**Introduction**

A few friends have recently started an Iranian restaurant in Frisco, TX, which is a suburb located outside of Dallas, TX. The restaurant has done very well and they have begun thinking about trying to expand into the Dallas area. They are confident that the restaurant can do equally as well if not better in the Dallas area. However, this type of branching out would be a very big leap for the company and is critical to their success. However, if the new restaurant fails, this could be detrimental to their original restaurant and possibly cause it to take severe losses or even close down.

Due to the magnitude of this decision, the group wants to do everything they can to make sure they are absolutely confident about opening up the new store. One of the most important tasks with opening up a new store is figuring out the location of this new store. They would like to have a quick, efficient, and overall smart way to find a good location to possibly place the new store. Traditional ways of trying to find a suitable area may take too long or may not be as accurate (contacting a real estate agent, checking local listings, etc). So the group decided to reach out to a data scientist to help them find the best location for the new store.

The way to find the best location for the store is to classify areas in Dallas as "clusters" based on similar traits. Features such as types of venues and most popular venues in these areas will help the group identify similar neighborhoods, which will then help the group decide which area is more suitable for the new restaurant. From there, they can decide on specific locations.

**Data Section**

Like stated in the introduction, we will have to break Dallas up into different areas within the city. After breaking Dallas up into these areas, we can further analyze them for types of venues to determine their similarities to each other. How similar they are will determine which cluster (or "group") they get put into. Once you determine which cluster each area belongs to, then you can decide which are the most optimal to place the new restaurant based on the group's criteria.

Our first step is to find location data for the city of Dallas, including zip codes, latitudes, and longitudes. We were able to find a free downloadable online source containing location data for all zip codes in the US, the only stipulation being that we had to mention the source providing this data. You can download the same data from <https://simplemaps.com/data/us-zips> . While the file contains many attributes for each zip code, we will only be focusing on zip code, latitude, longitude, city, county, and state. Using this information, we will then use Foursquare API to see types of venues and specific venues within these zip codes to help determine the clusters. We will also be using K-means classification to determine the optimal number of clusters, as well as the accuracy for each cities relation to the cluster.

The analysis of this data will be similar to the analysis done in the Segmenting and Clustering Toronto neighborhoods lab. Gathering all of the location data for a city, clustering the neighborhoods within that city, leveraging Foursquare API to determine number of venues and types of venues within each neighborhood, and using that to determine which cluster each neighborhood belongs in is how we completed that lab and how we will complete this analysis.

**Methodology section**

As stated in the Introduction and Data sections above, our objective is clustering all of the data points so that we can determine the best cluster. Once we determine the best cluster, we can pass the data along to the restaurant owners so that they can decide which specific area they like as the best to open up the 2nd restaurant.

First we must import the necessary libraries in order to properly start analyzing our data. Then, we must read our csv file with all the location data into a pandas dataframe so that we may begin analyzing the data.

In [1]:

import pandas as pd

pd.set\_option('display.max\_columns', None)

pd.set\_option('display.max\_rows', None)

import numpy as np

In [2]:

zcode=pd.read\_csv('uszips.csv')

print(zcode.shape)

zcode.head()

(33099, 16)

Out[2]:

|  | **zip** | **lat** | **lng** | **city** | **state\_id** | **state\_name** | **zcta** | **parent\_zcta** | **population** | **density** | **county\_fips** | **county\_name** | **all\_county\_weights** | **imprecise** | **military** | **timezone** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **0** | 601 | 18.1800 | -66.7522 | Adjuntas | PR | Puerto Rico | True | NaN | 18570 | 111.4 | 72001 | Adjuntas | {'72001':99.43,'72141':0.57} | False | False | America/Puerto\_Rico |
| **1** | 602 | 18.3607 | -67.1752 | Aguada | PR | Puerto Rico | True | NaN | 41520 | 523.7 | 72003 | Aguada | {'72003':100} | False | False | America/Puerto\_Rico |
| **2** | 603 | 18.4544 | -67.1220 | Aguadilla | PR | Puerto Rico | True | NaN | 54689 | 667.9 | 72005 | Aguadilla | {'72005':100} | False | False | America/Puerto\_Rico |
| **3** | 606 | 18.1672 | -66.9383 | Maricao | PR | Puerto Rico | True | NaN | 6615 | 60.4 | 72093 | Maricao | {'72093':94.88,'72121':1.35,'72153':3.78} | False | False | America/Puerto\_Rico |
| **4** | 610 | 18.2903 | -67.1224 | Anasco | PR | Puerto Rico | True | NaN | 29016 | 311.9 | 72011 | Añasco | {'72003':0.55,'72011':99.45} | False | False | America/Puerto\_Rico |

We check to see what the different unique states are in this dataframe, and verify that Texas is one of those states. Then we filter the dataframe to only show location data of Texas cities. We will later focus on Dallas zip codes only.

In [3]:

zcode["state\_id"].unique()

Out[3]:

array(['PR', 'MA', 'RI', 'NH', 'ME', 'VT', 'CT', 'NY', 'NJ', 'PA', 'DE',

'DC', 'VA', 'MD', 'WV', 'NC', 'SC', 'GA', 'FL', 'AL', 'TN', 'MS',

'KY', 'OH', 'IN', 'MI', 'IA', 'WI', 'MN', 'SD', 'ND', 'MT', 'IL',

'MO', 'KS', 'NE', 'LA', 'AR', 'OK', 'TX', 'CO', 'WY', 'ID', 'UT',

'AZ', 'NM', 'NV', 'CA', 'HI', 'OR', 'WA', 'AK'], dtype=object)

In [4]:

zcode = zcode.drop(zcode.index[zcode['state\_id'] != 'TX'])

zcode.head()

Out[4]:

|  | **zip** | **lat** | **lng** | **city** | **state\_id** | **state\_name** | **zcta** | **parent\_zcta** | **population** | **density** | **county\_fips** | **county\_name** | **all\_county\_weights** | **imprecise** | **military** | **timezone** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **25843** | 75001 | 32.9600 | -96.8385 | Addison | TX | Texas | True | NaN | 12414 | 1250.2 | 48113 | Dallas | {'48113':100} | False | False | America/Chicago |
| **25844** | 75002 | 33.0897 | -96.6075 | Allen | TX | Texas | True | NaN | 63140 | 655.7 | 48085 | Collin | {'48085':100} | False | False | America/Chicago |
| **25845** | 75006 | 32.9619 | -96.8970 | Carrollton | TX | Texas | True | NaN | 46364 | 1060.8 | 48113 | Dallas | {'48113':100} | False | False | America/Chicago |
| **25846** | 75007 | 33.0046 | -96.8971 | Carrollton | TX | Texas | True | NaN | 51624 | 1709.8 | 48121 | Denton | {'48113':5.79,'48121':94.21} | False | False | America/Chicago |
| **25847** | 75009 | 33.3403 | -96.7503 | Celina | TX | Texas | True | NaN | 8785 | 35.5 | 48085 | Collin | {'48085':94.8,'48121':5.2} | False | False | America/Chicago |

In [5]:

# We also want to make sure that there are no military zones left in the dataframe

zcode[zcode['military']!=False].size

Out[5]:

0

Here we drop the columns that we deem as unnecessary for further analyzing. We really only need the zipcode, longitude, latitude, city name, state, and count

In [6]:

zcode = zcode.drop(['zcta','parent\_zcta','population','density','county\_fips','all\_county\_weights','imprecise','military','timezone'], axis=1)

zcode.head()

Out[6]:

|  | **zip** | **lat** | **lng** | **city** | **state\_id** | **state\_name** | **county\_name** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **25843** | 75001 | 32.9600 | -96.8385 | Addison | TX | Texas | Dallas |
| **25844** | 75002 | 33.0897 | -96.6075 | Allen | TX | Texas | Collin |
| **25845** | 75006 | 32.9619 | -96.8970 | Carrollton | TX | Texas | Dallas |
| **25846** | 75007 | 33.0046 | -96.8971 | Carrollton | TX | Texas | Denton |
| **25847** | 75009 | 33.3403 | -96.7503 | Celina | TX | Texas | Collin |

In [7]:

zcode.shape

Out[7]:

(1935, 7)

In [8]:

# We have 1935 zip codes located in Texas, now we'll focus on zip codes located in the Dallas area

zcode = zcode[zcode['county\_name']=='Dallas']

zcode

Out[8]:

