Dance Studio Placement in Atlanta, Georgia

An IBM Data Science Capstone Project

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[†]A Jupyter notebook containing the full analysis can be found at: github.com/KSHHutch

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Abstract

A dance studio is a business which provides the service of dance lessons, most often for school-age children. They have unique challenges which can be mitigated by carefully considering where to locate one. This report details the use of data science techniques and freely available data to answer the question, "What is the best place to start a new dance studio?"

A dance studio thrives where there is minimal competition from other studios, a good student base, a solid teacher base, and is a convenient place for parents. As such, to answer the above question, data regarding existing dance studios, public schools, colleges and universities, and grocery stores were gathered. These various locations were plotted, clustered, and areas containing each of the desired features were found. While the data used in this analysis may potentially be lacking, the process used seems viable, and could be a boon to those seeking to open a dance studio.

1 Introduction

1.1 Background

Dance studios are places where children, teenagers, and even adults can go to learn dance from qualified instructors. There are various kinds of dance studios that specialize in certain forms of dance like a ballet specific studio. Other studios may offer training in a variety of dance types and techniques.

Irrespective of the kind of dance focused on in the studio, a dance studio may choose to enter into dance competitions. Dance competitions are a means for studios to push their students to excel, they create a common goal and sense of loyalty among dancers, and winning competitions can boost a studio's reputation. However, because of costs, long practice hours, and logistics associated with competitions, studios may choose to forgo competitions and instead focus on recreational dance [2].

1.2 The Business Problem

The teaching and learning of dance is an athletic, artistic, and fulfilling endeavor. Even so, a dance studio is, at its heart, still a business. Every business has unique needs, and dance studios are no exception. The needs of dance studios include, but are not limited to, competition with other studios for students, student retention, and finding qualified teachers. These needs and challenges necessitate that a potential studio director carefully choose the location for their studio. A good location can help to minimize some of the common issues that studios face [2].

While some needs like a good student base may be helped by obvious factors like being near public schools, other needs may be influenced by some non-obvious forces. A real issue studios face is student retention. A somewhat hidden factor in the retention of students is the commitment of parents. Parents need to be on board in order to insure students stick around, because they are likely paying for the lessons and providing transportation. Some locations may provide benefits for parents that will decrease the chances of students being pulled out of dance lessons. Among these bonus features could be close proximity to schools to minimize drive time for parents and as well as being located near shops or a grocery store so parents can run errands while their child is at dance.

A more complete list of issues and "bonus" features, explanations as to why they matter, as well as implications for a data science analysis, has been compiled in Table 1. This list was devised after an interview with a former dance studio assistant-director [2], so it is based on relevant, and real-world experience about what can make a significant impact on the success of dance studios. With all of these factors to consider, it may not be immediately obvious where the best place to start a new studio is. This report seeks to remove some of the difficulty in determining the best location for a new dance studio using data science techniques. Put succinctly, this analysis will seek to answer the question, "What is the best area to start a new dance studio?"

Issue/Bonus	Explanation	Model Implication
Competition with other studios	Two similar studios located near each other could start competing for students which is undesirable. It is best to be farther away from other studios if possible.	Maintain some minimum distance from existing studios
Student base	A dance studio needs a solid base of students. Most dance studios accept only students that are school-aged. Locating in an area near public schools insures there are plenty of potential students.	Proximity to public schools
Finding teachers	Finding qualified dance teachers can be made much easier by locating near a college or university. Often, such schools have dance majors or students who formerly danced in studios.	Proximity to colleges and universities
Parent convenience	Parents can have a lot of competing demands to balance. Locating a dance studio near public schools can help eliminate the need for a parent to pick their child up from school and drive across town to dance lessons. Locating the studio near a grocery store can allow parents to minimize the number of trips they make. They can get groceries while their child is at dance, and not have to worry about being late to pick their kid up.	Proximity to public schools, grocery stores.
Affordable performance venue	Recitals and performances give students a goal to work toward and help parents see the fruits of their financial and time investment. A recital can also help the studio raise funds, but that is only the case if the performance venue is relatively close by and not too expensive to use.	Proximity to performance venues; colleges and universities

Table 1: A list of needs and bonus features, explanations about them, and implications they have on a data science model.

