# Miami Neighborhoods Guide

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**Abstract**

This project uses unsupervised machine learning method: k-means to explore and cluster neighborhoods in Miami-dade county, in order to help customers to determine the most suitable neighborhood with personalized feature selection demands.

# 1 Introduction

## 1.1 Background

Located on the southern tip of mainland Florida, Miami teems with diverse cultural experiences, artwork, nightlife, and beauty. Living in and exploring Miami can be a total blast if you're up for some adventure. However, finding the perfect home among roughly numerous Miami neighborhoods and municipalities can feel overwhelming, especially when there're so many factors to consider, such as locations, prices, local culture, etc. Thus a method is needed to extract all the information one need to make their decisions and visualize the results on a map with details. And that's where machine learning comes to play. By using unsupervised machine learning methods and clustering neighborhoods with similar features, this project can help you take a shortcut of find the best place to stay if you know what kind of features you're looking for, such as a quiet neighborhood with high walkability and casual life style, or a coast line apartment with a perfect viewing point and easy beach access. By showing those groups of neighborhoods on a live map with distinct colors for each cluster, you can see clearly where to look or what to look for your perfect stay in Miami.

## 1.2 Business Problem

The general goal of this project is to help people visualize and find the most suitable neighborhoods in Miami-Dade County. The problem can be treated as 3 parts:

- Scrape relative information about neighborhoods in Miami, including names, locations, average rents, populations, etc.
- Develop a unsupervised machine learning method to cluster neighborhoods in Miami and explore their features in each cluster.
- Visualize the neighborhood clusters and their features on a interactive map.

## 1.3 Target Customers

This project should be interesting and helpful for new-comers who visits Miami for the first time, or for anyone who wants to have a general concept of how different neighborhoods are distributed in Miami-Dade County, and what they are most popular with. It should also be

intriguing for those who wants to develop an app that helps people find apartments, hotels and other places to stay in Miami area. This project can help you visualize the results and find popular features in your target neighborhoods.

# 2 Data

## 2.1 Data Requirement

When people talk about Miami, or the Magic City, they usually refer to Miami-Dade County, which covers City of Miami, Coral Gables, and the famous Miami Beach, and many other surrounding areas. However, finding neighborhoods in Miami-Dade County is relatively complicated. The county can be divided into a list of Municipalities and Census-designated places, each having their own definition of neighborhoods. Counting all the neighborhood in every municipality would be too much for this project. To make things simpler and clearer, I decide to divide the neighborhoods into two parts:

- Part 1: Neighborhoods in City of Miami following the definition in this Wikipedia page.
- Part 2: Other municipalities in Miami-Dade County, such as Coral Gables, Kendall and Miami Beach.

For each part I construct a dataset including their names, coordinates and find their population and average rent * accordingly. In the end, I merge those two parts together and in this way I can construct a table containing neighborhood names, locations, populations and average rents for all the neighborhoods in Miami plus all the municipalities in Miami-Dade County. By using Foursquare data, I can explore and add popular venues in each neighborhood, thus complete the construction of this dataset.

## 2.2 Data Preprocessing

To find all the neighborhoods and cluster them based on their features, we need the following data: (1).A list of neighborhoods in Miami City that includes neighborhood names, latitudes and longitudes, average rents and recent populations; (2).A list of municipalities in Miami-Dade County, excluding Miami City area, that includes the same features as (1); (3).Foursquare data in JSON format for each neighborhood and municipality including venue names and categories.

### 2.2.1 Part 1: Neighborhoods in City of Miami

The information of average rents in each neighborhood can be found on this website (see Fig.1). And a table of list of neighborhoods in Miami City can be obtained in this Wikipedia page. This table contains neighborhood names, population information, and coordinates. (see Fig.2)

*Rent*: The average rent in this project is calculated for two-bedroom apartments.

| | Neighborhood | Rent |
|---|---|---|
| 0 | Brickell | $2,050 |
| 1 | Coral Way | $1,650 |
| 2 | Edgewater | $1,909 |
| 3 | Little Haiti | $2,149 |
| 4 | Downtown Miami | $1,800 |
| 5 | East Little Havana | $1,300 |