|  | **zip** | **lat** | **lng** | **city** | **state\_id** | **state\_name** | **county\_name** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **25843** | 75001 | 32.9600 | -96.8385 | Addison | TX | Texas | Dallas |
| **25845** | 75006 | 32.9619 | -96.8970 | Carrollton | TX | Texas | Dallas |
| **25850** | 75019 | 32.9633 | -96.9855 | Coppell | TX | Texas | Dallas |
| **25861** | 75038 | 32.8746 | -96.9976 | Irving | TX | Texas | Dallas |
| **25862** | 75039 | 32.8875 | -96.9422 | Irving | TX | Texas | Dallas |
| **25863** | 75040 | 32.9277 | -96.6201 | Garland | TX | Texas | Dallas |
| **25864** | 75041 | 32.8809 | -96.6515 | Garland | TX | Texas | Dallas |
| **25865** | 75042 | 32.9139 | -96.6749 | Garland | TX | Texas | Dallas |
| **25866** | 75043 | 32.8571 | -96.5794 | Garland | TX | Texas | Dallas |
| **25867** | 75044 | 32.9626 | -96.6532 | Garland | TX | Texas | Dallas |
| **25868** | 75048 | 32.9720 | -96.5808 | Sachse | TX | Texas | Dallas |
| **25869** | 75050 | 32.7741 | -97.0053 | Grand Prairie | TX | Texas | Dallas |
| **25870** | 75051 | 32.7276 | -96.9944 | Grand Prairie | TX | Texas | Dallas |
| **25871** | 75052 | 32.6659 | -97.0265 | Grand Prairie | TX | Texas | Dallas |
| **25876** | 75060 | 32.7960 | -96.9545 | Irving | TX | Texas | Dallas |
| **25877** | 75061 | 32.8260 | -96.9655 | Irving | TX | Texas | Dallas |
| **25878** | 75062 | 32.8470 | -96.9569 | Irving | TX | Texas | Dallas |
| **25879** | 75063 | 32.9205 | -96.9859 | Irving | TX | Texas | Dallas |
| **25891** | 75080 | 32.9739 | -96.7420 | Richardson | TX | Texas | Dallas |
| **25892** | 75081 | 32.9488 | -96.7102 | Richardson | TX | Texas | Dallas |
| **25895** | 75088 | 32.8923 | -96.5491 | Rowlett | TX | Texas | Dallas |
| **25896** | 75089 | 32.9298 | -96.5498 | Rowlett | TX | Texas | Dallas |
| **25905** | 75104 | 32.5804 | -96.9662 | Cedar Hill | TX | Texas | Dallas |
| **25910** | 75115 | 32.5989 | -96.8637 | Desoto | TX | Texas | Dallas |
| **25911** | 75116 | 32.6602 | -96.9139 | Duncanville | TX | Texas | Dallas |
| **25919** | 75134 | 32.6201 | -96.7830 | Lancaster | TX | Texas | Dallas |
| **25921** | 75137 | 32.6340 | -96.9118 | Duncanville | TX | Texas | Dallas |
| **25923** | 75141 | 32.6400 | -96.6946 | Hutchins | TX | Texas | Dallas |
| **25927** | 75146 | 32.5746 | -96.7507 | Lancaster | TX | Texas | Dallas |
| **25930** | 75149 | 32.7700 | -96.6149 | Mesquite | TX | Texas | Dallas |
| **25931** | 75150 | 32.8158 | -96.6304 | Mesquite | TX | Texas | Dallas |
| **25939** | 75159 | 32.6075 | -96.5409 | Seagoville | TX | Texas | Dallas |
| **25948** | 75172 | 32.6048 | -96.6752 | Wilmer | TX | Texas | Dallas |
| **25950** | 75180 | 32.7189 | -96.6184 | Balch Springs | TX | Texas | Dallas |
| **25951** | 75181 | 32.7270 | -96.5552 | Mesquite | TX | Texas | Dallas |
| **25952** | 75182 | 32.8001 | -96.5541 | Sunnyvale | TX | Texas | Dallas |
| **25954** | 75201 | 32.7878 | -96.7995 | Dallas | TX | Texas | Dallas |
| **25955** | 75202 | 32.7792 | -96.8047 | Dallas | TX | Texas | Dallas |
| **25956** | 75203 | 32.7463 | -96.8030 | Dallas | TX | Texas | Dallas |
| **25957** | 75204 | 32.8021 | -96.7888 | Dallas | TX | Texas | Dallas |
| **25958** | 75205 | 32.8366 | -96.7962 | Dallas | TX | Texas | Dallas |
| **25959** | 75206 | 32.8316 | -96.7703 | Dallas | TX | Texas | Dallas |
| **25960** | 75207 | 32.7866 | -96.8212 | Dallas | TX | Texas | Dallas |
| **25961** | 75208 | 32.7537 | -96.8399 | Dallas | TX | Texas | Dallas |
| **25962** | 75209 | 32.8488 | -96.8259 | Dallas | TX | Texas | Dallas |
| **25963** | 75210 | 32.7713 | -96.7460 | Dallas | TX | Texas | Dallas |
| **25964** | 75211 | 32.7349 | -96.9030 | Dallas | TX | Texas | Dallas |
| **25965** | 75212 | 32.7814 | -96.8792 | Dallas | TX | Texas | Dallas |
| **25966** | 75214 | 32.8287 | -96.7454 | Dallas | TX | Texas | Dallas |
| **25967** | 75215 | 32.7507 | -96.7579 | Dallas | TX | Texas | Dallas |
| **25968** | 75216 | 32.7116 | -96.7837 | Dallas | TX | Texas | Dallas |
| **25969** | 75217 | 32.7122 | -96.6812 | Dallas | TX | Texas | Dallas |
| **25970** | 75218 | 32.8415 | -96.7024 | Dallas | TX | Texas | Dallas |
| **25971** | 75219 | 32.8118 | -96.8129 | Dallas | TX | Texas | Dallas |
| **25972** | 75220 | 32.8666 | -96.8761 | Dallas | TX | Texas | Dallas |
| **25973** | 75223 | 32.7922 | -96.7440 | Dallas | TX | Texas | Dallas |
| **25974** | 75224 | 32.7110 | -96.8399 | Dallas | TX | Texas | Dallas |
| **25975** | 75225 | 32.8652 | -96.7910 | Dallas | TX | Texas | Dallas |
| **25976** | 75226 | 32.7828 | -96.7764 | Dallas | TX | Texas | Dallas |
| **25977** | 75227 | 32.7700 | -96.6873 | Dallas | TX | Texas | Dallas |
| **25978** | 75228 | 32.8244 | -96.6799 | Dallas | TX | Texas | Dallas |
| **25979** | 75229 | 32.8937 | -96.8644 | Dallas | TX | Texas | Dallas |
| **25980** | 75230 | 32.9024 | -96.7921 | Dallas | TX | Texas | Dallas |
| **25981** | 75231 | 32.8776 | -96.7498 | Dallas | TX | Texas | Dallas |
| **25982** | 75232 | 32.6610 | -96.8402 | Dallas | TX | Texas | Dallas |
| **25983** | 75233 | 32.7044 | -96.8730 | Dallas | TX | Texas | Dallas |
| **25984** | 75234 | 32.9237 | -96.8903 | Dallas | TX | Texas | Dallas |
| **25985** | 75235 | 32.8325 | -96.8485 | Dallas | TX | Texas | Dallas |
| **25986** | 75236 | 32.6856 | -96.9358 | Dallas | TX | Texas | Dallas |
| **25987** | 75237 | 32.6656 | -96.8731 | Dallas | TX | Texas | Dallas |
| **25988** | 75238 | 32.8785 | -96.7078 | Dallas | TX | Texas | Dallas |
| **25989** | 75240 | 32.9318 | -96.7886 | Dallas | TX | Texas | Dallas |
| **25990** | 75241 | 32.6657 | -96.7590 | Dallas | TX | Texas | Dallas |
| **25991** | 75243 | 32.9121 | -96.7356 | Dallas | TX | Texas | Dallas |
| **25992** | 75244 | 32.9254 | -96.8366 | Dallas | TX | Texas | Dallas |
| **25993** | 75246 | 32.7929 | -96.7733 | Dallas | TX | Texas | Dallas |
| **25994** | 75247 | 32.8136 | -96.8775 | Dallas | TX | Texas | Dallas |
| **25995** | 75248 | 32.9696 | -96.7952 | Dallas | TX | Texas | Dallas |
| **25996** | 75249 | 32.6444 | -96.9588 | Dallas | TX | Texas | Dallas |
| **25997** | 75251 | 32.9190 | -96.7719 | Dallas | TX | Texas | Dallas |
| **25999** | 75253 | 32.6750 | -96.6129 | Dallas | TX | Texas | Dallas |
| **26000** | 75254 | 32.9456 | -96.8014 | Dallas | TX | Texas | Dallas |
| **26001** | 75270 | 32.7812 | -96.8022 | Dallas | TX | Texas | Dallas |
| **26003** | 75390 | 32.8141 | -96.8406 | Dallas | TX | Texas | Dallas |

In [9]:

zcode.shape

Out[9]:

(84, 7)

In [10]:

zcode["city"].unique()

Out[10]:

array(['Addison', 'Carrollton', 'Coppell', 'Irving', 'Garland', 'Sachse',

'Grand Prairie', 'Richardson', 'Rowlett', 'Cedar Hill', 'Desoto',

'Duncanville', 'Lancaster', 'Hutchins', 'Mesquite', 'Seagoville',

'Wilmer', 'Balch Springs', 'Sunnyvale', 'Dallas'], dtype=object)

**We're going to create a map of Dallas to visually see these cities**

In [11]:

# As we need to import librairies for creating our map,

# let's also import the other libraries we will use later

import json # library to handle JSON files

import requests # library to handle requests

from pandas.io.json import json\_normalize # tranform JSON file into a pandas dataframe

# Matplotlib and associated plotting modules

import matplotlib.cm as cm

import matplotlib.colors as colors

# import k-means for clustering stage

from sklearn.cluster import KMeans

!conda install -c conda-forge folium=0.5.0 --yes # uncomment this line if you haven't completed the Foursquare API lab

import folium # map rendering library

print('Done')

Collecting package metadata: done

Solving environment: done

# All requested packages already installed.

Done

In [12]:

# We're going to create a map of Dallas, centered around the center of Dallas

latitude = 32.78

longitude = -96.8

map\_dal = folium.Map(location=[latitude, longitude], zoom\_start=10)

# add markers to map

for lati, long, postcode, city in zip(zcode['lat'], zcode['lng'], zcode['zip'], zcode['city']):

label = '{}, {}'.format(postcode, city)

label = folium.Popup(label, parse\_html=True)

folium.CircleMarker(

[lati, long],

radius=5,

popup=label,

color='blue',

fill=True,

fill\_color='#3186cc',

fill\_opacity=0.7,

parse\_html=False).add\_to(map\_dal)

map\_dal

Out[12]:

**Work on our second database source**

In [13]:

# Our Foursquare credentials

CLIENT\_ID = 'PGZ33VUOMSUUH4SUYAPQAOZSBH5YYZNMU1XRKFR3YEL4HF2X' # your Foursquare ID

CLIENT\_SECRET = '2GP1WWAGWGBNSHIZSTY5PKILWVMT42DCYKDMVI4XIOYWJJA3' # your Foursquare Secret

VERSION = '20180605' # Foursquare API version

print('Your credentails:')

print('CLIENT\_ID: ' + CLIENT\_ID)

print('CLIENT\_SECRET:' + CLIENT\_SECRET)

Your credentails:

CLIENT\_ID: PGZ33VUOMSUUH4SUYAPQAOZSBH5YYZNMU1XRKFR3YEL4HF2X

CLIENT\_SECRET:2GP1WWAGWGBNSHIZSTY5PKILWVMT42DCYKDMVI4XIOYWJJA3

First, we're going to use Foursquare API to help return location data using the location data we already have. We're going to request the top 100 venues around our central point (latitude = 32.78, longitude = -96.8). within a 500 mile radius. We create the URL with our credentials and parameters listed below. Once we send the request to Foursquare to get the list of venues, we'll get a JSON file with a list of the results.

In [14]:

LIMIT = 100 # limit of number of venues returned by Foursquare API

radius = 500 # define radius

# lat90048, lon90048 (global variables) were computed before (see above, just before we created the first map of LA)

# and are the coordinates of our central point (zip code = 90048)

# create URL

url = 'https://api.foursquare.com/v2/venues/explore?&client\_id={}&client\_secret={}&v={}&ll={},{}&radius={}&limit={}'.format(

CLIENT\_ID,

CLIENT\_SECRET,

VERSION,

latitude,

longitude,

radius,

LIMIT)

url # display URL

results = requests.get(url).json()

results

Out[14]:

