Ice Cream Shop Opportunity in Sandy Springs, GA

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1. Introduction where you discuss the business problem and who would be interested in this project.

Coursera has equipped us with the skills and the tools to use location data to explore geographical locations and they have given us the opportunity to be as creative as we want and come up with an idea to leverage the Foursquare location data to explore or compare neighborhoods or cities of our choice or to come up with a problem that we can use the Foursquare location data to solve. One of the options that we were given was if someone, in a city of our choosing, was looking to open a restaurant, where would we recommend that the establishment be opened? Similarly, if a contractor was trying to start their own business, where would we recommend that they setup their office?

As a result, for the Capstone part of the Coursera Curriculum on Applied Data Science, I have chosen to examine the city of Sandy Springs, GA, where I live, and its surrounding areas to look at the viability of establishing and ice cream shop somewhere in town.

I recognize that the amount of data may be limited, but within the parameters of the instructions, we are going to explore the possibilities of opening an ice cream shop in this area.

I started with an Internet search that asked the question of what one needs to consider when opening an ice cream shop. I was surprised to find how much advice was available and how consistent it actually was.

I looked at the following URLs:

- https://www.centralrestaurant.com/resources/what-to-consider-before-opening-an-ice-cream-shop/
- https://www.shopkeep.com/blog/are-you-really-ready-to-open-an-ice-cream-shop

- https://www.focuspos.com/what-to-consider-when-opening-an-ice-cream-shop/
- https://www.kalscoops.com/5-things-to-consider-before-opening-an-ice-cream-business/

For the purposes of doing a project that incorporates the functionality of Foursquare, the messaging was fairly consistent. If you are looking for a location where you want to open an ice cream shop, you need to consider a few things:

- The business is fairly seasonal, unless you are operating the shop in a warm-weather location
- The business should be located in an area with ample foot traffic
- The business should be accessible to parking
- It is recommended that the business be located in an area that has a good concentration of kids and families
- Related to the topic of kids and families, the location is recommended to be near or adjacent to areas that have schools, parks and recreation areas
- The business would benefit by being located close to nearby restaurants

For the purposes of this report, we are only going to focus on the general location of the store, with Sandy Springs as a recommended area to set one up. While there are many different topics to consider in opening an ice creams store, including:

- Menu
- Equipment
- Leases
- Paperwork and permits
- Health department requirements
- Product type
- Being an independent owner or a franchisee
- An overall business plan

..we are not going to consider those here, as that is outside of the scope of this project.

While there is not a problem per se, I think that there would be interest in an ice cream store in the general area, and I think that there are areas in Sandy Springs that have been left as an opportunity to offer ice cream.

2. Describe the Data Being Used

The data that we are using comes from three different sources.

First, the main part of this data will come from Foursquare. According to Wikipedia, Foursquare was founded in late 2008 by Dennis Crowley and Naveen Selvadurai, and launched the following year. It gained recognition through its search-and-discovery mobile app, known today as the Foursquare City Guide. It offers real-time location-sharing and checking-in. In our case, we will use this data to examine some of the considerations listed in the introduction, relative to whether the Sandy Springs area is a suitable location for an ice cream shop. For instance, I was able to leverage this data in a way that spoke to Sandy Springs and its proximity or adjacency to parks, schools, restaurants and parking.

The second list of data comes from the Fulton County Government Office. I was looking for any kind of demographic information that I could find that might help shed some additional light on the city of Sandy Springs and its surrounding areas. Ultimately, I had to call the town for help. I spoke to Hyun Hee Kwak, who is the Geospatial Program Project Manager in the GIS Division of the Fulton County Department of Information Technology. I spoke to Ms. Kwak twice, and after getting a better understanding of what I was trying to do, she provided me with a link of demographic data from the Atlanta Regional Commission Open Data resource. What she sent to me can be found here:

https://gisdata.fultoncountyga.gov/datasets/GARC::household-composition-by-zip-code-2018

What she sent to me was 2018 data, which I considered to be recent enough for the purposes of this report. The data spoke to family households and households with kids under the age of 18 by Zip Code, among other things.

