

Coursera Applied Data Science Capstone Project

Denver Restaurant Placement Analysis

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Introduction

The restaurant industry is a cutthroat business. Restaurant placement is key to ensuring financial viability. In my project I specifically focused on Denver, Colorado. Denver is a blossoming city with many old and established neighborhoods as well as new neighborhoods currently in the works. A significant portion of the Denver nightlife and culture is focused on restaurants. Located on almost every corner, restaurants are an important part of the Denver economy. Having too many of one type of restaurant in area affects the prospective business evaluation. My project analyzes the prevalence of various types of venues in the fifty-six major neighborhoods in Denver in order to provide a road map for prospective business owners in terms of the ideal location for a new restaurant.

Data

Neighborhood data for the city of Denver was pulled from a Wikipedia page titled "List of Neighborhoods in Denver" (https://en.wikipedia.org/wiki/List_of_neighborhoods_in_Denver).

Foursquare was the source of the restaurant venue information for the city of Denver. This data was accessed using a RESTful API call to the Foursquare API.

Methodology & Results

The following Python libraries and packages were installed in order to complete this project: pandas, numpy, json, geopy.geocoders, folium, matplotlib, KMeans, and BeautifulSoup.

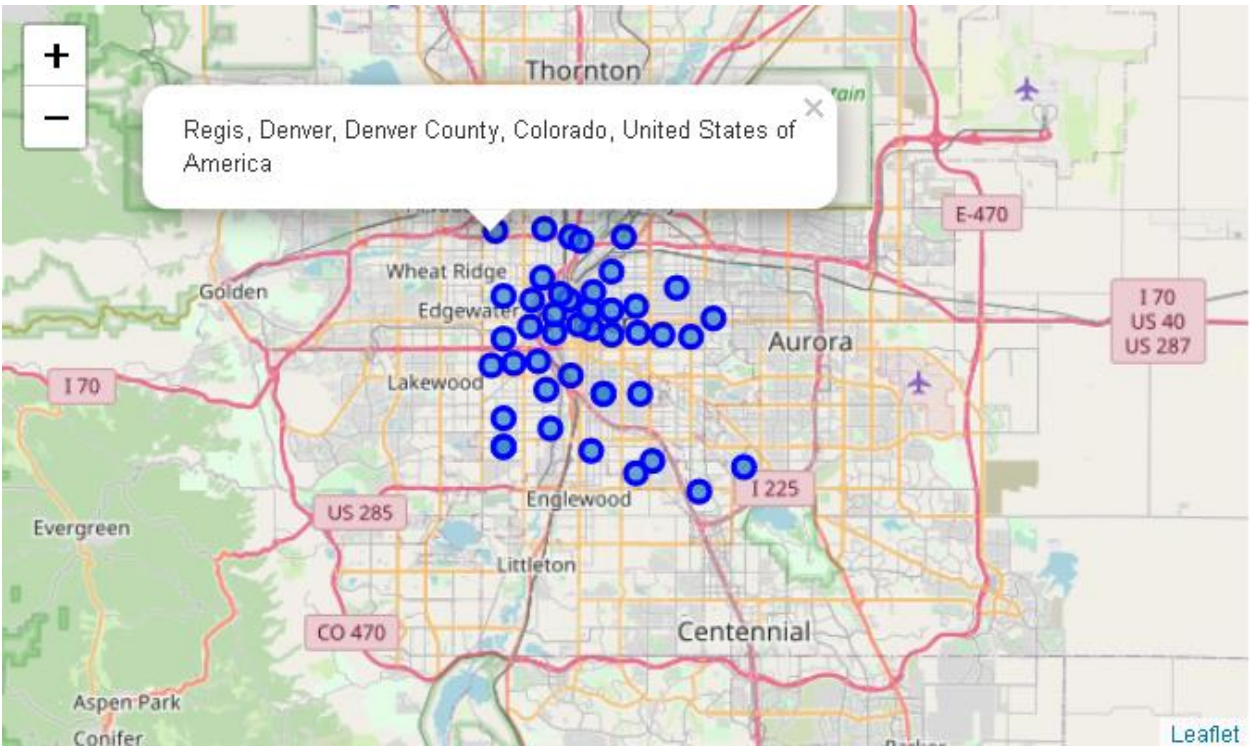
The BeautifulSoup Package was utilized to scrape the list of neighborhoods in Denver from the Wikipedia page. Before that data was useable, however, the data had to be cleaned and formatted in a user friendly format.

Once the data cleaning was completed, I utilized the Nominatim package from the geopy.geocoders library to pull GPS coordinates for each of the neighborhoods in Denver from the cleaned data. The compiled table with Denver neighborhood names and GPS coordinates is presented below.