{'meta': {'code': 200, 'requestId': '5c96a85c9fb6b73b71f88c38'},

'response': {'suggestedFilters': {'header': 'Tap to show:',

'filters': [{'name': 'Open now', 'key': 'openNow'},

{'name': '$-$$$$', 'key': 'price'}]},

'headerLocation': 'Main Street District',

'headerFullLocation': 'Main Street District, Dallas',

'headerLocationGranularity': 'neighborhood',

'totalResults': 104,

'suggestedBounds': {'ne': {'lat': 32.7845000045, 'lng': -96.794657660037},

'sw': {'lat': 32.7754999955, 'lng': -96.80534233996299}},

'groups': [{'type': 'Recommended Places',

'name': 'recommended',

'items': [{'reasons': {'count': 0,

'items': [{'summary': 'This spot is popular',

'type': 'general',

'reasonName': 'globalInteractionReason'}]},

'venue': {'id': '4bc3321adce4eee1287c719d',

'name': 'The Joule',

'location': {'address': '1530 Main St',

'crossStreet': 'btwn Akard & Ervay St',

'lat': 32.78055847145238,

'lng': -96.79824727359254,

'labeledLatLngs': [{'label': 'display',

'lat': 32.78055847145238,

'lng': -96.79824727359254}],

'distance': 175,

'postalCode': '75201',

'cc': 'US',

'city': 'Dallas',

'state': 'TX',

'country': 'United States',

'formattedAddress': ['1530 Main St (btwn Akard & Ervay St)',

'Dallas, TX 75201',

'United States']},

'categories': [{'id': '4bf58dd8d48988d1fa931735',

'name': 'Hotel',

'pluralName': 'Hotels',

'shortName': 'Hotel',

'icon': {'prefix': 'https://ss3.4sqi.net/img/categories\_v2/travel/hotel\_',

'suffix': '.png'},

'primary': True}],

'photos': {'count': 0, 'groups': []}},

'referralId': 'e-0-4bc3321adce4eee1287c719d-0'},

{'reasons': {'count': 0,

'items': [{'summary': 'This spot is popular',

'type': 'general',

'reasonName': 'globalInteractionReason'}]},

'venue': {'id': '56a17841498ecca51c3a96f1',

'name': 'The Westin Dallas Downtown',

'location': {'address': '1201 Main St',

'lat': 32.780708,

'lng': -96.801932,

'labeledLatLngs': [{'label': 'display',

'lat': 32.780708,

'lng': -96.801932}],

'distance': 197,

'postalCode': '75202',

'cc': 'US',

'city': 'Dallas',

'state': 'TX',

'country': 'United States',

'formattedAddress': ['1201 Main St',

'Dallas, TX 75202',

'United States']},

'categories': [{'id': '4bf58dd8d48988d1fa931735',

'name': 'Hotel',

'pluralName': 'Hotels',

'shortName': 'Hotel',

'icon': {'prefix': 'https://ss3.4sqi.net/img/categories\_v2/travel/hotel\_',

'suffix': '.png'},

'primary': True}],

'photos': {'count': 0, 'groups': []}},

'referralId': 'e-0-56a17841498ecca51c3a96f1-1'},

{'reasons': {'count': 0,

'items': [{'summary': 'This spot is popular',

'type': 'general',

'reasonName': 'globalInteractionReason'}]},

'venue': {'id': '5193bdfc454a90460c1c6129',

'name': 'Weekend',

'location': {'address': '1511 Commerce St',

'crossStreet': 'btwn S Akard & Lane St',

'lat': 32.78030886315037,

'lng': -96.7981907595276,

'labeledLatLngs': [{'label': 'display',

'lat': 32.78030886315037,

'lng': -96.7981907595276}],

'distance': 172,

'postalCode': '75201',

'cc': 'US',

'city': 'Dallas',

'state': 'TX',

'country': 'United States',

'formattedAddress': ['1511 Commerce St (btwn S Akard & Lane St)',

'Dallas, TX 75201',

'United States']},

'categories': [{'id': '4bf58dd8d48988d1e0931735',

'name': 'Coffee Shop',

'pluralName': 'Coffee Shops',

'shortName': 'Coffee Shop',

'icon': {'prefix': 'https://ss3.4sqi.net/img/categories\_v2/food/coffeeshop\_',

'suffix': '.png'},

'primary': True}],

'photos': {'count': 0, 'groups': []}},

'referralId': 'e-0-5193bdfc454a90460c1c6129-2'},

{'reasons': {'count': 0,

'items': [{'summary': 'This spot is popular',

'type': 'general',

'reasonName': 'globalInteractionReason'}]},

'venue': {'id': '4b60537cf964a520bfdf29e3',

'name': 'AT&T Store',

'location': {'address': '208 S Akard St Ste 110',

'crossStreet': 'at Commerce St.',

'lat': 32.779811423337875,

'lng': -96.79875040884804,

'labeledLatLngs': [{'label': 'display',

'lat': 32.779811423337875,

'lng': -96.79875040884804}],

'distance': 118,

'postalCode': '75202',

'cc': 'US',

'city': 'Dallas',

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'url': 'https://www.grubhub.com/restaurant/beyond-the-box-market-325-n-st-paul-st-dallas/754318?affiliate=1131&utm\_source=foursquare-affiliate-network&utm\_medium=affiliate&utm\_campaign=1131&utm\_content=754318',

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'lng': -96.79710284959081}],

'distance': 385,

'postalCode': '75201',

'cc': 'US',

'city': 'Dallas',

'state': 'TX',

'country': 'United States',

'formattedAddress': ['1700 Pacific Ave (lower level)',

'Dallas, TX 75201',

'United States']},

'categories': [{'id': '4bf58dd8d48988d16e941735',

'name': 'Fast Food Restaurant',

'pluralName': 'Fast Food Restaurants',

'shortName': 'Fast Food',

'icon': {'prefix': 'https://ss3.4sqi.net/img/categories\_v2/food/fastfood\_',

'suffix': '.png'},

'primary': True}],

'photos': {'count': 0, 'groups': []}},

'referralId': 'e-0-4b02f898f964a5208b4b22e3-95'},

{'reasons': {'count': 0,

'items': [{'summary': 'This spot is popular',

'type': 'general',

'reasonName': 'globalInteractionReason'}]},

'venue': {'id': '4b69b67af964a52065af2be3',

'name': 'Asia Wok',

'location': {'address': '901 Main St',

'lat': 32.78026302750945,

'lng': -96.8037933217625,

'labeledLatLngs': [{'label': 'display',

'lat': 32.78026302750945,

'lng': -96.8037933217625}],

'distance': 356,

'postalCode': '75202',

'cc': 'US',

'city': 'Dallas',

'state': 'TX',

'country': 'United States',

'formattedAddress': ['901 Main St',

'Dallas, TX 75202',

'United States']},

'categories': [{'id': '4bf58dd8d48988d142941735',

'name': 'Asian Restaurant',

'pluralName': 'Asian Restaurants',

'shortName': 'Asian',

'icon': {'prefix': 'https://ss3.4sqi.net/img/categories\_v2/food/asian\_',

'suffix': '.png'},

'primary': True}],

'photos': {'count': 0, 'groups': []}},

'referralId': 'e-0-4b69b67af964a52065af2be3-96'},

{'reasons': {'count': 0,

'items': [{'summary': 'This spot is popular',

'type': 'general',

'reasonName': 'globalInteractionReason'}]},

'venue': {'id': '4b4b8249f964a520859e26e3',

'name': 'Noodle Nexus',

'location': {'address': '325 N Saint Paul St',

'crossStreet': 'at Pacific Ave.',

'lat': 32.78253039930829,

'lng': -96.79739793247198,

'labeledLatLngs': [{'label': 'display',

'lat': 32.78253039930829,

'lng': -96.79739793247198}],

'distance': 372,

'postalCode': '75201',

'cc': 'US',

'city': 'Dallas',

'state': 'TX',

'country': 'United States',

'formattedAddress': ['325 N Saint Paul St (at Pacific Ave.)',

'Dallas, TX 75201',

'United States']},

'categories': [{'id': '4bf58dd8d48988d1d1941735',

'name': 'Noodle House',

'pluralName': 'Noodle Houses',

'shortName': 'Noodles',

'icon': {'prefix': 'https://ss3.4sqi.net/img/categories\_v2/food/ramen\_',

'suffix': '.png'},

'primary': True}],

'photos': {'count': 0, 'groups': []}},

'referralId': 'e-0-4b4b8249f964a520859e26e3-97'},

{'reasons': {'count': 0,

'items': [{'summary': 'This spot is popular',

'type': 'general',

'reasonName': 'globalInteractionReason'}]},

'venue': {'id': '4e1f112ed22d7c148ce7731d',

'name': 'Salata',

'location': {'address': '1700 Pacific Ave Ste C105',

'crossStreet': 'at Ervay St.',

'lat': 32.78237224564349,

'lng': -96.79715046277926,

'labeledLatLngs': [{'label': 'display',

'lat': 32.78237224564349,

'lng': -96.79715046277926}],

'distance': 375,

'postalCode': '75201',

'cc': 'US',

'city': 'Dallas',

'state': 'TX',

'country': 'United States',

'formattedAddress': ['1700 Pacific Ave Ste C105 (at Ervay St.)',

'Dallas, TX 75201',

'United States']},

'categories': [{'id': '4bf58dd8d48988d1bd941735',

'name': 'Salad Place',

'pluralName': 'Salad Places',

'shortName': 'Salad',

'icon': {'prefix': 'https://ss3.4sqi.net/img/categories\_v2/food/salad\_',

'suffix': '.png'},

'primary': True}],

'photos': {'count': 0, 'groups': []}},

'referralId': 'e-0-4e1f112ed22d7c148ce7731d-98'},

{'reasons': {'count': 0,

'items': [{'summary': 'This spot is popular',

'type': 'general',

'reasonName': 'globalInteractionReason'}]},

'venue': {'id': '4beaf32261aca593ae668400',

'name': 'Zaguan Express',

'location': {'address': '325 N Saint Paul St Ste C1',

'lat': 32.783055350079245,

'lng': -96.79682429170346,

'labeledLatLngs': [{'label': 'display',

'lat': 32.783055350079245,

'lng': -96.79682429170346}],

'distance': 451,

'postalCode': '75201',

'cc': 'US',

'city': 'Dallas',

'state': 'TX',

'country': 'United States',

'formattedAddress': ['325 N Saint Paul St Ste C1',

'Dallas, TX 75201',

'United States']},

'categories': [{'id': '4bf58dd8d48988d1be941735',

'name': 'Latin American Restaurant',

'pluralName': 'Latin American Restaurants',

'shortName': 'Latin American',

'icon': {'prefix': 'https://ss3.4sqi.net/img/categories\_v2/food/latinamerican\_',

'suffix': '.png'},

'primary': True}],

'photos': {'count': 0, 'groups': []}},

'referralId': 'e-0-4beaf32261aca593ae668400-99'}]}]}}

As you can see we have a large list of venues in the Dallas area in those specific zip codes. Now we're going to extract the venue's categories from this list, because that's the main feature we're going to use to compare how similar the different zip codes are. Once we determine their similarities we can begin clustering those areas.