Ultimately, I also had to leverage OpenDataDE for a json file on the State of Georgia to match the zip code data and convert the demographic data to a choropleth map. That can be found here:

https://github.com/OpenDataDE/State-zip-code-GeoJSON/find/master

Finally, the last bit of data that I used resulted from a Google search. It led my to Kaggle, where I found data that spoke to an example of how ice cream shop sales revenue relates to changes in temperature in degrees Celsius. If anything, I felt that this information would at least speak to the benefit of opening an ice cream shop in the southern United States.

3. **Methodology**

The vast majority of the methodology that I used was exploratory, leveraging Foursquare data. Using the Foursquare database, I was able to look at Sandy Springs and the surrounding areas for a variety of different factors that are important in looking for a location to start an ice cream shop. The first thing that I looked at was where competitors are located, with the idea that I did not want to open a shop too close to another shop already selling ice cream. I found that most of the nearby competitors a located along Roswell Road, but they are mostly found in areas to the west side of that street. As a result, there is an opportunity on the east side of town.

I also used Foursquare to confirm that the general vicinity has an ample number of parks and recreation areas, restaurants, schools and parking that is conducive to a successful ice cream venture. In addition to get a visual map of where all of those were located in the general area. Even taking into consideration the errors in Foursquare data that included, for instance, misidentified apartment complexes and office parks as parks and rec areas or businesses misidentified at ice creams shops, none of those data points were intrusive enough to take away from the findings of this report.

I also designed a choropleth map that illustrates the relative percentages of homes with kids under the age of 18. In order to create the map, I had to pare down the original dataset so that only the columns that I needed remained. That was easy enough to do in a csv file prior to loading the data into a pandas dataframe. In order to get the demographic data to translate to a choropleth map, I had to join that data with a json file for the state of Georgia. This helped attach the proper demographic information with appropriate zip code on the

resulting map. What we ended up seeing was that Sandy Springs is surrounded by zip codes that have high concentrations of home with kids, as noted by the darker reds on the map, a great set of consumers for an ice cream shop.

Another bit of data was the revenue and outside Celsius-based temperature data that was retrieved from Kaggle. I supplemented this data with a chart that I copied from Google that spoke to the average temperature in Sandy Springs by month over the course of the year. This speaks to the fact that an ice creams shop has a longer window of business, based on the fact that the shop would benefit from the general location in the southern United States. The only statistical testing that was conducted was for this data that spoke to the relationship between outside temperature and revenue. The testing that was done on the relationship between the two variables exhibited an r-square of 0.978, which tells us that the model is an extremely good fit for the data. It is clearly a strong linear relationship.

Finally, I attempted a Machine Learning analysis of the data, after merging the data frames from Foursquare and the Fulton County Government. Unfortunately, as you will see, the amount of data that I was using reflecting the Sandy Springs metro area was not conducive for reliable results from Machine Learning analysis.

4. **Results**

A. Households with Kids Under the Age of 18

One of the main factors for a successful location of an ice cream shop is a proximity to kids and families. As you can see from the heat map below, as well as in the zip code-based data represented to the left, Sandy Springs is a central area to high concentrations of homes with kids, the primary target for any ice cream shop.
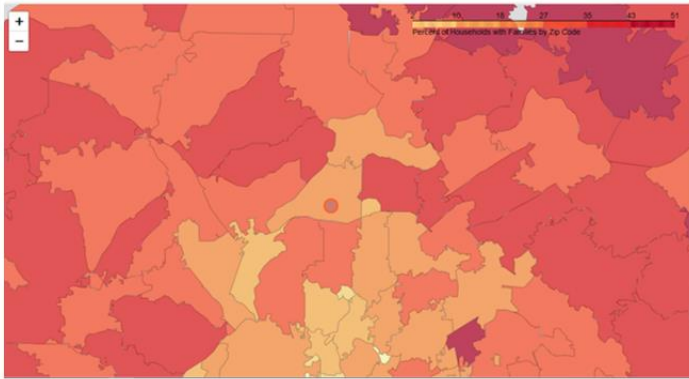
Zip Code	Total HHs	% of Homes w/Kids<18 yrs
30338	14219	54%
30022	24134	53%
30360	5202	52%
30342	12669	51%
30076	16694	51%
30009	6477	50%
30092	14530	49%
30068	12166	46%
30075	19559	45%
30328	16437	45%
30327	9178	44%
30346	3033	43%
30350	17060	42%
30319	19336	42%
30339	12263	34%
Atlanta Metro	1779786	47%

The shop will draw from adjacent areas, such as Dunwoody and Roswell, which are also represented in the zip code table. Many of the zip codes over-index the Atlanta Metro average that is shown at the bottom of the adjacent data table of zip codes in the Sandy Springs/Dunwoody/Roswell area.

