# Explore the different kind of restaurants in Atlanta, GA

Published by Manikandan Palanisamy

5/Jan/2020

## Table of contents



## Introduction of Business Requirement:

In this project, I am going to explore Atlanta and will try to find out what kind of restaurant is already popular in the target neighborhood. This project can give insight to those people who want to open a restaurant in Atlanta, GA. Assuming they have not decided what kind of restaurant they are going to open, I can show them which kind is already popular and better not to open the same.

Before that I need to know about features of each neighborhoods and decide which kind of restaurant is suitable for that particular regions. Based on features of selected neighborhoods, we are going to search the most popular kind of restaurant in these areas.

## Data Requirement and Data Collection:

Based on definition of our problem, points that will influence our decision are:

- features of each neighborhood
- what kind of restaurant has already opened in the selected neighborhood?

Following data sources will be used:

- neighborhood list of Atlanta **City of Atlanta**(via Kaggle.com)
- venues in each neighborhood will be obtained using **Foursquare API** (via www.foursquare.com)

## Data Cleaning and Modeling:

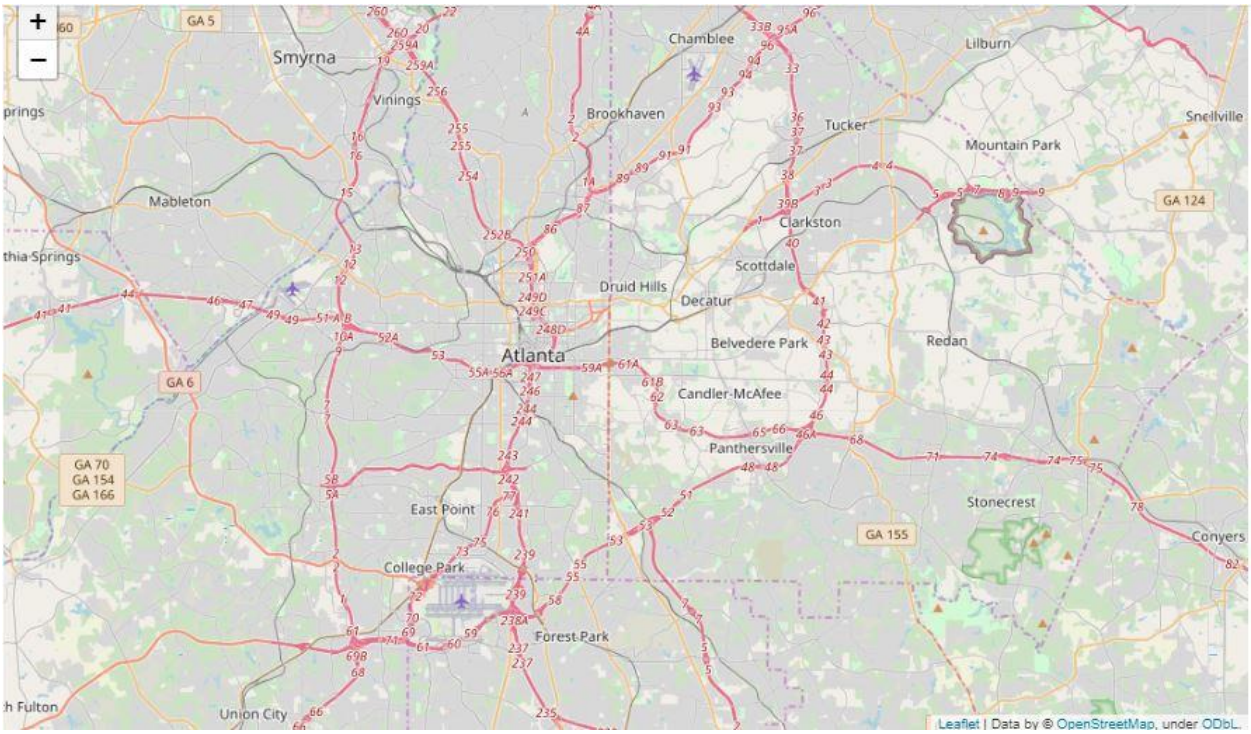
In this project, I detect venues in an area ~2km around each neighborhood center.