	Neighborhood	GPS
0	Baker, Denver, Denver County, Colorado, United...	(39.711594500000004, -104.99374985708542)
1	Capitol Hill, Denver, Denver County, Colorado,...	(39.7358754, -104.9799213)
2	Central Business District, Denver, Denver Coun...	(39.7500931, -104.9954351)
3	Cherry Creek, Denver, Denver County, Colorado,...	(39.6636098, -104.8774436)
4	Cheesman Park, 1599, Cheesman Park, Denver, De...	(39.73281355, -104.96645529888413)
5	City Park, Denver, Denver County, Colorado, Un...	(39.74734, -104.95028497370055)
6	Congress Park, Denver, Denver County, Colorado...	(39.7337198, -104.9483668)
7	City Park West, Denver, Denver County, Colorad...	(39.74537615, -104.96657726439688)
8	Civic Center, Denver, Denver County, Colorado,...	(39.738181, -104.9877439)
9	Country Club, Wolters Village, Mineral Wells, ...	(32.8248337, -98.0605864)
10	Lincoln Park, Denver, Denver County, Colorado,...	(39.7331384, -105.0052409729397)
11	North Capitol Hill, Denver, Denver County, Col...	(39.7456241, -104.98159787979148)
12	Speer, Laramie County, Wyoming, United States ...	(41.0544276, -104.895525)
13	Union Station, 1701, Wynkoop Street, 16th Stre...	(39.75363, -105.0007481)
14	East Belcaro Drive, Denver, Denver County, Col...	(39.7023138, -104.9472404)
15	East Colfax, Denver, Denver County, Colorado, ...	(39.7406288, -104.8977476)
16	Hale, Denver, Denver County, Colorado, 80262, ...	(39.7330213, -104.931128)
17	Hilltop, 4770, Fox Street, Globeville, Denver,...	(39.78307865, -104.99396107499159)
18	Indian Creek, 801, Redwood Shores, Redwood Cit...	(37.539283749999996, -122.24944089661915)
19	Lowry, Pope County, Minnesota, United States o...	(45.7048887, -95.519095)
20	Montclair, Denver, Denver County, Colorado, 80...	(39.731735, -104.9129478)
21	Cole, Denver, Denver County, Colorado, United ...	(39.76563005, -104.96655706375016)
22	Elyria Swansea, Denver, Denver County, Colorad...	(39.78295795, -104.95811286177516)
23	Five Points, Denver, Denver County, Colorado, ...	(39.7546578, -104.9779857)
24	Globeville, Denver, Denver County, Colorado, 8...	(39.78073155, -104.9869723275022)
25	North Park Hill, Denver, Denver County, Colora...	(39.75682585, -104.92173198175104)
26	Chaffee Park, Denver, Denver County, Colorado,...	(39.787909, -105.01099347721791)
27	Highland, Denver, Denver County, Colorado, 802...	(39.76158305, -105.01250026995918)
28	Jefferson Park, Denver, Denver County, Colorad...	(39.7506207, -105.01977930852223)

	Neighborhood	GPS
29	Regis, Denver, Denver County, Colorado, United...	(39.7867787, -105.04396785379609)
30	Sloan Lake, Denver, Denver County, Colorado, U...	(39.7524265, -105.0392401926602)
31	Rosedale, Denver, Denver County, Colorado, Uni...	(39.6719007, -104.98049875528524)
32	Metropolitan State University of Denver, Lawre...	(39.7434647, -105.0043402)
33	University Hills, 2730, Denver, Denver County,...	(39.66694365, -104.9384116)
34	University Park, 1900, University Parkway, Uni...	(41.4594827, -87.7232711)
35	Washington Park, Alamo Placita, Denver, Denver...	(39.7020811, -104.971033692151)
36	Washington Park, Alamo Placita, Denver, Denver...	(39.7020811, -104.971033692151)
37	Wellshire, Denver, Denver County, Colorado, Un...	(39.66052985, -104.95009148581619)
38	Goldsmith, Ector County, Texas, 79741, United ...	(31.980673, -102.61515)
39	Hampden, Ramsey County, North Dakota, 53338, U...	(48.5402849, -98.6542903)
40	Hampden, Ramsey County, North Dakota, 53338, U...	(48.5402849, -98.6542903)
41	Kennedy, Michael Avenue, Kennedy, San Joaquin ...	(37.9308025, -121.24579786822119)
42	Southmoor Park, Denver, Denver County, Colorad...	(39.65112095, -104.90715363615266)
43	Bear Valley, Mariposa County, California, Unit...	(37.5688237, -120.1193489)
44	Fort Logan, Meagher County, Montana, United St...	(46.6786351, -111.1737139)
45	Harvey Park, College View, Denver, Denver Coun...	(39.67466375, -105.0391671580048)
46	Harvey Park, College View, Denver, Denver Coun...	(39.67466375, -105.0391671580048)
47	Marston, New Madrid County, Missouri, 63866, U...	(36.5189503, -89.6125789)
48	Athmar Park, College View, Denver, Denver Coun...	(39.7036815, -105.01074128924688)
49	Barnum, Denver, Denver County, Colorado, Unite...	(39.71768305, -105.03245529638046)
50	Barnum West, Denver, Denver County, Colorado, ...	(39.717155149999996, -105.0464972167263)
51	Mar Lee, College View, Denver, Denver County, ...	(39.6891921, -105.03914145138785)
52	Ruby Hill, Denver, Denver County, Colorado, 80...	(39.6835984, -105.0072046)
53	Sun Valley, Denver, Denver County, Colorado, U...	(39.736379299999996, -105.02145887063874)
54	Valverde, Denver, Denver County, Colorado, 802...	(39.71830095, -105.01582317422992)
55	Villa Park, Denver, Denver County, Colorado, 8...	(39.7307265, -105.0392123630247)