B. Weather Drives Revenue

The Sandy Springs, GA area benefits from being located in the Southern part of the United States, where pleasant weather is available for the majority of the months of the year, allowing an ice cream shop to maximize its revenue across more months out of the year. As you can see from the temperature trends (in degrees Celsius, taken from a Google search), there is good sales potential from March to the beginning of November.
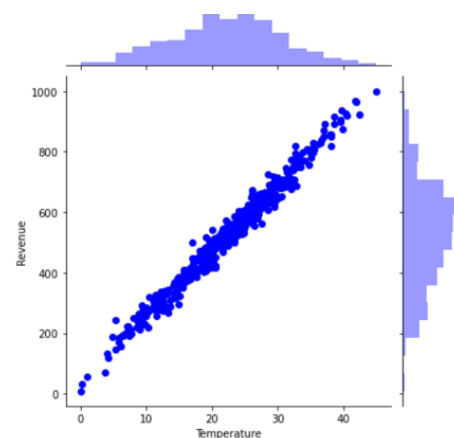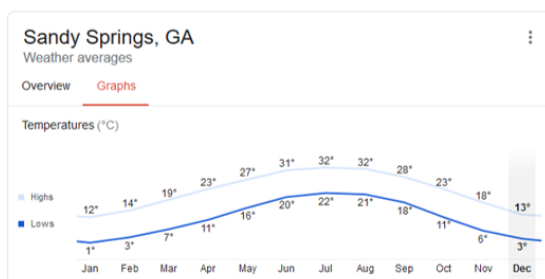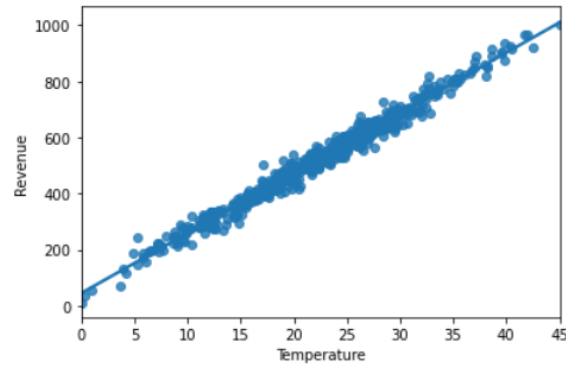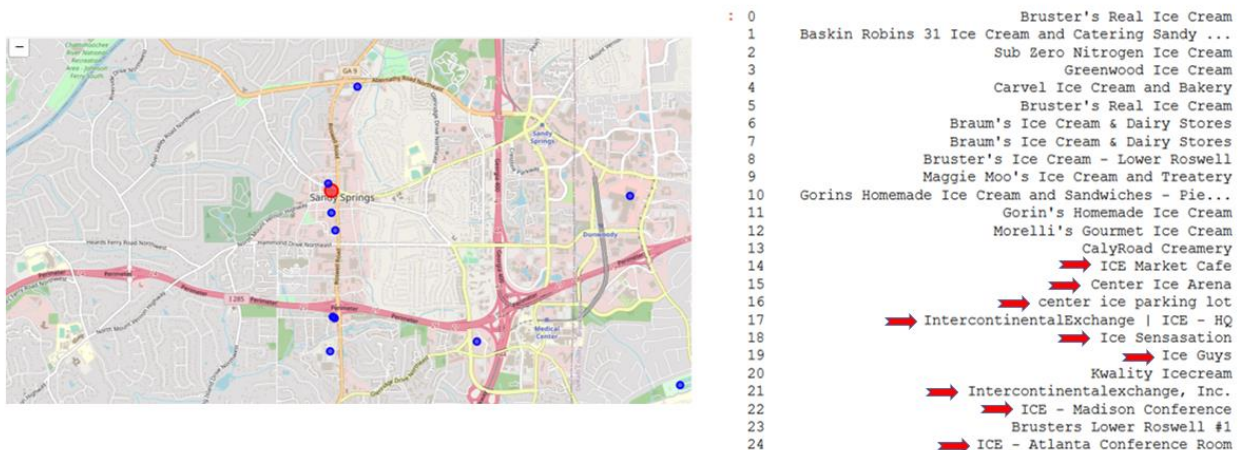
```
R2: 0.977546278174417
MSE: 618.1650069238149
```