In [15]:

# function that extracts the category of the venue

def get\_category\_type(row):

try:

categories\_list = row['categories']

except:

categories\_list = row['venue.categories']

if len(categories\_list) == 0:

return None

else:

return categories\_list[0]['name']

# now we can clean the json structure and build our dataframe

venues = results['response']['groups'][0]['items']

nearby\_venues = json\_normalize(venues) # flatten JSON

# filter columns

filtered\_columns = ['venue.name', 'venue.categories', 'venue.location.lat', 'venue.location.lng']

nearby\_venues =nearby\_venues.loc[:, filtered\_columns]

# filter the category for each row

nearby\_venues['venue.categories'] = nearby\_venues.apply(get\_category\_type, axis=1)

# clean columns

nearby\_venues.columns = [col.split(".")[-1] for col in nearby\_venues.columns]

nearby\_venues.head()

Out[15]:

|  | **name** | **categories** | **lat** | **lng** |
| --- | --- | --- | --- | --- |
| **0** | The Joule | Hotel | 32.780558 | -96.798247 |
| **1** | The Westin Dallas Downtown | Hotel | 32.780708 | -96.801932 |
| **2** | Weekend | Coffee Shop | 32.780309 | -96.798191 |
| **3** | AT&T Store | Mobile Phone Shop | 32.779811 | -96.798750 |
| **4** | Bread Zeppelin | Salad Place | 32.780309 | -96.800749 |

In [16]:

nearby\_venues.shape

Out[16]:

(100, 4)

In [17]:

nearby\_venues['categories'].unique()

Out[17]:

array(['Hotel', 'Coffee Shop', 'Mobile Phone Shop', 'Salad Place',

'New American Restaurant', 'Bistro', 'Burger Joint',

'French Restaurant', 'Italian Restaurant', 'Indian Restaurant',

'Cupcake Shop', 'Department Store', 'Pool', 'Cocktail Bar',

'Seafood Restaurant', 'Park', 'Mexican Restaurant', 'Restaurant',

'Boutique', 'Sandwich Place', 'Plaza', 'Bar', 'Deli / Bodega',

'Wings Joint', 'Taco Place', 'Sports Bar', 'American Restaurant',

'Japanese Restaurant', 'Fast Food Restaurant', 'IT Services',

'Convenience Store', 'Bank', 'Thai Restaurant', 'Gym',

'Cajun / Creole Restaurant', 'Noodle House', 'Lounge',

'Chinese Restaurant', 'Mediterranean Restaurant', 'Hotel Bar',

'Café', 'Breakfast Spot', 'Smoothie Shop', 'Sushi Restaurant',

'Pharmacy', 'BBQ Joint', 'Rental Car Location',

'Fried Chicken Joint', 'Asian Restaurant',

'Latin American Restaurant'], dtype=object)

The function "getNearbyVenues" will append the useful results. We're adding the parameter "min\_venues" to see if any of the requests above have a small number of venues. If the number of venues is deemed too small (i.e. 0), we can double check the zip code to see if we need to explore that zip code more to understand why there are so few venues.

In [18]:

# Create a function to repeat a similar process for all the areas (postal codes)

def getNearbyVenues(postalcodes, latitudes, longitudes, radius=500, min\_venues=0):

venues\_list=[]

# name is actually postal code name (name -- zipcode)

for zipcode, lat, lng in zip(postalcodes, latitudes, longitudes):

#print(zipcode)

# create the API request URL

url = 'https://api.foursquare.com/v2/venues/explore?&client\_id={}&client\_secret={}&v={}&ll={},{}&radius={}&limit={}'.format(

CLIENT\_ID,

CLIENT\_SECRET,

VERSION,

lat,

lng,

radius,

LIMIT)

# make the GET request

results = requests.get(url).json()["response"]['groups'][0]['items']

#print("results . shape = ", len(results))

#if len(results) < min\_venues : print("number of venues for zipcode {} is low : {} venues.".format(zipcode,len(results)))

print("number of venues for zipcode {} is : {} venues.".format(zipcode,len(results)))

# return only relevant information for each nearby venue

## if len(results) >= min\_venues)

for v in results :

venues\_list.append([(

zipcode,

lat,

lng,

v['venue']['name'],

v['venue']['location']['lat'],

v['venue']['location']['lng'],

v['venue']['categories'][0]['name'])])

# for v in results if len(results) >= min\_venues])

nearby\_venues = pd.DataFrame([item for venue\_list in venues\_list for item in venue\_list])

nearby\_venues.columns = ['PostalCode',

'PC Latitude',

'PC Longitude',

'Venue',

'Venue Latitude',

'Venue Longitude',

'Venue Category']

return(nearby\_venues)

In [19]:

# Now we can run the function above with our database of areas to get the number of venues per zip code

dal\_venues = getNearbyVenues(postalcodes=zcode['zip'],

latitudes=zcode['lat'],

longitudes=zcode['lng'],

min\_venues=0)

number of venues for zipcode 75001 is : 11 venues.

number of venues for zipcode 75006 is : 4 venues.

number of venues for zipcode 75019 is : 2 venues.

number of venues for zipcode 75038 is : 2 venues.

number of venues for zipcode 75039 is : 0 venues.

number of venues for zipcode 75040 is : 2 venues.

number of venues for zipcode 75041 is : 6 venues.

number of venues for zipcode 75042 is : 6 venues.

number of venues for zipcode 75043 is : 3 venues.

number of venues for zipcode 75044 is : 6 venues.

number of venues for zipcode 75048 is : 2 venues.

number of venues for zipcode 75050 is : 0 venues.

number of venues for zipcode 75051 is : 1 venues.

number of venues for zipcode 75052 is : 0 venues.

number of venues for zipcode 75060 is : 2 venues.

number of venues for zipcode 75061 is : 8 venues.

number of venues for zipcode 75062 is : 7 venues.

number of venues for zipcode 75063 is : 26 venues.

number of venues for zipcode 75080 is : 21 venues.

number of venues for zipcode 75081 is : 9 venues.

number of venues for zipcode 75088 is : 2 venues.

number of venues for zipcode 75089 is : 0 venues.

number of venues for zipcode 75104 is : 1 venues.

number of venues for zipcode 75115 is : 3 venues.

number of venues for zipcode 75116 is : 9 venues.

number of venues for zipcode 75134 is : 0 venues.

number of venues for zipcode 75137 is : 4 venues.

number of venues for zipcode 75141 is : 0 venues.

number of venues for zipcode 75146 is : 0 venues.

number of venues for zipcode 75149 is : 6 venues.

number of venues for zipcode 75150 is : 37 venues.

number of venues for zipcode 75159 is : 0 venues.

number of venues for zipcode 75172 is : 0 venues.

number of venues for zipcode 75180 is : 18 venues.

number of venues for zipcode 75181 is : 0 venues.

number of venues for zipcode 75182 is : 2 venues.

number of venues for zipcode 75201 is : 38 venues.

number of venues for zipcode 75202 is : 89 venues.

number of venues for zipcode 75203 is : 4 venues.

number of venues for zipcode 75204 is : 23 venues.

number of venues for zipcode 75205 is : 1 venues.

number of venues for zipcode 75206 is : 23 venues.

number of venues for zipcode 75207 is : 13 venues.

number of venues for zipcode 75208 is : 8 venues.

number of venues for zipcode 75209 is : 16 venues.

number of venues for zipcode 75210 is : 3 venues.

number of venues for zipcode 75211 is : 4 venues.

number of venues for zipcode 75212 is : 1 venues.

number of venues for zipcode 75214 is : 3 venues.

number of venues for zipcode 75215 is : 4 venues.

number of venues for zipcode 75216 is : 2 venues.

number of venues for zipcode 75217 is : 4 venues.

number of venues for zipcode 75218 is : 2 venues.

number of venues for zipcode 75219 is : 34 venues.

number of venues for zipcode 75220 is : 7 venues.

number of venues for zipcode 75223 is : 11 venues.

number of venues for zipcode 75224 is : 0 venues.

number of venues for zipcode 75225 is : 14 venues.

number of venues for zipcode 75226 is : 24 venues.

number of venues for zipcode 75227 is : 4 venues.

number of venues for zipcode 75228 is : 10 venues.

number of venues for zipcode 75229 is : 5 venues.

number of venues for zipcode 75230 is : 2 venues.

number of venues for zipcode 75231 is : 5 venues.

number of venues for zipcode 75232 is : 13 venues.

number of venues for zipcode 75233 is : 2 venues.

number of venues for zipcode 75234 is : 10 venues.

number of venues for zipcode 75235 is : 5 venues.

number of venues for zipcode 75236 is : 2 venues.

number of venues for zipcode 75237 is : 17 venues.

number of venues for zipcode 75238 is : 1 venues.

number of venues for zipcode 75240 is : 5 venues.

number of venues for zipcode 75241 is : 0 venues.

number of venues for zipcode 75243 is : 26 venues.

number of venues for zipcode 75244 is : 26 venues.

number of venues for zipcode 75246 is : 19 venues.

number of venues for zipcode 75247 is : 2 venues.

number of venues for zipcode 75248 is : 0 venues.

number of venues for zipcode 75249 is : 2 venues.

number of venues for zipcode 75251 is : 15 venues.

number of venues for zipcode 75253 is : 0 venues.

number of venues for zipcode 75254 is : 8 venues.

number of venues for zipcode 75270 is : 100 venues.

number of venues for zipcode 75390 is : 8 venues.

In [20]:

print(dal\_venues.shape)

dal\_venues.head()

(815, 7)

Out[20]:

|  | **PostalCode** | **PC Latitude** | **PC Longitude** | **Venue** | **Venue Latitude** | **Venue Longitude** | **Venue Category** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **0** | 75001 | 32.96 | -96.8385 | Cindi's N.Y. Delicatessen | 32.961864 | -96.838873 | Diner |
| **1** | 75001 | 32.96 | -96.8385 | La Spiga | 32.958278 | -96.837417 | Bakery |
| **2** | 75001 | 32.96 | -96.8385 | Enterprise Rent-A-Car | 32.960673 | -96.838102 | Rental Car Location |
| **3** | 75001 | 32.96 | -96.8385 | Scanning Nations | 32.961567 | -96.839008 | Business Service |
| **4** | 75001 | 32.96 | -96.8385 | Ed's Lawn Equipment | 32.958521 | -96.839043 | Hardware Store |

We show the number of unique venue categories the names of those categories.

In [21]:

dal\_venues['PostalCode'].unique().shape

print('There are {} unique categories.'.format(len(dal\_venues['Venue Category'].unique())))

There are 184 unique categories.

In [22]:

dal\_venues['Venue Category'].unique()

Out[22]:

array(['Diner', 'Bakery', 'Rental Car Location', 'Business Service',

'Hardware Store', 'Arts & Crafts Store', 'Music Store',

'Art Studio', 'Furniture / Home Store', 'Jewelry Store',

'History Museum', 'Park', 'Water Park',

'Construction & Landscaping', 'Fried Chicken Joint', 'Golf Course',

'Costume Shop', 'American Restaurant', 'Other Repair Shop', 'Food',

'Mexican Restaurant', 'Music Venue', 'Print Shop', 'Movie Theater',

'Cosmetics Shop', 'Pizza Place', 'Donut Shop', 'Baseball Field',

'Gym', 'Trail', 'Video Store', 'Café', 'Pool',

'Gym / Fitness Center', 'Bar', 'Discount Store',

'Fast Food Restaurant', 'Salvadoran Restaurant',

'Convenience Store', 'Gas Station', 'Indian Restaurant',

'Grocery Store', 'Boutique', 'Burger Joint', 'Market',

'New American Restaurant', 'Bowling Alley', 'Chinese Restaurant',

'Sandwich Place', 'Smoothie Shop', 'Steakhouse',

'Mediterranean Restaurant', 'Shipping Store', 'Food Truck',

'South Indian Restaurant', 'Hawaiian Restaurant',

'Southern / Soul Food Restaurant', 'Plaza', 'Restaurant',

'Asian Restaurant', 'Organic Grocery', 'Tea Room', 'Go Kart Track',

'Hookah Bar', 'Farmers Market', 'Dessert Shop', 'Pharmacy',

'Museum', 'BBQ Joint', 'College Bookstore',

'Middle Eastern Restaurant', 'Clothing Store', 'Flower Shop',

'Sports Bar', 'Dry Cleaner', 'Automotive Shop', 'Lake',

'Thrift / Vintage Store', 'Home Service', 'Department Store',

'Flea Market', 'Skating Rink', 'Sporting Goods Shop',

'Cajun / Creole Restaurant', 'Italian Restaurant',

'Seafood Restaurant', 'Video Game Store',

'Paper / Office Supplies Store', 'Thai Restaurant', 'Arcade',

'Kids Store', 'Comfort Food Restaurant', 'Taco Place',

'Optical Shop', "Doctor's Office", 'Football Stadium',

'Art Museum', 'Concert Hall', 'Dog Run', 'Performing Arts Venue',

'Opera House', 'Hotel', 'French Restaurant', 'Theater',

'Coffee Shop', 'Cafeteria', 'Deli / Bodega', 'Gift Shop',

'Salad Place', 'Wings Joint', 'Monument / Landmark', 'Bistro',

'Latin American Restaurant', 'Cocktail Bar', 'Liquor Store',

'Aquarium', 'Japanese Restaurant', 'Bank', 'Lounge',

'Tex-Mex Restaurant', 'Frozen Yogurt Shop', 'Light Rail Station',

'Sushi Restaurant', 'Beer Garden', 'Nightclub', 'Spa',

'Shopping Mall', 'Carpet Store', 'Pet Service', 'Pet Store',

'Big Box Store', 'Shoe Store', 'Electronics Store', 'Intersection',

'School', 'Greek Restaurant', 'Cupcake Shop', 'Salon / Barbershop',

'Ice Cream Shop', 'Halal Restaurant', 'Antique Shop', 'Brewery',

'Art Gallery', 'Dance Studio', 'Dive Bar', 'Wine Shop',

'Nail Salon', 'Garden', 'Recreation Center', 'Locksmith',

"Men's Store", 'Shop & Service', 'Breakfast Spot', 'Rugby Pitch',

'Gay Bar', 'Tanning Salon', 'Vietnamese Restaurant',

'Supplement Shop', 'Health Food Store', 'Smoke Shop',

'Leather Goods Store', 'Noodle House', 'Bubble Tea Shop',

'Cheese Shop', 'Auto Garage', 'Nightlife Spot', 'Campground',

'Recording Studio', 'Field', 'Pawn Shop', 'Basketball Court',

'Storage Facility', 'Soccer Field', 'Bus Stop',

'Miscellaneous Shop', "Women's Store", 'Tennis Court',

'Mobile Phone Shop', 'Check Cashing Service', 'Outlet Store',

'Supermarket', 'Warehouse Store',

'Residential Building (Apartment / Condo)', 'IT Services'],

dtype=object)

**Use one-hot encoding to further break down each zip code**

The process we're about to perform is:

We apply one hot encoding to the data frame we created and gather all the venues from each area (with their category). Basically we have a 0 if a category isn't present in that zipcode and a 1 if it is present.

We get rid of the actual lat,lon coordinates of the venues, so that we may stay at the zipcode level. So, we make sure we add the zipcode, lat,lon info to the one hot dataframe.

We group rows by postal code and by taking the mean of the frequency of occurrence of each category, then we can print the 5 most common venue categories in each zip code.

We can put that information for all areas into a dataframe. Using a function to sort the venues categories in descending order, then we create the new dataframe and display the top 10 venues (categories) for each zip code we consider.

In [23]:

# one hot encoding

dal\_venues\_onehot = pd.get\_dummies(dal\_venues[['Venue Category']], prefix="", prefix\_sep="")

# add postalcode column back to dataframe

dal\_venues\_onehot['PostalCode'] = dal\_venues['PostalCode']

# move postalcode column to the first column

fixed\_columns = [dal\_venues\_onehot.columns[-1]] + list(dal\_venues\_onehot.columns[:-1])

dal\_venues\_onehot = dal\_venues\_onehot[fixed\_columns]

dal\_venues\_onehot.head()

Out[23]:

|  | **PostalCode** | **American Restaurant** | **Antique Shop** | **Aquarium** | **Arcade** | **Art Gallery** | **Art Museum** | **Art Studio** | **Arts & Crafts Store** | **Asian Restaurant** | **Auto Garage** | **Automotive Shop** | **BBQ Joint** | **Bakery** | **Bank** | **Bar** | **Baseball Field** | **Basketball Court** | **Beer Garden** | **Big Box Store** | **Bistro** | **Boutique** | **Bowling Alley** | **Breakfast Spot** | **Brewery** | **Bubble Tea Shop** | **Burger Joint** | **Bus Stop** | **Business Service** | **Cafeteria** | **Café** | **Cajun / Creole Restaurant** | **Campground** | **Carpet Store** | **Check Cashing Service** | **Cheese Shop** | **Chinese Restaurant** | **Clothing Store** | **Cocktail Bar** | **Coffee Shop** | **College Bookstore** | **Comfort Food Restaurant** | **Concert Hall** | **Construction & Landscaping** | **Convenience Store** | **Cosmetics Shop** | **Costume Shop** | **Cupcake Shop** | **Dance Studio** | **Deli / Bodega** | **Department Store** | **Dessert Shop** | **Diner** | **Discount Store** | **Dive Bar** | **Doctor's Office** | **Dog Run** | **Donut Shop** | **Dry Cleaner** | **Electronics Store** | **Farmers Market** | **Fast Food Restaurant**FieldFlea MarketFlower ShopFoodFood TruckFootball StadiumFrench RestaurantFried Chicken JointFrozen Yogurt ShopFurniture / Home StoreGardenGas StationGay BarGift ShopGo Kart TrackGolf CourseGreek RestaurantGrocery StoreGymGym / Fitness CenterHalal RestaurantHardware StoreHawaiian RestaurantHealth Food StoreHistory MuseumHome ServiceHookah BarHotelIT ServicesIce Cream ShopIndian RestaurantIntersectionItalian RestaurantJapanese RestaurantJewelry StoreKids StoreLakeLatin American RestaurantLeather Goods StoreLight Rail StationLiquor StoreLocksmithLoungeMarketMediterranean RestaurantMen's StoreMexican RestaurantMiddle Eastern RestaurantMiscellaneous ShopMobile Phone ShopMonument / LandmarkMovie TheaterMuseumMusic StoreMusic VenueNail SalonNew American RestaurantNightclubNightlife SpotNoodle HouseOpera HouseOptical ShopOrganic GroceryOther Repair ShopOutlet StorePaper / Office Supplies StoreParkPawn ShopPerforming Arts VenuePet ServicePet StorePharmacyPizza PlacePlazaPoolPrint ShopRecording StudioRecreation CenterRental Car LocationResidential Building (Apartment / Condo)RestaurantRugby PitchSalad PlaceSalon / BarbershopSalvadoran RestaurantSandwich PlaceSchoolSeafood RestaurantShipping StoreShoe StoreShop & ServiceShopping MallSkating RinkSmoke ShopSmoothie ShopSoccer FieldSouth Indian RestaurantSouthern / Soul Food RestaurantSpaSporting Goods ShopSports BarSteakhouseStorage FacilitySupermarketSupplement ShopSushi RestaurantTaco PlaceTanning SalonTea RoomTennis CourtTex-Mex RestaurantThai RestaurantTheaterThrift / Vintage StoreTrailVideo Game StoreVideo StoreVietnamese RestaurantWarehouse StoreWater ParkWine ShopWings JointWomen's Store |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **0** | 75001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000 |
| **1** | 75001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000 |
| **2** | 75001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0000000000000000000000000000000000000000000000000000000000000000000000000000000100000000000000000000000000000000000000000000 |
| **3** | 75001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000 |
| **4** | 75001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0000000000000000000000100000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000 |

In [24]:

dal\_venues\_onehot.shape

Out[24]:

(815, 185)

In [25]:

dal\_venues\_grouped = dal\_venues\_onehot.groupby('PostalCode').mean().reset\_index()

dal\_venues\_grouped.head()

Out[25]:

|  | **PostalCode** | **American Restaurant** | **Antique Shop** | **Aquarium** | **Arcade** | **Art Gallery** | **Art Museum** | **Art Studio** | **Arts & Crafts Store** | **Asian Restaurant** | **Auto Garage** | **Automotive Shop** | **BBQ Joint** | **Bakery** | **Bank** | **Bar** | **Baseball Field** | **Basketball Court** | **Beer Garden** | **Big Box Store** | **Bistro** | **Boutique** | **Bowling Alley** | **Breakfast Spot** | **Brewery** | **Bubble Tea Shop** | **Burger Joint** | **Bus Stop** | **Business Service** | **Cafeteria** | **Café** | **Cajun / Creole Restaurant** | **Campground** | **Carpet Store** | **Check Cashing Service** | **Cheese Shop** | **Chinese Restaurant** | **Clothing Store** | **Cocktail Bar** | **Coffee Shop** | **College Bookstore** | **Comfort Food Restaurant** | **Concert Hall** | **Construction & Landscaping** | **Convenience Store** | **Cosmetics Shop** | **Costume Shop** | **Cupcake Shop** | **Dance Studio** | **Deli / Bodega** | **Department Store** | **Dessert Shop** | **Diner** | **Discount Store** | **Dive Bar** | **Doctor's Office** | **Dog Run** | **Donut Shop** | **Dry Cleaner** | **Electronics Store** | **Farmers Market** | **Fast Food Restaurant**FieldFlea MarketFlower ShopFoodFood TruckFootball StadiumFrench RestaurantFried Chicken JointFrozen Yogurt ShopFurniture / Home StoreGardenGas StationGay BarGift ShopGo Kart TrackGolf CourseGreek RestaurantGrocery StoreGymGym / Fitness CenterHalal RestaurantHardware StoreHawaiian RestaurantHealth Food StoreHistory MuseumHome ServiceHookah BarHotelIT ServicesIce Cream ShopIndian RestaurantIntersectionItalian RestaurantJapanese RestaurantJewelry StoreKids StoreLakeLatin American RestaurantLeather Goods StoreLight Rail StationLiquor StoreLocksmithLoungeMarketMediterranean RestaurantMen's StoreMexican RestaurantMiddle Eastern RestaurantMiscellaneous ShopMobile Phone ShopMonument / LandmarkMovie TheaterMuseumMusic StoreMusic VenueNail SalonNew American RestaurantNightclubNightlife SpotNoodle HouseOpera HouseOptical ShopOrganic GroceryOther Repair ShopOutlet StorePaper / Office Supplies StoreParkPawn ShopPerforming Arts VenuePet ServicePet StorePharmacyPizza PlacePlazaPoolPrint ShopRecording StudioRecreation CenterRental Car LocationResidential Building (Apartment / Condo)RestaurantRugby PitchSalad PlaceSalon / BarbershopSalvadoran RestaurantSandwich PlaceSchoolSeafood RestaurantShipping StoreShoe StoreShop & ServiceShopping MallSkating RinkSmoke ShopSmoothie ShopSoccer FieldSouth Indian RestaurantSouthern / Soul Food RestaurantSpaSporting Goods ShopSports BarSteakhouseStorage FacilitySupermarketSupplement ShopSushi RestaurantTaco PlaceTanning SalonTea RoomTennis CourtTex-Mex RestaurantThai RestaurantTheaterThrift / Vintage StoreTrailVideo Game StoreVideo StoreVietnamese RestaurantWarehouse StoreWater ParkWine ShopWings JointWomen's Store |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **0** | 75001 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.090909 | 0.181818 | 0.0 | 0.0 | 0.0 | 0.0 | 0.090909 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.090909 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.090909 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00.00.00.00.00.00.00.00.00.00.0909090.00.00.00.00.00.00.00.00.00.00.00.0909090.00.00.000.00.00.00.00.00.00.00.00.00.0909090.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.0909090.00.00.00.00.00.00.00.00.00.00.00.00.000.00.00.00.00.00.00.00.00.00.00.00.0909090.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.000.00.00.0 |
| **1** | 75006 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.000000 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.25 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00.00.00.00.00.00.00.00.00.00.0000000.00.00.00.00.00.00.00.00.00.00.00.0000000.00.00.250.00.00.00.00.00.00.00.00.00.0000000.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.0000000.00.00.00.00.00.00.00.00.00.00.00.00.250.00.00.00.00.00.00.00.00.00.00.00.0000000.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.250.00.00.0 |
| **2** | 75019 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.000000 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.50 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00.00.00.00.00.00.00.00.00.00.0000000.00.00.00.00.00.00.00.00.00.00.00.0000000.00.00.000.00.00.00.00.00.00.00.00.00.0000000.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.0000000.00.00.00.00.00.00.00.00.00.00.00.00.500.00.00.00.00.00.00.00.00.00.00.00.0000000.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.000.00.00.0 |
| **3** | 75038 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.000000 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00.00.00.00.00.00.00.00.50.00.0000000.00.00.00.00.00.50.00.00.00.00.00.0000000.00.00.000.00.00.00.00.00.00.00.00.00.0000000.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.0000000.00.00.00.00.00.00.00.00.00.00.00.00.000.00.00.00.00.00.00.00.00.00.00.00.0000000.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.000.00.00.0 |
| **4** | 75040 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.000000 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.500000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00.00.00.00.00.00.00.00.00.00.0000000.00.00.00.00.00.00.00.00.00.00.00.0000000.00.00.000.00.00.00.00.00.00.00.00.00.0000000.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.0000000.00.00.00.00.00.00.00.00.00.00.00.00.000.00.00.00.00.00.00.00.00.00.00.00.0000000.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.000.00.00.0 |