With this information, a folium map was generated to visually display the different neighborhoods in Denver with labels to better enable the prospective business owner to make an informed decision.



Foursquare was utilized to pull Denver venue information using a RESTful API call to the Foursquare API. This required CLIENT_ID, CLIENT_SECRET, and VERSION to make the call.

I grouped the venues into categories to make this vast amount of data easier to comb through. I used the GPS coordinates previously ascertained in combination with the Foursquare API to sort the venue list by neighborhood.

Once the venues were separated into their respective neighborhoods, I used OneHot Encoding to determine the numerical frequency of categories of venues in each neighborhood. The results from the Civic Center neighborhood in Denver is shown below.

	venue	freq
0	Zoo Exhibit	0.38
1	Science Museum	0.17
2	Park	0.07
3	Outdoor Sculpture	0.05
4	History Museum	0.05
5	Baseball Field	0.02
6	Track	0.02
7	Theme Park Ride / Attraction	0.02
8	Sculpture Garden	0.02
9	Scenic Lookout	0.02
---- Civic Center, Denver, Denver County, Colorado		

I then utilized K Means clustering and placed the data into a table format that depicts the top ten most common venues in every one of the fifty six Denver neighborhoods. A portion of this table is depicted below.

Neighborhood	GPS	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue
Baker, Denver, Denver County, Colorado, United...	(39.711594500000004, -104.99374985708542)	39.711595	-104.993750	0.0	Marijuana Dispensary	Mexican Restaurant	Bar	Coffee Shop	Beach Bar	Food Truck
Capitol Hill, Denver, Denver County, Colorado,...	(39.7358754, -104.9799213)	39.735875	-104.979921	0.0	Pizza Place	Sandwich Place	Bar	Coffee Shop	Convenience Store	Pub
Central Business District, Denver, Denver Coun...	(39.7500931, -104.9954351)	39.750093	-104.995435	0.0	Hotel	American Restaurant	Cocktail Bar	Bar	New American Restaurant	Mexican Restaurant
Cherry Creek, Denver, Denver County, Colorado,...	(39.8636098, -104.8774436)	39.863610	-104.877444	0.0	Park	Trail	Construction & Landscaping	Farmers Market	Financial or Legal Service	Fabric Shop
Cheesman Park, 1599, Cheesman Park, Denver, De...	(39.73281355, -104.96645529888413)	39.732814	-104.966455	0.0	Coffee Shop	Garden	Botanical Garden	Bar	Café	Park

5. Discussion

My project utilized various methods to present the same information in order to suit the needs and data visualization preferences of any potential business owner. Data was presented numerically, graphically, tabular, and visually to provide analysis from different angles. The business owner can determine which visualization appeals to him/her. In my opinion, the table presents the clearest and quickest representation of the information, but the Folium map is a good start to get geographically acquainted with the area.

6. Conclusion

The analysis provided valuable information about the most common venues in Denver, sorted by the 56 neighborhoods that compose Denver. This information will allow prospective restaurant owners the ability to find optimal placement for their restaurants to make sure there is not too much direct competition in the neighborhood of choice. For example, Capitol Hill might not be the most optimal location for a pizza place because the most common restaurant type in that neighborhood is already pizza places. The competition might hinder the ability for a new pizza place to enter the market.