1.3 Interested Parties

This report is targeted to any person interested in starting a dance studio. This report may be appealing because it details a process which does a lot of the heavy lifting involved in deciding what a good location might be. Namely, it avoids areas with existing dance studios, locates in areas with a good potential student base, and locates in areas where there might be more teachers available to hire. Obviously, personal preferences, financial limitations, and other factors will come into play when considering where to start a dance studio, and this report does not address those factors. Instead, the aim is to supply a potential studio owner with targeted regions that will support the basic needs of a new studio, and maybe even provide a slight edge over their competition.

It is important to note that the results of this report may be more optimal for those seeking to run a recreational dance studio, as competition studios may have additional needs that are not be considered here. Even with that limitation, it still stands to reason that any current or potential studio directors in any area may also glean insights from this report.

Given that the author lives in Atlanta, Georgia, this report will focus on the Atlanta metropolitan area. Even with this seemingly arbitrary choice of location, Atlanta is actually an excellent place to start a business. It has steady population growth [4] as well as economic growth [3].

2 Data

2.1 Sources

To answer the question, "What is the best location for a new dance studio in Atlanta, Georgia?", first, necessary data must be collected. Due to the nature of the problem, location data including features from Table 1 will be the main kind of data utilized – namely public schools, colleges, grocery stores, and performing arts venues. In particular, to facilitate the use of a clustering machine learning approach, latitude and longitude data will be required for each of the features. Another important piece of information for each feature will be its zip code, because a zip code is more easily usable and searchable by an interested party than geographic coordinates.

The Foursquare API was used to find data on existing dance studios, performance venues, and grocery stores. Foursquare is able to provide geographic data and other information like latitude, longitude, the name of the venue, etc. For example, as Figure 1 shows, a list of existing dance studios was easily generated with data provided by FourSquare.

The majority of the data in this report started with information scraped from the following webpages:

- The Keen Team – Real Estate website containing a list of zip codes and neighborhood names for Atlanta, Georgia. No other pre-made list was found elsewhere.
- Education Bug – List of public schools in Georgia by county

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
1050	Downtown Atlanta - Grant Park	33.744222	-84.393238	Rhythma Dance Studio	33.742962	-84.406353	Dance Studio
1264	Cabbagetown - East Atlanta Village - Ormewood ...	33.736990	-84.350905	Dance 411 Studios	33.741120	-84.349610	Dance Studio
1350	Cabbagetown - East Atlanta Village - Ormewood ...	33.736990	-84.350905	The Beam: Moving In The Spirit	33.741769	-84.361998	Dance Studio
1599	Morningside/Lenox Park - Piedmont Heights - Le...	33.821216	-84.368706	Academy Ballroom	33.830702	-84.363622	Dance Studio
2139	Hapeville	33.672086	-84.371992	MoveWithAPurpose Dance	33.681068	-84.381351	Dance Studio

Figure 1: A data frame containing data gathered from the FourSquare API.

- Wikipedia – List of colleges and universities in Georgia

After scraping the information from the web pages using the Beautiful Soup package, it was necessary to add in latitude, longitude, and zip code. For example, the web scrape of the List of Colleges and Universities in Georgia (U.S. State) web page provided a list of the names of colleges in the state of Georgia (see Figure 2. After that, the geographic coordinates were found by geocoding the names using the Geopy package in Python, and zip codes were found using the US Zip Code package in Python. The results of this can be seen in Figure 3

	College Name
0	Georgia Institute of Technology
1	University of Georgia
2	Augusta University
3	Georgia State University
4	Georgia Southern University
5	Kennesaw State University

Figure 2: The first few entries of a data frame containing a list of colleges scraped from Wikipedia.

2.2 Cleaning

Data from the Foursquare API contains information about all venues in a given locality. Foursquare has done a very thorough job categorizing venues. For this situation, a large number of unnecessary categories were present that were dropped so only categories relevant to features in Table 1 were included.