In [26]:

print(dal\_venues\_grouped.shape)

(70, 185)

In [27]:

# Following our process described above, we print each area along with the top 5 most common categories of venues¶

num\_top\_venues = 5

for area in dal\_venues\_grouped['PostalCode']:

print("----- {} -----".format(area))

#print("----"+area+"----")

temp = dal\_venues\_grouped[dal\_venues\_grouped['PostalCode'] == area].T.reset\_index()

temp.columns = ['venue cateory','freq']

temp = temp.iloc[1:]

temp['freq'] = temp['freq'].astype(float)

temp = temp.round({'freq': 2})

print(temp.sort\_values('freq', ascending=False).reset\_index(drop=True).head(num\_top\_venues))

print('\n')

----- 75001 -----

venue cateory freq

0 Arts & Crafts Store 0.18

1 Jewelry Store 0.09

2 Bakery 0.09

3 Furniture / Home Store 0.09

4 Business Service 0.09

----- 75006 -----

venue cateory freq

0 Water Park 0.25

1 Construction & Landscaping 0.25

2 History Museum 0.25

3 Park 0.25

4 American Restaurant 0.00

----- 75019 -----

venue cateory freq

0 Park 0.5

1 Construction & Landscaping 0.5

2 American Restaurant 0.0

3 Nightclub 0.0

4 Nightlife Spot 0.0

----- 75038 -----

venue cateory freq

0 Fried Chicken Joint 0.5

1 Golf Course 0.5

2 Outlet Store 0.0

3 New American Restaurant 0.0

4 Nightclub 0.0

----- 75040 -----

venue cateory freq

0 Costume Shop 0.5

1 Business Service 0.5

2 American Restaurant 0.0

3 Park 0.0

4 Nightlife Spot 0.0

----- 75041 -----

venue cateory freq

0 American Restaurant 0.17

1 Construction & Landscaping 0.17

2 Food 0.17

3 Other Repair Shop 0.17

4 Mexican Restaurant 0.17

----- 75042 -----

venue cateory freq

0 Business Service 0.17

1 Print Shop 0.17

2 Cosmetics Shop 0.17

3 Construction & Landscaping 0.17

4 Music Venue 0.17

----- 75043 -----

venue cateory freq

0 Pizza Place 0.33

1 Donut Shop 0.33

2 Baseball Field 0.33

3 American Restaurant 0.00

4 Paper / Office Supplies Store 0.00

----- 75044 -----

venue cateory freq

0 Gym / Fitness Center 0.17

1 Pool 0.17

2 Café 0.17

3 Video Store 0.17

4 Trail 0.17

----- 75048 -----

venue cateory freq

0 Park 0.5

1 Bar 0.5

2 Paper / Office Supplies Store 0.0

3 Nightclub 0.0

4 Nightlife Spot 0.0

----- 75051 -----

venue cateory freq

0 Discount Store 1.0

1 American Restaurant 0.0

2 Park 0.0

3 Nightclub 0.0

4 Nightlife Spot 0.0

----- 75060 -----

venue cateory freq

0 Park 0.5

1 Baseball Field 0.5

2 Paper / Office Supplies Store 0.0

3 Nightclub 0.0

4 Nightlife Spot 0.0

----- 75061 -----

venue cateory freq

0 Mexican Restaurant 0.12

1 Gym / Fitness Center 0.12

2 Gas Station 0.12

3 Discount Store 0.12

4 Convenience Store 0.12

----- 75062 -----

venue cateory freq

0 Indian Restaurant 0.29

1 Burger Joint 0.14

2 Convenience Store 0.14

3 Boutique 0.14

4 Market 0.14

----- 75063 -----

venue cateory freq

0 Furniture / Home Store 0.19

1 American Restaurant 0.08

2 Bowling Alley 0.04

3 Fast Food Restaurant 0.04

4 Sandwich Place 0.04

----- 75080 -----

venue cateory freq

0 Dessert Shop 0.10

1 Pizza Place 0.10

2 Middle Eastern Restaurant 0.05

3 Hookah Bar 0.05

4 Museum 0.05

----- 75081 -----

venue cateory freq

0 Mexican Restaurant 0.22

1 Sports Bar 0.11

2 Chinese Restaurant 0.11

3 Music Store 0.11

4 Donut Shop 0.11

----- 75088 -----

venue cateory freq

0 Lake 0.5

1 Fried Chicken Joint 0.5

2 American Restaurant 0.0

3 Paper / Office Supplies Store 0.0

4 Nightclub 0.0

----- 75104 -----

venue cateory freq

0 Thrift / Vintage Store 1.0

1 American Restaurant 0.0

2 Paper / Office Supplies Store 0.0

3 New American Restaurant 0.0

4 Nightclub 0.0

----- 75115 -----

venue cateory freq

0 Home Service 0.67

1 Gym 0.33

2 American Restaurant 0.00

3 Outlet Store 0.00

4 New American Restaurant 0.00

----- 75116 -----

venue cateory freq

0 Fried Chicken Joint 0.22

1 Department Store 0.11

2 Discount Store 0.11

3 Pizza Place 0.11

4 Video Store 0.11

----- 75137 -----

venue cateory freq

0 Food 0.50

1 Flea Market 0.25

2 Other Repair Shop 0.25

3 American Restaurant 0.00

4 Outlet Store 0.00

----- 75149 -----

venue cateory freq

0 Convenience Store 0.33

1 Lake 0.17

2 Skating Rink 0.17

3 Sporting Goods Shop 0.17

4 Baseball Field 0.17

----- 75150 -----

venue cateory freq

0 Mexican Restaurant 0.11

1 American Restaurant 0.08

2 Clothing Store 0.08

3 Italian Restaurant 0.05

4 Video Game Store 0.05

----- 75180 -----

venue cateory freq

0 Fast Food Restaurant 0.22

1 Fried Chicken Joint 0.17

2 Discount Store 0.11

3 Grocery Store 0.11

4 Video Store 0.06

----- 75182 -----

venue cateory freq

0 Business Service 0.5

1 Football Stadium 0.5

2 American Restaurant 0.0

3 Paper / Office Supplies Store 0.0

4 Nightlife Spot 0.0

----- 75201 -----

venue cateory freq

0 Food Truck 0.13

1 American Restaurant 0.08

2 Performing Arts Venue 0.08

3 Steakhouse 0.05

4 Theater 0.05

----- 75202 -----

venue cateory freq

0 Hotel 0.08

1 Plaza 0.06

2 Coffee Shop 0.06

3 American Restaurant 0.04

4 History Museum 0.04

----- 75203 -----

venue cateory freq

0 Light Rail Station 0.50

1 Business Service 0.25

2 Carpet Store 0.25

3 American Restaurant 0.00

4 Paper / Office Supplies Store 0.00

----- 75204 -----

venue cateory freq

0 Shoe Store 0.09

1 Clothing Store 0.09

2 Grocery Store 0.09

3 Fast Food Restaurant 0.09

4 Intersection 0.04

----- 75205 -----

venue cateory freq

0 Pool 1.0

1 American Restaurant 0.0

2 Paper / Office Supplies Store 0.0

3 New American Restaurant 0.0

4 Nightclub 0.0

----- 75206 -----

venue cateory freq

0 Burger Joint 0.09

1 Sushi Restaurant 0.09

2 Salon / Barbershop 0.04

3 Bar 0.04

4 Chinese Restaurant 0.04

----- 75207 -----

venue cateory freq

0 Art Gallery 0.23

1 Antique Shop 0.15

2 Dance Studio 0.08

3 Brewery 0.08

4 Mexican Restaurant 0.08

----- 75208 -----

venue cateory freq

0 Park 0.25

1 Mexican Restaurant 0.25

2 Donut Shop 0.12

3 Golf Course 0.12

4 Italian Restaurant 0.12

----- 75209 -----

venue cateory freq

0 Dive Bar 0.12

1 American Restaurant 0.06

2 Bank 0.06

3 Mexican Restaurant 0.06

4 Nail Salon 0.06

----- 75210 -----

venue cateory freq

0 Recreation Center 0.33

1 Garden 0.33

2 Grocery Store 0.33

3 Music Venue 0.00

4 New American Restaurant 0.00

----- 75211 -----

venue cateory freq

0 Golf Course 0.50

1 Home Service 0.25

2 Locksmith 0.25

3 American Restaurant 0.00

4 Paper / Office Supplies Store 0.00

----- 75212 -----

venue cateory freq

0 Construction & Landscaping 1.0

1 American Restaurant 0.0

2 Park 0.0

3 Nightclub 0.0

4 Nightlife Spot 0.0

----- 75214 -----

venue cateory freq

0 Spa 0.33

1 Shop & Service 0.33

2 Men's Store 0.33

3 Nail Salon 0.00

4 New American Restaurant 0.00

----- 75215 -----

venue cateory freq

0 Seafood Restaurant 0.5

1 Convenience Store 0.5

2 Pawn Shop 0.0

3 Nightlife Spot 0.0

4 Noodle House 0.0

----- 75216 -----

venue cateory freq

0 Breakfast Spot 0.5

1 Locksmith 0.5

2 American Restaurant 0.0

3 Paper / Office Supplies Store 0.0

4 Nightclub 0.0

----- 75217 -----

venue cateory freq

0 Fast Food Restaurant 0.25

1 Gas Station 0.25

2 Fried Chicken Joint 0.25

3 Discount Store 0.25

4 American Restaurant 0.00

----- 75218 -----

venue cateory freq

0 Park 0.5

1 Rugby Pitch 0.5

2 Paper / Office Supplies Store 0.0

3 New American Restaurant 0.0

4 Nightclub 0.0

----- 75219 -----

venue cateory freq

0 Gay Bar 0.26

1 Bar 0.06

2 Intersection 0.03

3 Supplement Shop 0.03

4 Breakfast Spot 0.03

----- 75220 -----

venue cateory freq

0 Mexican Restaurant 0.29

1 Convenience Store 0.14

2 Video Store 0.14

3 Light Rail Station 0.14

4 Taco Place 0.14

----- 75223 -----

venue cateory freq

0 Convenience Store 0.18

1 Mexican Restaurant 0.18