**Fig. 1.** Average Rent for Neighborhoods in City of Miami.

| | Neighborhood | Demonym | Population2010 | Population/Km$^2$ | Sub-neighborhoods | Coordinates |
|---|---|---|---|---|---|---|
| 0 | Allapattah | NaN | 54289 | 4401 | NaN | 25.815-80.224 |
| 1 | Arts & Entertainment District | NaN | 11033 | 7948 | NaN | 25.799-80.190 |
| 2 | Brickell | Brickellite | 31759 | 14541 | West Brickell | 25.758-80.193 |
| 3 | Buena Vista | NaN | 9058 | 3540 | Buena Vista East Historic District and Design ... | 25.813-80.192 |
| 4 | Coconut Grove | Grovite | 20076 | 3091 | Center Grove, Northeast Coconut Grove, Southwe... | 25.712-80.257 |
| 5 | Coral Way | NaN | 35062 | 4496 | Coral Gate, Golden Pines, Shenandoah, Historic... | 25.750-80.283 |
| 6 | Design District | NaN | 3573 | 3623 | NaN | 25.813-80.193 |
| 7 | Downtown | Downtowner | 71,000 (13,635 CBD only) | 10613 | Brickell, Central Business District (CBD), Dow... | 25.774-80.193 |
| 8 | Edgewater | NaN | 15005 | 6675 | NaN | 25.802-80.190 |
| 9 | Flagami | NaN | 50834 | 5665 | Alameda, Grapeland Heights, and Fairlawn | 25.762-80.316 |

**Fig. 2.** A List of Neighborhoods in City of Miami.

We only need neighborhood names, population and coordinates from this table. After removing irrelevant columns and converting coordinates column to latitudes and longitudes, we can combine Fig.1 with Fig.2 and construct a table with all the features we need (see Fig.3).

| | Neighborhood | Population | Latitudes | Longitudes | Rent |
|---|---|---|---|---|---|
| 0 | Allapattah | 54289 | 25.815 | -80.224 | $1,555 |
| 1 | Arts & Entertainment District | 11033 | 25.799 | -80.190 | $1,855 |
| 2 | Brickell | 31759 | 25.758 | -80.193 | $2,050 |
| 3 | Buena Vista | 9058 | 25.813 | -80.192 | NaN |
| 4 | Coconut Grove | 20076 | 25.712 | -80.257 | $1,360 |
| 5 | Coral Way | 35062 | 25.750 | -80.283 | $1,650 |
| 6 | Design District | 3573 | 25.813 | -80.193 | NaN |

**Fig. 3.** Table of Neighborhoods in City of Miami.

### 2.2.2 Part 2: Municipalities in Miami-Dade County

Miami-Dade County is comprised of 34 municipalities. Adding all neighborhoods in all municipalities would be overwhelming for our purpose. Thus, we treat each municipality

as a whole and count it as one neighborhood. Getting the location and average rents for municipalities can be a little bit tricky, since no table can be found that gives all the information we need directly. The ROOF DEPOT USA website provides some basic information, including folio number, municipality names, zipcodes, address, and contact information for this company (Fig.4). We only need zipcodes and municipality names from this table. After