Knowing that many schools in the United States might share the same name, schools were fed to the Geopy geocoder using their name along with "Georgia, USA". Even with these measures taken, some of the schools were geocoded incorrectly. This is for the obvious

	College Name	Latitude	Longitude	Zip Code
0	Georgia Institute of Technology	33.776033	-84.398841	30363
1	University of Georgia	33.940428	-83.373049	30606
2	Augusta University	33.469335	-81.988562	30912
3	Georgia State University	33.754794	-84.387896	30303
4	Georgia Southern University	32.421438	-81.784505	30458
5	Kennesaw State University	34.038832	-84.582745	30144

Figure 3: The first few entries of a data frame containing the geographic coordinates and zip codes of the colleges.

fact that many other schools in the USA and around the world share the same name. These schools that were assigned an incorrect location were weeded out by constraining the schools within a particular maximum and minimum longitude around the Atlanta area.

3 Methodology

3.1 Prioritization of Features

The aim of this report is to find areas for dance studios to be located that will be mutually beneficial for parents, students, the studio owner, and studio staff. Based on the features discussed in Table 1, potential areas will be identified based on the following constraints (in order of priority):

1. A minimum 2 miles away from other existing dance studios
2. Near as many public schools as possible
3. Close to a college or university
4. Near a grocery store
5. Near a performing arts venue

There is reasoning behind this order of priority, and it was informed by interviewing a former dance studio assistant-director [2]. First and foremost it's important to have paying customers, i.e. students. Keeping some distance from existing studios will ensure a good reputation for your studio as well as minimal competition to garner students. Being near multiple public schools will ensure a good general student base as well. Second, a studio

needs qualified teachers. Close proximity to a university or college is important not only to have a base of potential teachers, but also to make it possible for them to commute. Many college students rely on public transportation, so being within a reasonable walking distance or bus ride of a college could be important to make it reasonable for college students to consider working at your studio. Lastly, being near a grocery store or performing arts venue are nice bonuses, but nowhere near as vital as having students and teachers at your studio, so they are given lowest priority.

The sources and processing of the data for all of the various features are discussed in Section 2.

3.2 Preliminary Analysis – Maps

As was mentioned before, the aim of this analysis is to find some broad areas within which a dance studio could locate to avoid some common problems all studios face. After the data surrounding different features and venues were gathered, maps were generated using the Folium package to get a more qualitative visual feel for what areas might be best. This gave a broad idea of what areas might be good, and what areas would better be avoided. Making these maps also helped to identify any issues that may have arisen in the data gathering and cleaning stages. For example, when one public school was being geocoded, it ended up being assigned to coordinates in Japan. This was not quickly apparent from looking at the data frame, but it was easy to spot when looking at a zoomed out map.

It is worth mentioning here that the Foursquare API only delivered 3 existing dance studios within the zip codes. It seems unlikely that there are so few existing studios in the greater Atlanta Metropolitan area. The search radius parameter for the API call was adjusted to try and find more studios, but 3 was the maximum number yielded.

3.3 Fine Analysis – DBSCAN Clustering

After getting an intuitive feel for what areas might be good by making maps, a more quantitative approach was taken to determine discrete areas which could serve as candidate regions for the opening of a dance studio. For this reason, the Density-based spatial clustering of applications with noise (DBSCAN) algorithm was employed [1] . DBSCAN was chosen for use in this situation because it could divide the schools, colleges, grocery stores, and performing arts venues into clusters based on how close they are to each other. That proximity is desirable in this situation. Even though geographic distances here are quite small and euclidean distance would have sufficed, the haversine parameter was still chosen for good measure.

In order to avoid being near existing studios, after gathering and cleaning the data (see Section 2), any venues within 2 miles of the dance studios were eliminated from the clustering dataset. That way, DBSCAN would automatically make clusters which not only excluded existing studios, but also only included relevant locations which are 2 miles or more away from existing studios. Again, the idea here is to stay away from areas with existing studios to avoid competing with their student base. This was a simple way to do

that. DBSCAN created 27 clusters from the location data after dance studios and venues near them were dropped.

After running the DBSCAN algorithm, the various clusters were sorted based on which of them have more of the most important features. The order of priority for what was considered a better cluster/area was decided based on the list above in section 3.1. The central point of the top 10 clusters was calculated and the zip code that the central point lies in was found. Any studio which locates in this zip code should therefore be surrounded by schools, colleges, grocery stores, and performing arts venues, and theoretically have all of basic elements for success.