2 Fried Chicken Joint 0.09

3 Discount Store 0.09

4 Dive Bar 0.09

----- 75225 -----

venue cateory freq

0 Sandwich Place 0.07

1 Convenience Store 0.07

2 Mexican Restaurant 0.07

3 Health Food Store 0.07

4 Bakery 0.07

----- 75226 -----

venue cateory freq

0 BBQ Joint 0.08

1 Art Gallery 0.08

2 Music Venue 0.08

3 Bar 0.08

4 Dive Bar 0.08

----- 75227 -----

venue cateory freq

0 Electronics Store 0.25

1 Discount Store 0.25

2 Arts & Crafts Store 0.25

3 Mexican Restaurant 0.25

4 Pawn Shop 0.00

----- 75228 -----

venue cateory freq

0 Convenience Store 0.2

1 Burger Joint 0.1

2 Auto Garage 0.1

3 Discount Store 0.1

4 Sandwich Place 0.1

----- 75229 -----

venue cateory freq

0 Recording Studio 0.2

1 Campground 0.2

2 Nightlife Spot 0.2

3 Recreation Center 0.2

4 Aquarium 0.2

----- 75230 -----

venue cateory freq

0 Intersection 0.5

1 Locksmith 0.5

2 Park 0.0

3 Nightclub 0.0

4 Nightlife Spot 0.0

----- 75231 -----

venue cateory freq

0 Baseball Field 0.4

1 Football Stadium 0.2

2 Locksmith 0.2

3 Field 0.2

4 American Restaurant 0.0

----- 75232 -----

venue cateory freq

0 Pizza Place 0.15

1 Department Store 0.08

2 Grocery Store 0.08

3 Pawn Shop 0.08

4 Sandwich Place 0.08

----- 75233 -----

venue cateory freq

0 Rental Car Location 0.5

1 Storage Facility 0.5

2 American Restaurant 0.0

3 Outlet Store 0.0

4 New American Restaurant 0.0

----- 75234 -----

venue cateory freq

0 Soccer Field 0.2

1 Baseball Field 0.2

2 Garden 0.1

3 Home Service 0.1

4 Theater 0.1

----- 75235 -----

venue cateory freq

0 Bar 0.4

1 Rental Car Location 0.2

2 Gym 0.2

3 Bus Stop 0.2

4 Pool 0.0

----- 75236 -----

venue cateory freq

0 Construction & Landscaping 0.5

1 Home Service 0.5

2 American Restaurant 0.0

3 Park 0.0

4 Nightclub 0.0

----- 75237 -----

venue cateory freq

0 Women's Store 0.12

1 Fried Chicken Joint 0.12

2 Discount Store 0.12

3 Southern / Soul Food Restaurant 0.06

4 Miscellaneous Shop 0.06

----- 75238 -----

venue cateory freq

0 Business Service 1.0

1 American Restaurant 0.0

2 Paper / Office Supplies Store 0.0

3 Nightclub 0.0

4 Nightlife Spot 0.0

----- 75240 -----

venue cateory freq

0 Intersection 0.2

1 Gym / Fitness Center 0.2

2 Restaurant 0.2

3 Golf Course 0.2

4 Tennis Court 0.2

----- 75243 -----

venue cateory freq

0 Fast Food Restaurant 0.23

1 Fried Chicken Joint 0.12

2 Discount Store 0.08

3 Convenience Store 0.08

4 Burger Joint 0.08

----- 75244 -----

venue cateory freq

0 Furniture / Home Store 0.23

1 Fast Food Restaurant 0.15

2 Gym / Fitness Center 0.08

3 Bar 0.04

4 Soccer Field 0.04

----- 75246 -----

venue cateory freq

0 Pizza Place 0.11

1 Sandwich Place 0.11

2 Taco Place 0.11

3 Grocery Store 0.05

4 Convenience Store 0.05

----- 75247 -----

venue cateory freq

0 Warehouse Store 0.5

1 Construction & Landscaping 0.5

2 American Restaurant 0.0

3 Park 0.0

4 Nightclub 0.0

----- 75249 -----

venue cateory freq

0 Recreation Center 0.5

1 Park 0.5

2 Print Shop 0.0

3 Outlet Store 0.0

4 New American Restaurant 0.0

----- 75251 -----

venue cateory freq

0 Hotel 0.27

1 Gym 0.20

2 Gym / Fitness Center 0.13

3 American Restaurant 0.07

4 Japanese Restaurant 0.07

----- 75254 -----

venue cateory freq

0 American Restaurant 0.12

1 Taco Place 0.12

2 Pizza Place 0.12

3 Dry Cleaner 0.12

4 Park 0.12

----- 75270 -----

venue cateory freq

0 Coffee Shop 0.10

1 Hotel 0.08

2 Sandwich Place 0.05

3 Mexican Restaurant 0.04

4 Cocktail Bar 0.04

----- 75390 -----

venue cateory freq

0 BBQ Joint 0.25

1 Fast Food Restaurant 0.25

2 Sandwich Place 0.12

3 Convenience Store 0.12

4 Liquor Store 0.12

In [28]:

# Create a pandas dataframe and display the top 10 categories of venues for each zip code.

def return\_most\_common\_venues(row, num\_top\_venues):

row\_categories = row.iloc[1:]

row\_categories\_sorted = row\_categories.sort\_values(ascending=False)

return row\_categories\_sorted.index.values[0:num\_top\_venues]

num\_top\_venues = 10

indicators = ['st', 'nd', 'rd']

# create columns according to number of top venues

columns = ['PostalCode']

for ind in np.arange(num\_top\_venues):

try:

columns.append('{}{} Most Common Venue'.format(ind+1, indicators[ind]))

except:

columns.append('{}th Most Common Venue'.format(ind+1))

# create a new dataframe

postalcode\_area\_venues\_sorted = pd.DataFrame(columns=columns)

postalcode\_area\_venues\_sorted['PostalCode'] = dal\_venues\_grouped['PostalCode']

for ind in np.arange(dal\_venues\_grouped.shape[0]):

postalcode\_area\_venues\_sorted.iloc[ind, 1:] = return\_most\_common\_venues(dal\_venues\_grouped.iloc[ind, :], num\_top\_venues)

postalcode\_area\_venues\_sorted.head()

Out[28]:

|  | **PostalCode** | **1st Most Common Venue** | **2nd Most Common Venue** | **3rd Most Common Venue** | **4th Most Common Venue** | **5th Most Common Venue** | **6th Most Common Venue** | **7th Most Common Venue** | **8th Most Common Venue** | **9th Most Common Venue** | **10th Most Common Venue** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **0** | 75001 | Arts & Crafts Store | Music Store | Bakery | Diner | Jewelry Store | Rental Car Location | Art Studio | Business Service | Hardware Store | Furniture / Home Store |
| **1** | 75006 | Water Park | Construction & Landscaping | History Museum | Park | Women's Store | Donut Shop | Food | Flower Shop | Flea Market | Field |
| **2** | 75019 | Construction & Landscaping | Park | Women's Store | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **3** | 75038 | Fried Chicken Joint | Golf Course | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant | Farmers Market |
| **4** | 75040 | Costume Shop | Business Service | Electronics Store | Football Stadium | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |

**K-Means Clustering**

The database is ready to apply the k-means clustering method. We are going to start with a default 5 clusters, similar to what we did in the New York and Toronto labs.

Based on the 84 total number of zip codes we have, we consider 5 clusters is a good number for classification purposes. As a reminder, our overall objective is to identify the best cluster to select. We will use that best cluster as a guidance and as a list of zip codes to target for our stakeholders to begin finding areas for the new Persian restaurant. So, via reviewing the clustering results, we will estimate the similarity inside each cluster and unsimilarities between two clusters. It will be a key phase when we work with the client and have a shared understanding of the results. In case of more clarity needed, or if we need to get our results more solid, we can run k-means for other values of k and explore further.

In [29]:

# set number of clusters

kclusters = 5

dal\_venues\_grouped\_clustering = dal\_venues\_grouped.drop('PostalCode', 1)

# run k-means clustering

kmeans = KMeans(n\_clusters=kclusters, random\_state=0).fit(dal\_venues\_grouped\_clustering)

# check cluster labels generated for each row in the dataframe

kmeans.labels\_

Out[29]:

array([1, 1, 0, 1, 3, 1, 1, 1, 1, 2, 1, 2, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,

1, 1, 1, 3, 1, 1, 1, 1, 4, 1, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 2, 1,

1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 1, 3, 1, 1, 1, 1, 0, 2,

1, 1, 1, 1], dtype=int32)

In [30]:

# Add clustering labels

postalcode\_area\_venues\_sorted.insert(0, 'Cluster Labels', kmeans.labels\_)

dal\_merged = zcode

# merge data frames to add latitude/longitude for each zip code

dal\_merged = dal\_merged.join(postalcode\_area\_venues\_sorted.set\_index('PostalCode'), on='zip', how='inner')

dal\_merged.head(20)