Based on 2018 ice cream sales data retrieved from Kaggle, you see a definite positive linear relationship between increased temperature and ice cream sales revenue. The calculated r-square value of 0.978 confirms that this is a good fit.

C. Ice Cream Competition in the Area

There are a handful of competitive ice cream shops in the area, but not as many as Foursquare makes one think. In fact, it incorrectly identified eight entities (marked with a red arrow) as ice cream shops that are not.


```
:  0                       Bruster's Real Ice Cream
   1    Baskin Robins 31 Ice Cream and Catering Sandy ...
   2                       Sub Zero Nitrogen Ice Cream
   3                            Greenwood Ice Cream
   4                       Carvel Ice Cream and Bakery
   5                       Bruster's Real Ice Cream
   6                     Braum's Ice Cream & Dairy Stores
   7                     Braum's Ice Cream & Dairy Stores
   8                   Bruster's Ice Cream - Lower Roswell
   9                   Maggie Moo's Ice Cream and Treatery
  10    Gorins Homemade Ice Cream and Sandwiches - Pie...
  11                        Gorin's Homemade Ice Cream
  12                       Morelli's Gourmet Ice Cream
  13                            CalyRoad Creamery
  14        ➡          ICE Market Cafe
  15        ➡          Center Ice Arena
  16        ➡       center ice parking lot
  17   ➡  IntercontinentalExchange | ICE - HQ
  18        ➡          Ice Sensasation
  19        ➡            Ice Guys
  20                          Kwality Icecream
  21   ➡  Intercontinentalexchange, Inc.
  22        ➡      ICE - Madison Conference
  23                       Brusters Lower Roswell #1
  24   ➡  ICE - Atlanta Conference Room
```

None the less, the ones that are correctly identified are in places that have adequate parking and are near shopping areas where consumers can easily access the store.

D. Adjacent Parks and Recreational Areas

There are a number of public parks, playgrounds and recreation areas in the general vicinity, enough to provide ample opportunity consumers who might be looking for a treat to want to search for a local ice cream shop to satisfy their craving.
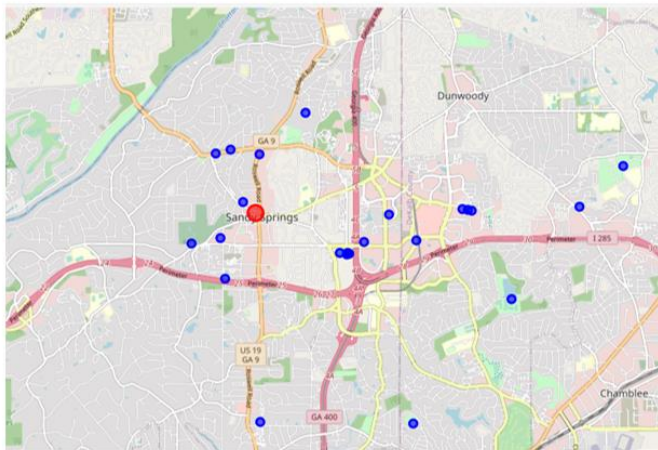


```
0                            Allen Road Park
1                              Park Center 1
2                         Gym @ Park Towers
3  ➡  Park at Abernathy Square Apartments
4  ➡        The Vue @ Park Towers Pool
5       Chattahoochee Nature Trails & Park
6                  Bank of North Georgia Park
7                        Murphey Candler Park
8                   Morgan Falls Overlook Park
9                              Chastain Park
10                        Cox Central Park 6B
11                            Brook Run Park
12                     Lake Forrest Office Park
13                           Park at Chastain
14                              Lynwood Park
15                   Park at Pernoshal Court
16                            Park towers II
17  ➡      Lakeside Commons Office Park
18      Abernathy Greenway Park and Playground
19                    Chastain Park Playground
20                               Park Towers
21                            Dragonfly Park
22  ➡    Savannah at Park Place Apartments
23                            Hammond Park
24      Fitness Center @ Savannah at Park Place
```

Again, Foursquare infrequently misidentified some areas as public parks (see red arrows), when in fact they were an office or apartment complex. This does not significantly take away from the supply of locations.