4 Results

4.1 Preliminary Analysis – Maps and Tables

This section lists all of the cleaned tables found from the data gathering in section 2 and the maps described in section 3.2 . Listed below is some information on the different features and data:

- In total, there were 35 different zip codes found from the real estate webpage around Atlanta.
- The zip codes came overwhelmingly from Fulton and DeKalb counties, so lists of schools from these counties were used. Overall, 90 public schools in the area were accurately labeled and geocoded.
- 4 different colleges and universities were found and accurately geocoded around Atlanta.
- 3 dance studios.

Figures 4 through 10 contain the results from the preliminary analysis.

4.2 Fine Analysis – Maps and Tables

DBSCAN created 27 clusters out of all of the features and venues remaining after the dance studios and all features within 2 miles of them were dropped.

Figures 11 through 13 contain the results from the fine analysis and DBSCAN clustering.

5 Discussion

5.1 Data Completeness

The number of public schools found certainly seems sufficient for this project. 90 were found and accurately geocoded within the area. This would allow a potential studio owner

	Zip Code	Neighborhood	Latitude	Longitude
0	30002	Avondale Estates	33.779842	-84.257246
1	30021	Clarkston	33.818102	-84.231757
2	30030	City of Decatur - Oakhurst - Winnona Park	33.764085	-84.312390
3	30032	East Lake - South Decatur	33.742619	-84.265073
4	30033	North Decatur	33.795165	-84.285839
5	30080	Smyrna	33.900181	-84.477476
6	30084	Tucker	33.820128	-84.222067
7	30303	Downtown - Central Business District - Fairlee...	33.753226	-84.390483
8	30305	Buckhead - Garden Hills - Haynes Manor - Peach...	33.832365	-84.384984
9	30306	Virginia Highlands - Morningside/Lenox Park - ...	33.793415	-84.360846
10	30307	Candler Park - Druid Hills - Edgewood - Emory ...	33.761351	-84.349699

Figure 4: A portion of the data frame containing names of neighborhoods and zip codes in and around Atlanta, GA.

Out[5]:

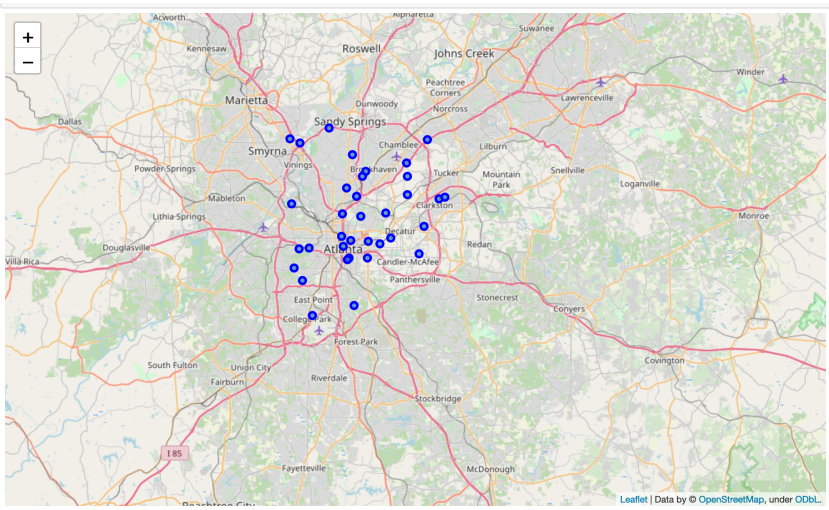

Figure 5: A map plotting the centers of zip codes in and around Atlanta, GA.

	Longitude	Latitude	School Name	Category
0	-84.438540	33.720941	Arkwright Elementary School	School
1	-84.463263	33.735663	Beecher Hills Elementary School	School
2	-84.374371	33.767884	C. W. Hill Elementary School	School
3	-84.388538	33.715107	Campbell Elementary School	School
4	-84.406872	33.715663	Capitol View Elementary School	School
5	-84.389093	33.718441	Carver High School	School
6	-84.465085	33.717115	Cascade Elementary School	School
7	-84.395556	33.769722	Centennial Place Elementary School	School
8	-84.439929	33.732329	Connally Elementary School	School
9	-84.442151	33.753440	F. L. Stanton Elementary School	School

Figure 6: A portion of the data frame containing a list of public schools in and around Atlanta, GA.

