness Center
7	C	Food Truck	Sandwich Place	Mexican Restaurant	Department Store	Pizza Place	Chinese Restaurant	Clothing Store	Coffee Shop	Pub	Cosmetics Shop
8	C	Italian Restaurant	Taco Place	Sandwich Place	Pizza Place	Chinese Restaurant	Cajun / Creole Restaurant	Smoke Shop	Burger Joint	Cupcake Shop	Gas Station
9	C	Pizza Place	Yoga Studio	Shipping Store	Rental Car Location	Pool	Pharmacy	Lounge	Japanese Restaurant	Gym	Grocery Store
10	C	Outdoors & Recreation	Pool	Baseball Field	Gay Bar	Department Store	Doctor's Office	Dog Run	Donut Shop	Fast Food Restaurant	Financial or Legal Service
11	C	Italian Restaurant	Burger Joint	Pizza Place	Smoke Shop	Chinese Restaurant	Gas Station	Taco Place	Sandwich Place	Cajun / Creole Restaurant	Outdoors & Recreation
12	C	Wine Shop	Dog Run	Gym	Ski Trail	Boat or Ferry	Yoga Studio	Gas Station	Cupcake Shop	Department Store	Doctor's Office
13	C	Southern / Soul Food Restaurant	Breakfast Spot	Donut Shop	Cuban Restaurant	Racetrack	Cosmetics Shop	Ice Cream Shop	Fast Food Restaurant	Park	Clothing Store
15	C	American Restaurant	Pharmacy	Mexican Restaurant	Mediterranean Restaurant	Shopping Plaza	Salon / Barbershop	New American Restaurant	Women's Store	Italian Restaurant	Ice Cream Shop
16	C	Park	Theater	Basketball Court	Recreation Center	Gym / Fitness Center	Gym	Golf Course	Tennis Court	Baseball Field	Financial or Legal Service
18	C	Italian Restaurant	Taco Place	Sandwich Place	Pizza Place	Chinese Restaurant	Cajun / Creole Restaurant	Smoke Shop	Burger Joint	Cupcake Shop	Gas Station
19	C	College Track	Wine Bar	Gym / Fitness Center	Gym	Shop & Service	General Travel	Brewery	Fried Chicken Joint	Cupcake Shop	Department Store
20	C	Recreation Center	Construction & Landscaping	Automotive Shop	Gym	Grocery Store	Candy Store	Park	Gas Station	Department Store	Doctor's Office

Cluster 2

	NPU	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	C	Campground	Yoga Studio	Cuban Restaurant	Department Store	Doctor's Office	Dog Run	Donut Shop	Fast Food Restaurant	Financial or Legal Service	Food Truck

Cluster 3

	NPU	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
17	C	Rental Car Location	Pool	Cuban Restaurant	Cupcake Shop	Department Store	Doctor's Office	Dog Run	Donut Shop	Fast Food Restaurant	Financial or Legal Service

Cluster 4

	NPU	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	C	Ice Cream Shop	Yoga Studio	Gastropub	Cupcake Shop	Department Store	Doctor's Office	Dog Run	Donut Shop	Fast Food Restaurant	Financial or Legal Service

Cluster 5

	NPU	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
3	C	Jewelry Store	Beer Garden	Gay Bar	Department Store	Doctor's Office	Dog Run	Donut Shop	Fast Food Restaurant	Financial or Legal Service	Food Truck

Discussion

The objective of the analysis was to help small entrepreneurs to make data based informed decisions. The analysis here provides several insights some of the key aspects, but specifically identifying NPU in the following order of priority

1. Lowest crime to ensure safety of business and customers.
2. Neighborhood with median income over $65000/year to cater premium goods and services.
3. Highest population density in neighborhoods with lowest crime and Income to ensure business revenue.

Neighborhood venues were then identified from Foursquare API and other data sources.

K-Means clustering further enabled choosing the right venue based on most and least common venues in the area.

This information can be used to identify in which neighborhood and which venue, the business can be the most successful.

Conclusion

Through the analysis, insights were offered into the city to help small entrepreneurs with recommendation as to which business will be most successful in the safest neighborhood based on income, population and crime criteria. The report was presented with exploratory data analysis, then picking the ideal neighborhood using machine learning techniques. Several business options are available, a specific venue can be decided on least common venue available from the clusters presented.

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