E. Adjacent Parking

Sandy Springs and the surrounding locations are not a loss for parking.
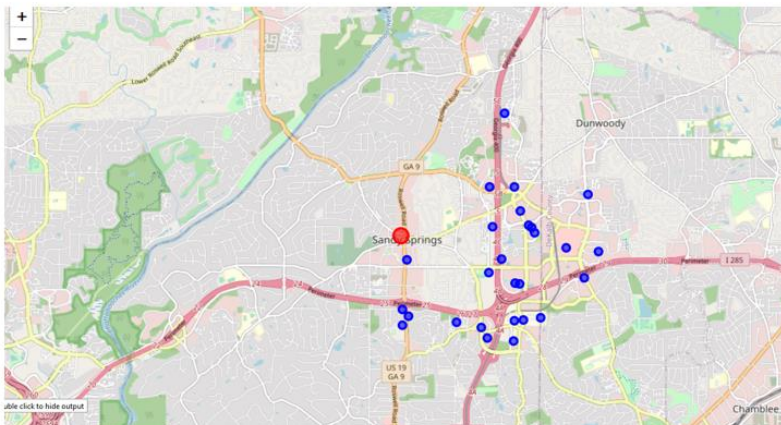

```
0                  Perimeter Mall Parking Deck
1                              Parking Garage
2                     Concourse Parking Deck 1
3              Northside Tower Parking Garage
4                                 SP+ Parking
5                      center ice parking lot
6                 Three Ravinia Parking Garage
7                                 Parking lot
8                                Parking Deck
9                      The Prado Parking Deck
10     Parking deck Roof 2 - Lunchtime Nap Spot
11                             parking garage
12      GA 400 Toll Plaza Employee Parking Lot
13                   park towers parking garage
14                           Byers Parking Deck
15          Childrens Healthcare Parking Deck
16                                 Parking Lot
17     Parking Lot Dunwoody Station (Entrance)
18               One Glenlake Parking Garage
19                          Cox - Parking Deck
20                Town Brookhaven Parking Lot
21                  Concourse Parking Deck 2
22                     Cox Parking Deck 6205
23             Glenridge South Parking Deck
24                  Parking Lot Known As 400
```

Many of the established lots can be found closely adjacent to the two major highways, 400 and 285, but there is also a limitless amount of parking at strip malls, which are not considered in this list.