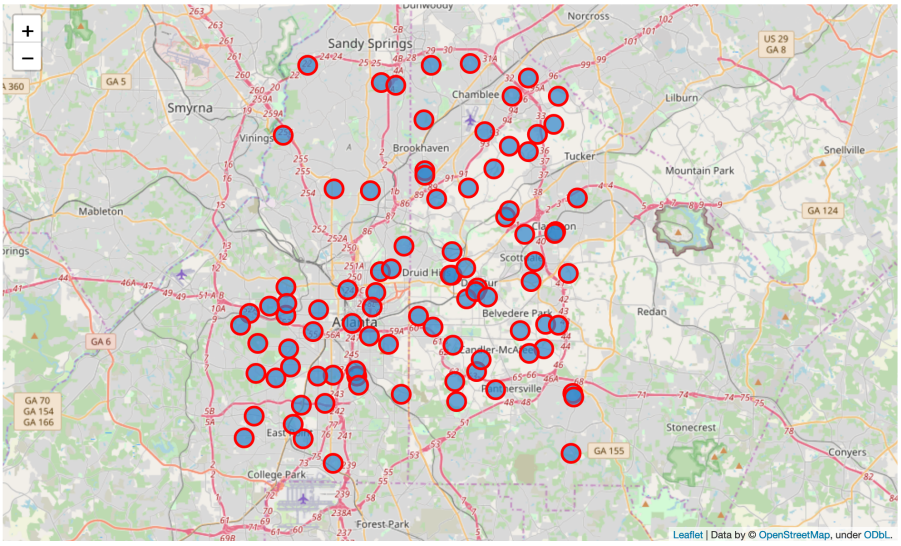

Figure 7: A map showing the locations of all the schools around Atlanta, GA used for this analysis.

	College Name	Latitude	Longitude	Zip Code
0	Georgia Institute of Technology	33.776033	-84.398841	30363
1	University of Georgia	33.940428	-83.373049	30606
2	Augusta University	33.469335	-81.988562	30912
3	Georgia State University	33.754794	-84.387896	30303
4	Georgia Southern University	32.421438	-81.784505	30458
5	Kennesaw State University	34.038832	-84.582745	30144

Figure 8: A data frame created from web scraping a Wikipedia article containing a list of colleges and universities around Atlanta, GA.

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
1252	Cabbagetown - East Atlanta Village - Ormewood ...	33.736990	-84.350905	Dance 411 Studios	33.741120	-84.349610	Dance Studio
1589	Morningside/Lenox Park - Piedmont Heights - Le...	33.820849	-84.368822	Academy Ballroom	33.830702	-84.363622	Dance Studio
2132	Hapeville	33.672086	-84.371992	MoveWithAPurpose Dance	33.681068	-84.381351	Dance Studio
34	Clarkston	33.818102	-84.231757	Super Fresh Foods	33.819506	-84.228496	Grocery Store
40	Clarkston	33.818102	-84.231757	Food mart	33.810461	-84.239526	Grocery Store
101	East Lake - South Decatur	33.742619	-84.265073	Wayfield Foods, Inc.	33.739440	-84.253608	Grocery Store
106	East Lake - South Decatur	33.742619	-84.265073	Aldi	33.754020	-84.270818	Grocery Store
120	East Lake - South Decatur	33.742619	-84.265073	Big T's Supermarket	33.751289	-84.274384	Grocery Store
329	Downtown - Central Business District - Fairlee...	33.753226	-84.390483	Rialto Center for the Arts	33.756813	-84.389239	Performing Arts Venue
771	Midtown - Ansley Park - Brookwood Hills - Lori...	33.796604	-84.390649	Center for Puppetry Arts	33.792871	-84.389690	Performing Arts Venue
795	Midtown - Ansley Park - Brookwood Hills - Lori...	33.796604	-84.390649	The Woodruff Arts Center	33.789379	-84.384648	Performing Arts Venue
1112	Downtown Atlanta - Castlebury Hill	33.766628	-84.392518	Rialto Center for the Arts	33.756813	-84.389239	Performing Arts Venue
1399	East Lake - Kirkwood - Edgewood	33.756305	-84.329987	Healium Center	33.764122	-84.340188	Performing Arts Venue
1598	Morningside/Lenox Park - Piedmont Heights - Le...	33.820849	-84.368822	Professional Actor's Studio	33.832595	-84.367787	Performing Arts Venue
1894	Vinings	33.894345	-84.461307	Cobb Energy Performing Arts Centre	33.884471	-84.458715	Performing Arts Venue