| Folio | Municipality | Address | Bldg. Dept. Phone No. | Zip Code | Inspection Phone No. | Inspection | | Inspection Links | Building Dept. Links |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Call Hrs. | Days | | |
| 28 | Aventura | 19200 W. Country Club Dr. | 305-466-8937 | 33180 | 305-466-8900 | 8:30-4:00 | | http://www | cityofaventura.co |
| 12 | Bal Harbour | 665 96 Street | 305-865-7525 | 33154 | 305-866-4633 | 8:00-4pm | | http://www | www.balharbourg |
| 13 | Bay Harbor Island | 9665 Bay Harbor Terrace | 305-993-1786 | 33154 | 305-993-1786 | 9:00-5:00 | M/W/F | http://www | bayharborislands |
| 17 | Biscayne Park | 640 NE 114 Street | 305-893-7490 | 33161 | 305-899-8000 | 8:00-2:30 | | http://www | biscaynepark.gov |
| 3 | Coral Gables | 405 Biltmore Way | 305-446-6800 | 33134 | 305-460-5245 | 7:30-3:30 | | | http://coralgable |
| 35 | Doral | 8300 NW 53 ST #100 | 305-593-6725 | 33178 | 305-593-6725 | 8:00-4:00 | | http://207.1 | cityofdoral.com |
| 18 | El Portal | 500 NE 87 Street | 305-795-7880 | 33138 | 305-795-7880 | 8:00-2:30 | Tu/Thr | | |
| 16 | Florida City | 404 W. Palm Drive Bldg 3 | 305-242-8125 | 33034 | | 8:00-4:30 | | | http://www.floridac |
| 19 | Golden Beach | 1 Golden Beach Drive | 305-932-0744 | 33160 | 305-932-0744 | 8:00-3:30 | M/W | | http://www.golden |
| 4 | Hialeah | 501 Palm Avenue | 305-883-5825 | 33011 | 305-883-5825 | 8:00-4:00 | | | hialeahfl.gov |
| 27 | Hialeah Gardens | 10001 NW 87 Avenue | 305-558-4114 | 33016 | 305-558-4114 | 8:30-5:00 | | http://ww | cityofhialeahgarde |
| 10 | Homestead | 790 N. Homestead Blvd | 305-247-1801 | 33030 | 305-224-4500 | 7:30-4:30 | | http://servi | cityofhomestead.c |
| 21 | Indian Creek | 9080 Bay Drive | 305-865-4121 | 33154 | 305-865-4121 | 9:00-5:00 | | | |
| 24 | Key Biscayne | 88 W. McIntyre Street | 305-365-5511 | 33149 | 305-365-5512 | 8:00-3:00 | | http://www | keybiscayne.fl.go |

**Fig. 4.** List of Municipalities in Miami-Dade County by ROOF DEPOT USA.

removing other columns, the zipcodes can be converted to latitudes and longitudes using GeoPy, which is a Python client for several popular geocoding web services. The OFFICE OF POLICY DEVELOPMENT AND RESEARCH (PDR) offers information about fair market rents, which can be downloaded as a .xlsx spreadsheet, which are indexed by their zipcodes. We can read this table into a Pandas DataFrame and append rents to our table according to corresponding zipcodes. Similarly, the population information can be obtained using uszipcode - a programmable zipcode database in Python. After appending this information by their zipcodes, we complete our table of municipalities in Miami-Dade County (Fig.5).

| | Municipality | Zipcode | Latitudes | Longitudes | Rent | Population |
|---|---|---|---|---|---|---|
| 0 | Aventura | 33180 | 25.962897 | -80.144402 | $2310 | 30840.0 |
| 1 | Bal Harbour | 33154 | 25.882990 | -80.128078 | $2220 | 13971.0 |
| 2 | Bay Harbor Island | 33154 | 25.882990 | -80.128078 | $2220 | 13971.0 |
| 3 | Biscayne Park | 33161 | 25.893410 | -80.182457 | $1470 | 53710.0 |
| 4 | Coral Gables | 33134 | 25.755556 | -80.270126 | $1740 | 37456.0 |
| 5 | Doral | 33178 | 25.832296 | -80.369946 | $2250 | 39489.0 |

**Fig. 5.** Table of Municipalities in Miami-Dade County.

### 2.2.3 Get venues from Foursquare

We can now combine neighborhood table and municipality table from Part 1 and part 2 into one Pandas DataFrame, following the same format as Fig.3. And we can define a function to get popular venues in a given radius(2000 meters in this project) for each neighborhood in our table from Foursquare database (Fig.6).

| | Neighborhood | Latitudes | Longitudes | Venue | Venue Latitude | Venue Longitude | Venue Category |
|---|---|---|---|---|---|---|---|
| **0** | Allapattah | 25.815 | -80.224 | Club Tipico Dominicano | 25.809557 | -80.218593 | Nightclub |
| **1** | Allapattah | 25.815 | -80.224 | Plaza Seafood Market | 25.805638 | -80.223992 | Seafood Restaurant |
| **2** | Allapattah | 25.815 | -80.224 | Snappers Fish & Chicken | 25.824110 | -80.224870 | Seafood Restaurant |
| **3** | Allapattah | 25.815 | -80.224 | Papo Llega y Pon | 25.803466 | -80.223886 | Cuban Restaurant |
| **4** | Allapattah | 25.815 | -80.224 | Moore Park | 25.810316 | -80.209683 | Park |

**Fig. 6.** Table of popular venues in each neighborhood.