## Data Cleaning:

I have collected and cleaned the required data:

1. neighborhood list in Atlanta

Atlanta Geo Map:




2. venues around each neighborhood

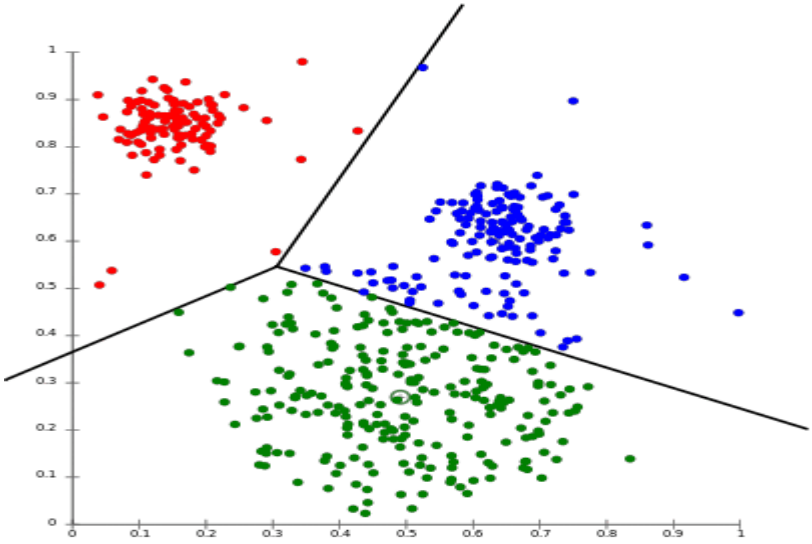
## Modeling:

I am going to explore these neighborhoods by the categories of venues. I will use K-means to cluster neighborhoods and find which cluster is suitable to open a restaurant.

### Description:

Given a set of observations (x1, x2, ..., xn), where each observation is a d-dimensional real vector, k-means clustering aims to partition the n observations into k (≤ n)
sets S = {S1, S2, ..., Sk} so as to minimize the within-cluster sum of squares (WCSS)

**K means - Clustering sample:**



**Arithmetic Equation:**

$$J = \sum_{i=1}^{m} \sum_{k=1}^{K} w_{ik} \|x^i - \mu_k\|^2 \tag{1}$$

$$\frac{\partial J}{\partial w_{ik}} = \sum_{i=1}^{m} \sum_{k=1}^{K} \|x^i - \mu_k\|^2$$

$$\Rightarrow w_{ik} = \begin{cases} 1 & \text{if } k = argmin_j \|x^i - \mu_j\|^2 \\ 0 & \text{otherwise.} \end{cases} \tag{2}$$