Figure 9: A data frame created from venue data gathered from the FourSquare API.

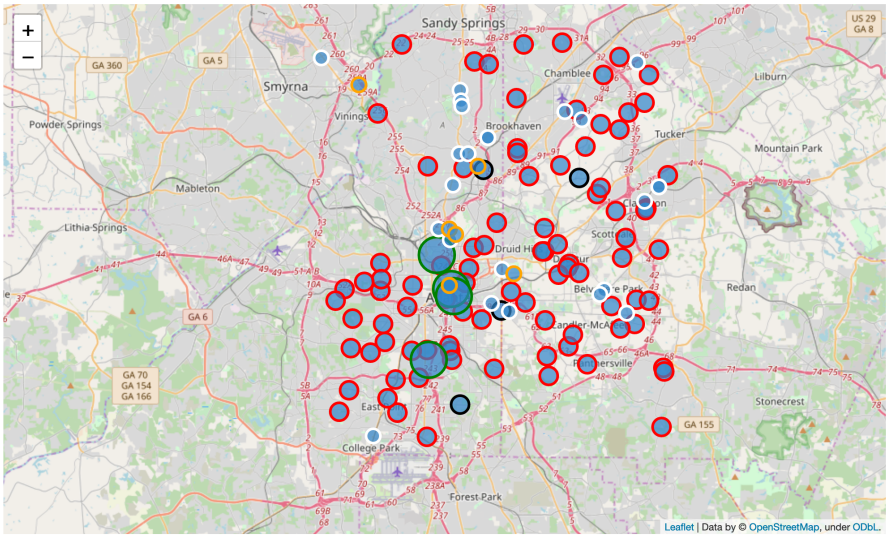

Figure 10: A map showing all of the features and venues. Red: Public School; White: Grocery Store; Orange: Performance Venue; Green: College.

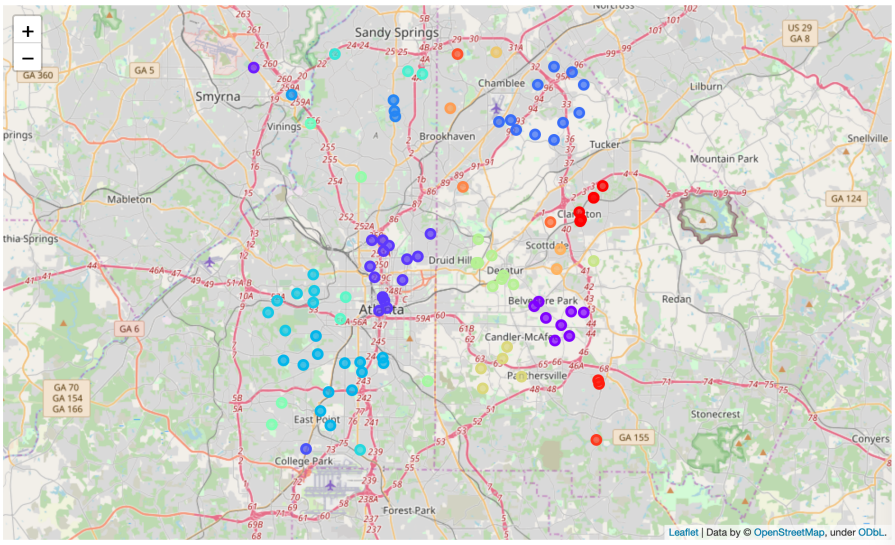

Figure 11: A map showing the clustered venues.