F. Adjacent Restaurants

Sandy Springs has a wide variety of different cuisines that are located up and down Roswell Road, which is the main thoroughfare that goes through town.
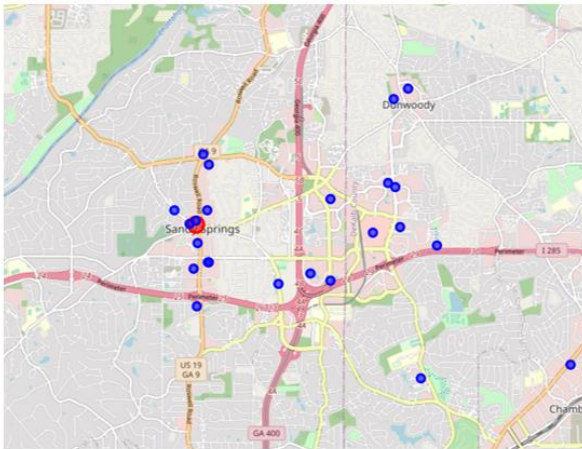

```
0                                    Zafron Restaurant
1                        The Select Restaurant  + Bar
2                   El Paraiso Grill Mexican Restaurant
3                        Jade Palace Chinese Restaurant
4                            National Restaurant Brokers
5                          Thai Restaurant Sandy Springs
6        Perkins Restaurant & Bakery Support Center
7                                    Joy Thai Restaurant
8                              Taki Japanese Restaurant
9        Simha Authentic Multi Cuisine Fine Dine Restau...
10                         El Torero Mexican Restaurant
11                         Shamshiri Persian Restaurant
12                             Tomo Japanese Restaurant
13                                        Restaurant Nasr
14                            Arby's Restaurant Group, Inc.
15                                 Nations Restaurant News
16               North Peking: Super Chinese Restaurant
17                           Courtside Restaurant & Cafe
18        Tequila Mexican Restaurant Restaurant
19                              HAVEN Restaurant & Bar
20                          Chef Rob's Caribbean Cafe
21                        Downwind Restaurant & Lounge
22                                      Aldo's Italian
23                                          Ippolito's
24                         Alexander's Restaurant
```
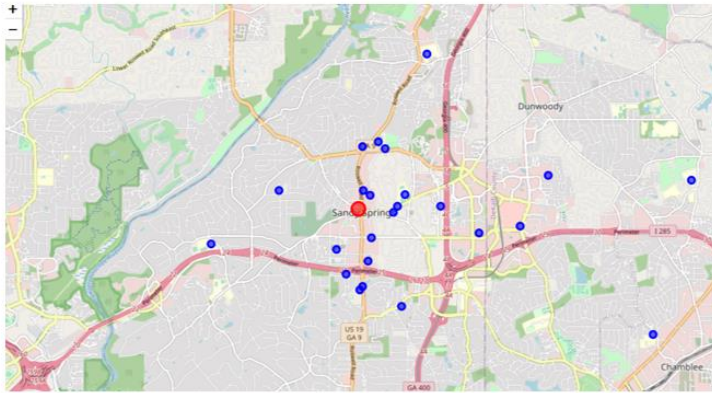
You can see this denoted in the blues dots that are north and south of the Sandy Springs City Center, which is denoted by a larger red dot.

G. Adjacent Schools

Related to the previous data that spoke to the percentage of homes with kids under the age of 18, there are a number of schools in and around the Sandy Springs area to accommodate the number of kids.

0	Lake Forest Elementary School
1	1 ACT DUI & Defensive Driving School
2	Riverwood International Charter School
3	International School of Skin & Nailcare
4	Timber Ridge Elementary School
5	Goldfish Swim School – Sandy Springs
6	The Goddard School
7	The Goddard School
8	North Springs Charter School of Arts & Sciences
9	Mount Vernon Presbyterian School – Glenn Campus
10	Chamblee Charter High School
11	Mount Vernon Presbyterian School
12	St. Martin's Episcopal School
13	MOUNT VERNON PRESBYTERIAN SCHOOL
14	Rock Steady School of Ballroom Dance
15	Empire Beauty School
16	School Of Humanity And Awareness
17	School
18	The Weber School
19	Sandy Springs Charter Middle School
20	The Epstein School
21	Primrose School of Sandy Springs North
22	The Galloway School
23	School Bus Stop
24	Holy Spirit Preparatory School – Upper School

Some of these schools are also located near some of the shopping and dining areas of town, giving kids easy access to get some ice cream in between classes or after school.

H. Attempt at Machine Learning Example

I attempted to use Machine Learning techniques, but I came to learn very quickly that the amount of data that I had was not conducive to this method. To start, I looked at scatterplots that showed the number of ice cream shops in the general area crossed with the demographic data that I received from the Fulton County Government office. As you can see in the plots below, (a) there is clearly not enough data reflected in the surrounding area, (b) the results in the scatterplots are very inconsistent and (c) there is no real indication of any type of relationship between the variables, all of which is driven by the minimal amount of available data.