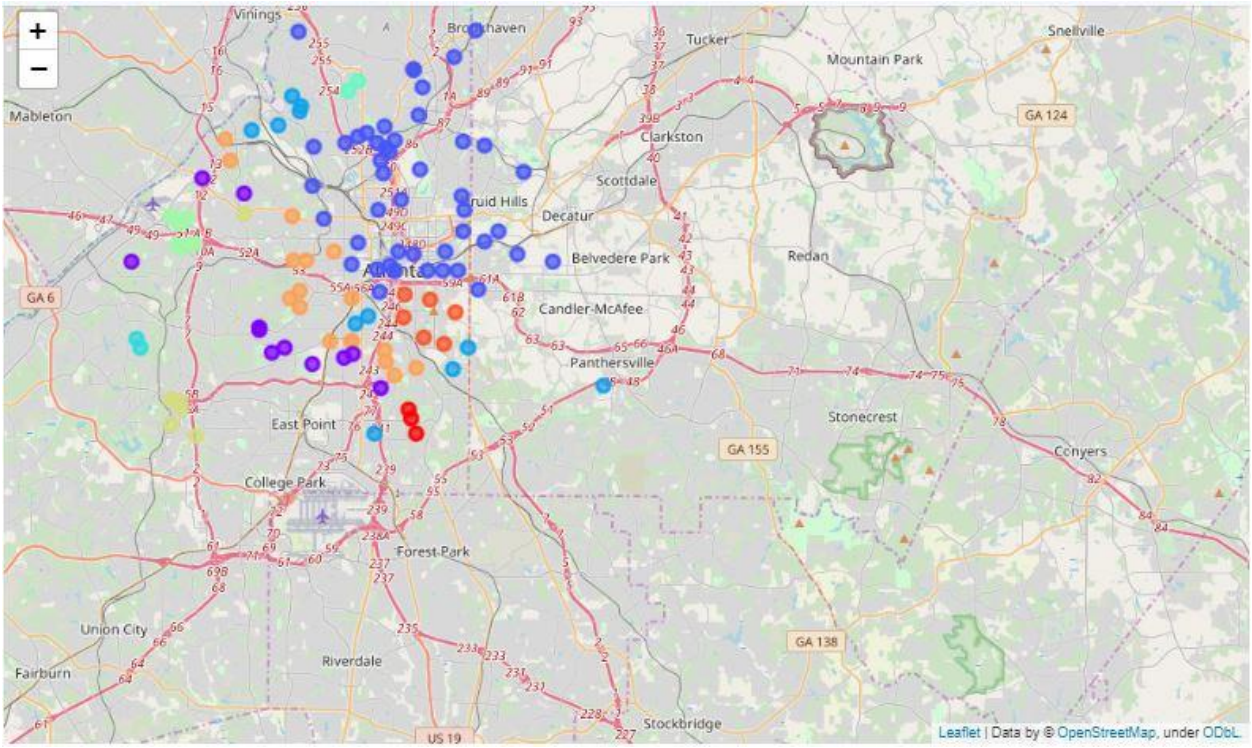
$$\frac{\partial J}{\partial \mu_k} = 2 \sum_{i=1}^{m} w_{ik}(x^i - \mu_k) = 0$$

$$\Rightarrow \mu_k = \frac{\sum_{i=1}^{m} w_{ik} x^i}{\sum_{i=1}^{m} w_{ik}} \tag{3}$$

$$\frac{1}{m_k} \sum_{i=1}^{m_k} \|x^i - \mu_{c^k}\|^2 \qquad (4)$$

## Model Evaluation and Analysis:

I will evaluated more in this selected cluster. Each neighborhood in this cluster will be analyzed and discussed, and we want to know opening which kind of restaurant in a specific neighborhood could be profitable. We will present a map to tell our results shown below.




The above figure shows the clustering group of restaurant based on their features and selected neighborhood. Likewise, I will do the K means clustering with different K values until to find the best clustering group.

## Feedback and Result:

Based on the clustering of neighborhoods, I found that areas in Cluster 2(K=2) are good places to open a restaurant. Since the distribution of Cluster 2 is around the center of Atlanta, then we want to open a restaurant near Gatech, Midtown and Atlantic Station.

The neighborhoods listed below satisfy my criteria:

1. Ansley Park
2. Atlantic Station
3. Brookwood
4. Georgia Tech
5. Loring Heights
6. Midtown

The most popular restaurant in each selected neighborhood are listed below:

- ➔ **Ansley Park:** Thai Restaurant, Southern / Soul Food Restaurant, American Restaurant, Seafood Restaurant
- ➔ **Atlantic Station:** American Restaurant, Seafood Restaurant, Southern / Soul Food Restaurant
- ➔ **Brookwood:** American Restaurant, New American Restaurant, Mexican Restaurant
- ➔ **Georgia Tech:** Seafood Restaurant, American Restaurant, New American Restaurant
- ➔ **Loring Heights:** American Restaurant, Japanese Restaurant, Southern / Soul Food Restaurant, Mexican Restaurant
- ➔ **Midtwon:** Southern / Soul Food Restaurant, American Restaurant, Seafood Restaurant, Mediterranean Restaurant