	Cluster	Zip Code	Neighborhood	School	College	Grocery Store	Performing Arts Venue	Center Lat	Center Lon
0	7	30308	Midtown - Old Fourth Ward	True	True	True	True	33.767884	-84.374371
1	8	30310	Adair Park - Capitol View - Oakland City - Wes...	True	True	True	False	33.732329	-84.439929
2	0	30021	Clarkston	True	False	True	False	33.819506	-84.228496
3	2	30032	East Lake - South Decatur	True	False	True	False	33.739440	-84.253608
4	3	30033	North Decatur	True	False	True	False	33.815104	-84.276034
5	20	30345	Briarcliff Woods - Oak Grove - Northlake	True	False	True	False	33.866952	-84.252094
6	1	30030	City of Decatur - Oakhurst - Winnona Park	True	False	False	False	33.783263	-84.306297
7	4	30033	North Decatur	True	False	False	False	33.833160	-84.304091
8	6	30305	Buckhead - Garden Hills - Haynes Manor - Peach...	True	False	False	False	33.832985	-84.405778
9	9	30315	Grant Park - Peoplestown - Lakewood	True	False	False	False	33.703996	-84.355203

Figure 12: A data frame containing the top 10 clusters from the idealness ranking.

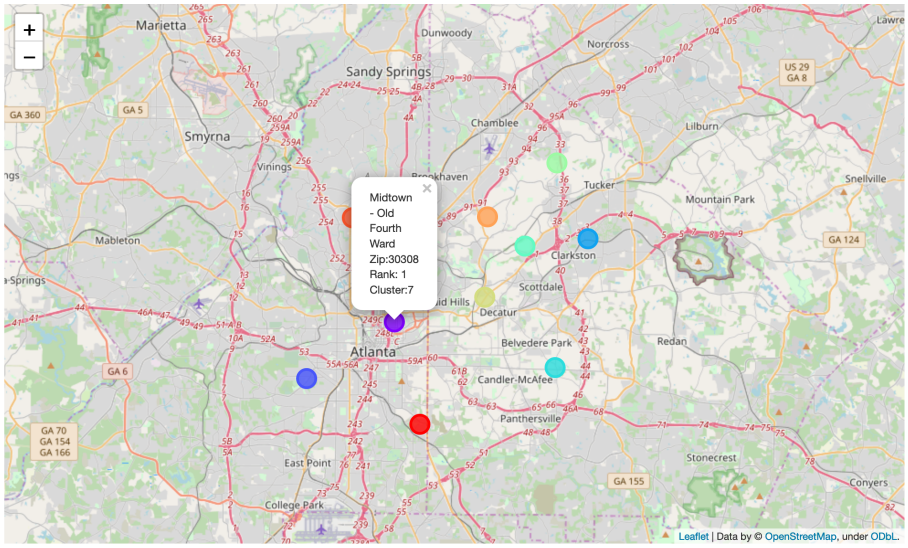

Figure 13: A map containing the center points of the top 10 best clusters. The flag of the top cluster is highlighted.

to locate in a spot with a sufficient student base. It is worth noting that the grade range of the school ie. elementary, middle, or high school, was not focused on in this analysis. However, the Education Bug list contained that information. All of the names of the school were suffixed with the grade range of the school eg. Miller Grove Middle School. So, if a potential studio owner wanted to focus on a particular age range, it could easily be done. Conversely, if a studio owner wanted to insure a broad age range in the hopes of being able to have young dancers stay with the studio through their older years, it would not be difficult to rank clusters based on inclusion of each of the types of schools.

The other ancillary features like number of colleges, grocery stores, and performing arts venues seem sufficient enough for this project. It does seem, however, that grocery stores and performing arts venues were somewhat sparse for a metropolitan area with a population around 5 million people [5]. Perhaps these categories could also be supplemented or replaced by another source.

As was mentioned before, it seems that the Foursquare API data is lacking in regards to existing dance studios in the Atlanta, GA area. It seems unlikely that there are only 3 studios, and any attempts to remedy this issue via Foursquare were unsuccessful. As such, it appears as though the results of analysis may not be entirely accurate, as it is likely there are other existing studios which would change the results.