Number of Ice Cream Shops Versus
Households, Family HHLDs and HHLDs with Kids<18
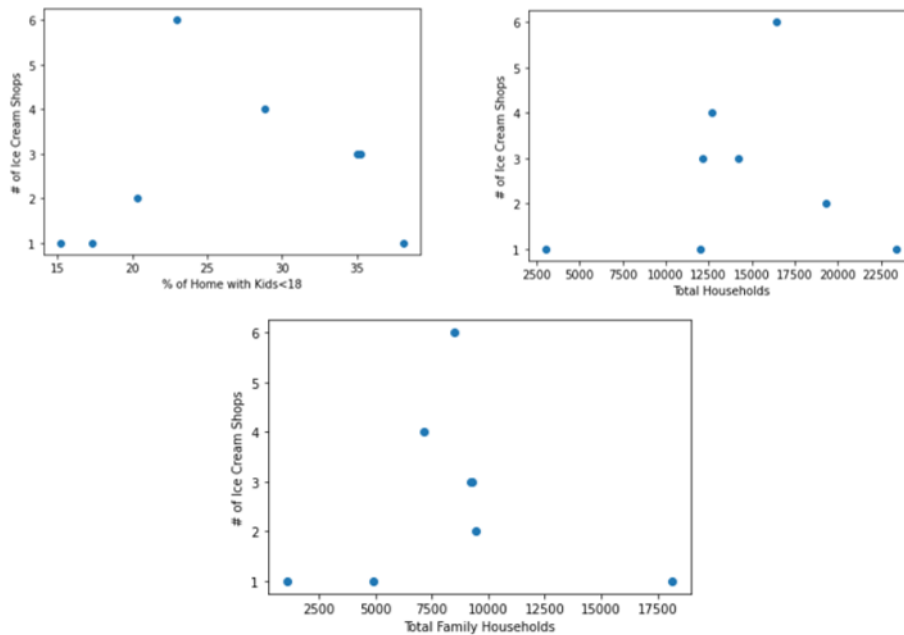
5. Discussion of observations & recommendations

- While there is some competition in the area, there still appears to be an opportunity to serve the community with an ice cream shop. The fact that the town benefits from having nice weather for the majority of the year only helps this.

- The area is not only home to a significant number of families, supported by the array of schools and local park and recreation areas, but it also has a robust consumer area that is supported by an array of restaurants.

- Add to this the recent development of Sandy Springs City Center, where there is a newly-constructed indoor concert venue and adjacent outdoor events venue.

- There would be an advantage to helping expand the business district on the east side of town, where there is space, along with accessibility to people, schools, places of worship and parking.

- Regarding Machine Learning techniques used, one option could've been to expand the analysis to a larger area, but that may or may not have yielded results applicable to Sandy Springs.

6. Conclusion

Drilling down closer in the Sandy Springs map that was developed, there is a better **opportunity to establish an ice cream store on the east side of Roswell Road**, either on Johnson Ferry Road or Mount Vernon Highway, giving access to some of the churches and synagogues, townhome developments and Mount Vernon School.
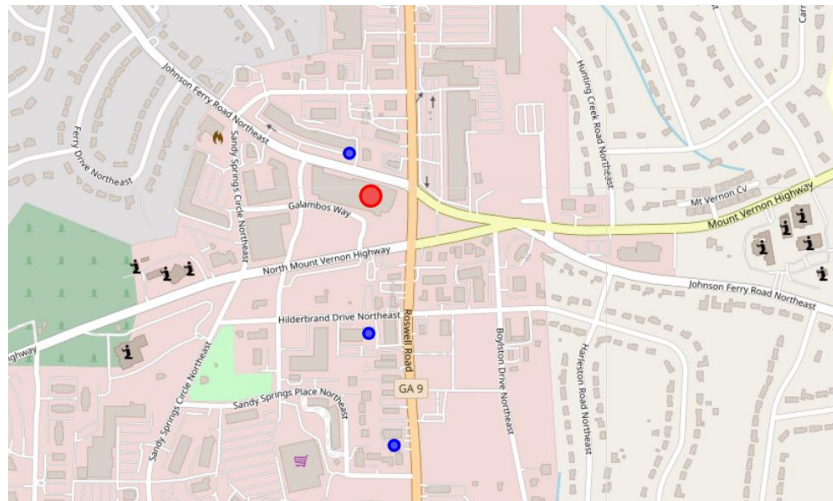
It would also be close enough to parking at City Center that is available on the east side of Roswell Road.

The bottom line is that the city of Sandy Springs has all of the ingredients of a good location for an ice cream shop.