5.2 Best Clusters

Regardless of the shortcomings of the data sources, the process of the analysis proved successful. One area was found with one of each of the desired categories, one was found with 3 of the four, and many more were found with 2. Each of these areas could be very good and set a dance studio up to succeed (see figure 12).

From this analysis it appears as though cluster 7 in Midtown Atlanta would be one of the best areas to locate a dance studio. It contained one of each of the four features. Additionally, it is fairly centrally located in the Greater Atlanta Area, which would make it easy to access on public transit or by car. The next best area, Oakland City or cluster 8, is located a bit to the southwest of the Atlanta Downtown and Midtown areas. It contained 3 of the four desired features.

It should be acknowledged here that the extent of the ranking is to see if at least 1 of the desired features is present. An area with more schools may have a higher potential student base and could be a better choice.

6 Conclusion

6.1 Summary

To sum up, despite important data being somewhat sparse, it is still apparent that this method is successful at narrowing down potential good areas for a dance studio. As figure 12 shows, it is possible to identify areas with necessary features like public schools and a minimum distance from existing studios, as well as nice-to-haves for parents, teachers and

students like grocery stores and performing arts venues. Based on this analysis, locating in Midtown or Oakland City in the Atlanta metropolitan area would likely give a fledgling studio a great chance to succeed. However, having more complete sets of data and features would serve to make the results more accurate and nuanced.

6.2 Ideas for Further Work

There are clearly many ways which this analysis can be improved. Most glaring are the deficits in the data discussed in section 5.1. Further work might include finding data from different sources to supplement the data gathered from the Foursquare API. Perhaps dance studios, performance venues, and grocery stores simply are not Foursquare's forte, and another source might be better.

Besides a stronger dataset, there are many other avenues that could be explored to give more ideal and nuanced locations for a dance studio to locate. Some examples are:

- Cafes and restaurants – Locating near cafes and restaurants could help build student camaraderie by giving students a place to go and hang out after classes. That in turn could help build a community around the studio and encourage retention.
- Private Schools – Private schools could also be included in the analysis of schools in order to give more information about potential student base.
- Public Transportation – Locating near public transportation would make it easier for students who rely on public transit, as well as teachers/studio staff who might also rely on public transit.
- Income Data – Incorporating publicly available income data would be another way to shape this kind of analysis. A studio owner may wish to locate in a more affluent area with the hopes of attracting more students coming from families with disposable income. Alternatively, a potential studio owner might intentionally wish to locate in a less affluent area to afford opportunities to dance to students who may not normally have that chance.
- Dance Competitions – In order to broaden this analysis to be more beneficial to a competition studio, data surrounding dance competitions in the area and other competition studios in the area could be incorporated.
- Grade Level Targeting – As was mentioned in section 5.1, available information about whether the school is an elementary, middle, or high school could be incorporated to allow a studio owner to locate in a more targeted area.
- Weighted Cluster Rating – A potential shortcoming of the analysis discussed in section 5.2 is that the areas with multiple of one feature were not in any way differentiated from areas with only one. A weighted cluster rating score could be devised which would give an area with 10 schools and 1 grocery store a higher ranking than 5 schools and 1 grocery store, for example.

References

[1] Erich Shubert, Jorg Sander, Martin Ester, Hans-Peter Kriegel & Xiaowei Xu. Dbscan revisited, revisited: why and how you should (still) use dbscan. 42(3), 2017.

[2] Madison Hutchings. Private communication, 2020.

[3] Fiza Pirani. Atlanta named among america's fastest-growing economies in new ranking. https://www.ajc.com/news/local/atlanta-named-among-america-fastest-growing-economies-new-ranking/uT3CYl472BJckpY8liW57J/, 2017. Accessed: 2020-04-13.

[4] World Population Review. Atlanta, georgia population 2020. https://worldpopulationreview.com/us-cities/atlanta-population/, 2020. Accessed: 2020-04-13.

[5] Wikipedia. Atlanta metropolitan area. https://en.wikipedia.org/wiki/Atlanta_metropolitan_area, 2020. Accessed: 2020-04-13.