Out[30]:

|  | **zip** | **lat** | **lng** | **city** | **state\_id** | **state\_name** | **county\_name** | **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** | **7th Most Common Venue** | **8th Most Common Venue** | **9th Most Common Venue** | **10th Most Common Venue** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **25843** | 75001 | 32.9600 | -96.8385 | Addison | TX | Texas | Dallas | 1 | Arts & Crafts Store | Music Store | Bakery | Diner | Jewelry Store | Rental Car Location | Art Studio | Business Service | Hardware Store | Furniture / Home Store |
| **25845** | 75006 | 32.9619 | -96.8970 | Carrollton | TX | Texas | Dallas | 1 | Water Park | Construction & Landscaping | History Museum | Park | Women's Store | Donut Shop | Food | Flower Shop | Flea Market | Field |
| **25850** | 75019 | 32.9633 | -96.9855 | Coppell | TX | Texas | Dallas | 0 | Construction & Landscaping | Park | Women's Store | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25861** | 75038 | 32.8746 | -96.9976 | Irving | TX | Texas | Dallas | 1 | Fried Chicken Joint | Golf Course | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant | Farmers Market |
| **25863** | 75040 | 32.9277 | -96.6201 | Garland | TX | Texas | Dallas | 3 | Costume Shop | Business Service | Electronics Store | Football Stadium | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25864** | 75041 | 32.8809 | -96.6515 | Garland | TX | Texas | Dallas | 1 | American Restaurant | Bakery | Food | Mexican Restaurant | Other Repair Shop | Construction & Landscaping | Diner | Farmers Market | Food Truck | Department Store |
| **25865** | 75042 | 32.9139 | -96.6749 | Garland | TX | Texas | Dallas | 1 | Print Shop | Movie Theater | Cosmetics Shop | Construction & Landscaping | Business Service | Music Venue | Electronics Store | Food | Flower Shop | Flea Market |
| **25866** | 75043 | 32.8571 | -96.5794 | Garland | TX | Texas | Dallas | 1 | Donut Shop | Pizza Place | Baseball Field | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25867** | 75044 | 32.9626 | -96.6532 | Garland | TX | Texas | Dallas | 1 | Pool | Video Store | Café | Trail | Gym / Fitness Center | Gym | Women's Store | Dog Run | Flea Market | Field |
| **25868** | 75048 | 32.9720 | -96.5808 | Sachse | TX | Texas | Dallas | 2 | Bar | Park | Women's Store | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25870** | 75051 | 32.7276 | -96.9944 | Grand Prairie | TX | Texas | Dallas | 1 | Discount Store | Women's Store | Dry Cleaner | Football Stadium | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25876** | 75060 | 32.7960 | -96.9545 | Irving | TX | Texas | Dallas | 2 | Baseball Field | Park | Women's Store | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25877** | 75061 | 32.8260 | -96.9655 | Irving | TX | Texas | Dallas | 1 | Convenience Store | Fast Food Restaurant | Discount Store | Gym / Fitness Center | Salvadoran Restaurant | Park | Gas Station | Mexican Restaurant | Women's Store | Dry Cleaner |
| **25878** | 75062 | 32.8470 | -96.9569 | Irving | TX | Texas | Dallas | 1 | Indian Restaurant | Market | Boutique | Grocery Store | Burger Joint | Convenience Store | Farmers Market | Football Stadium | Food Truck | Department Store |
| **25879** | 75063 | 32.9205 | -96.9859 | Irving | TX | Texas | Dallas | 1 | Furniture / Home Store | American Restaurant | Mediterranean Restaurant | South Indian Restaurant | Smoothie Shop | Shipping Store | Sandwich Place | Plaza | Pizza Place | New American Restaurant |
| **25891** | 75080 | 32.9739 | -96.7420 | Richardson | TX | Texas | Dallas | 1 | Pizza Place | Dessert Shop | Hookah Bar | Go Kart Track | Pharmacy | Discount Store | Organic Grocery | College Bookstore | Restaurant | Clothing Store |
| **25892** | 75081 | 32.9488 | -96.7102 | Richardson | TX | Texas | Dallas | 1 | Mexican Restaurant | Chinese Restaurant | Sports Bar | Flower Shop | Donut Shop | Automotive Shop | Music Store | Dry Cleaner | Farmers Market | Food Truck |
| **25895** | 75088 | 32.8923 | -96.5491 | Rowlett | TX | Texas | Dallas | 1 | Fried Chicken Joint | Lake | Donut Shop | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant | Farmers Market |
| **25905** | 75104 | 32.5804 | -96.9662 | Cedar Hill | TX | Texas | Dallas | 1 | Thrift / Vintage Store | Women's Store | Donut Shop | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant | Farmers Market |
| **25910** | 75115 | 32.5989 | -96.8637 | Desoto | TX | Texas | Dallas | 1 | Home Service | Gym | Donut Shop | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant | Farmers Market |

In [31]:

# Recreate the map to show the zip codes with their assigned clusters

map\_clusters = folium.Map(location=[latitude, longitude], zoom\_start=10)

# set color scheme for the clusters

x = np.arange(kclusters)

ys = [i + x + (i\*x)\*\*2 for i in range(kclusters)]

colors\_array = cm.rainbow(np.linspace(0, 1, len(ys)))

rainbow = [colors.rgb2hex(i) for i in colors\_array]

# add markers to the map

markers\_colors = []

for lati, long, city, poi, cluster in zip(dal\_merged['lat'], dal\_merged['lng'], dal\_merged['city'], dal\_merged['zip'], dal\_merged['Cluster Labels']):

label = folium.Popup(str(city) + ', ' + str(poi) + ', Cluster ' + str(cluster), parse\_html=True)

folium.CircleMarker(

[lati, long],

radius=5,

popup=label,

color=rainbow[cluster-1],

fill=True,

fill\_color=rainbow[cluster-1],

fill\_opacity=0.99).add\_to(map\_clusters)

map\_clusters

Out[31]:

In [32]:

dal\_merged.head(5)

Out[32]:

|  | **zip** | **lat** | **lng** | **city** | **state\_id** | **state\_name** | **county\_name** | **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** | **7th Most Common Venue** | **8th Most Common Venue** | **9th Most Common Venue** | **10th Most Common Venue** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **25843** | 75001 | 32.9600 | -96.8385 | Addison | TX | Texas | Dallas | 1 | Arts & Crafts Store | Music Store | Bakery | Diner | Jewelry Store | Rental Car Location | Art Studio | Business Service | Hardware Store | Furniture / Home Store |
| **25845** | 75006 | 32.9619 | -96.8970 | Carrollton | TX | Texas | Dallas | 1 | Water Park | Construction & Landscaping | History Museum | Park | Women's Store | Donut Shop | Food | Flower Shop | Flea Market | Field |
| **25850** | 75019 | 32.9633 | -96.9855 | Coppell | TX | Texas | Dallas | 0 | Construction & Landscaping | Park | Women's Store | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25861** | 75038 | 32.8746 | -96.9976 | Irving | TX | Texas | Dallas | 1 | Fried Chicken Joint | Golf Course | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant | Farmers Market |
| **25863** | 75040 | 32.9277 | -96.6201 | Garland | TX | Texas | Dallas | 3 | Costume Shop | Business Service | Electronics Store | Football Stadium | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |

Majority of the points are located in Cluster 1, so we will need further analysis to determine if this is cluster is acceptable or if it needs to be broken down more. We can still review each cluster and build the functions we'll use later. We can also review more in details each cluster to see what level of similarity the points have in each cluster, and how different the clusters are.

**Examining each Cluster**

Below we'll examine each of the 5 clusters and see which venue categories distinguish each cluster from the next, as well as the top 10 most common venues for each zip code per cluster

**Cluster 0**

In [33]:

dal\_merged.loc[dal\_merged['Cluster Labels'] == 0, dal\_merged.columns[list(range(0,1)) + [6,7] + list(range(9, dal\_merged.shape[1]))]]

Out[33]:

|  | **zip** | **county\_name** | **Cluster Labels** | **2nd Most Common Venue** | **3rd Most Common Venue** | **4th Most Common Venue** | **5th Most Common Venue** | **6th Most Common Venue** | **7th Most Common Venue** | **8th Most Common Venue** | **9th Most Common Venue** | **10th Most Common Venue** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **25850** | 75019 | Dallas | 0 | Park | Women's Store | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25965** | 75212 | Dallas | 0 | Women's Store | Dry Cleaner | Football Stadium | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25986** | 75236 | Dallas | 0 | Home Service | Women's Store | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25994** | 75247 | Dallas | 0 | Warehouse Store | Women's Store | Donut Shop | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |

**Cluster 1**

In [35]:

dal\_merged.loc[dal\_merged['Cluster Labels'] == 1, dal\_merged.columns[list(range(0,1)) + [6,7] + list(range(9, dal\_merged.shape[1]))]]

Out[35]:

|  | **zip** | **county\_name** | **Cluster Labels** | **2nd Most Common Venue** | **3rd Most Common Venue** | **4th Most Common Venue** | **5th Most Common Venue** | **6th Most Common Venue** | **7th Most Common Venue** | **8th Most Common Venue** | **9th Most Common Venue** | **10th Most Common Venue** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **25843** | 75001 | Dallas | 1 | Music Store | Bakery | Diner | Jewelry Store | Rental Car Location | Art Studio | Business Service | Hardware Store | Furniture / Home Store |
| **25845** | 75006 | Dallas | 1 | Construction & Landscaping | History Museum | Park | Women's Store | Donut Shop | Food | Flower Shop | Flea Market | Field |
| **25861** | 75038 | Dallas | 1 | Golf Course | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant | Farmers Market |
| **25864** | 75041 | Dallas | 1 | Bakery | Food | Mexican Restaurant | Other Repair Shop | Construction & Landscaping | Diner | Farmers Market | Food Truck | Department Store |
| **25865** | 75042 | Dallas | 1 | Movie Theater | Cosmetics Shop | Construction & Landscaping | Business Service | Music Venue | Electronics Store | Food | Flower Shop | Flea Market |
| **25866** | 75043 | Dallas | 1 | Pizza Place | Baseball Field | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25867** | 75044 | Dallas | 1 | Video Store | Café | Trail | Gym / Fitness Center | Gym | Women's Store | Dog Run | Flea Market | Field |
| **25870** | 75051 | Dallas | 1 | Women's Store | Dry Cleaner | Football Stadium | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25877** | 75061 | Dallas | 1 | Fast Food Restaurant | Discount Store | Gym / Fitness Center | Salvadoran Restaurant | Park | Gas Station | Mexican Restaurant | Women's Store | Dry Cleaner |
| **25878** | 75062 | Dallas | 1 | Market | Boutique | Grocery Store | Burger Joint | Convenience Store | Farmers Market | Football Stadium | Food Truck | Department Store |
| **25879** | 75063 | Dallas | 1 | American Restaurant | Mediterranean Restaurant | South Indian Restaurant | Smoothie Shop | Shipping Store | Sandwich Place | Plaza | Pizza Place | New American Restaurant |
| **25891** | 75080 | Dallas | 1 | Dessert Shop | Hookah Bar | Go Kart Track | Pharmacy | Discount Store | Organic Grocery | College Bookstore | Restaurant | Clothing Store |
| **25892** | 75081 | Dallas | 1 | Chinese Restaurant | Sports Bar | Flower Shop | Donut Shop | Automotive Shop | Music Store | Dry Cleaner | Farmers Market | Food Truck |
| **25895** | 75088 | Dallas | 1 | Lake | Donut Shop | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant | Farmers Market |
| **25905** | 75104 | Dallas | 1 | Women's Store | Donut Shop | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant | Farmers Market |
| **25910** | 75115 | Dallas | 1 | Gym | Donut Shop | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant | Farmers Market |
| **25911** | 75116 | Dallas | 1 | Pizza Place | Department Store | Video Store | Discount Store | Fast Food Restaurant | Gym / Fitness Center | Grocery Store | Dry Cleaner | Food |
| **25921** | 75137 | Dallas | 1 | Flea Market | Other Repair Shop | Women's Store | Dry Cleaner | Food Truck | Flower Shop | Field | Fast Food Restaurant | Farmers Market |
| **25930** | 75149 | Dallas | 1 | Sporting Goods Shop | Skating Rink | Lake | Baseball Field | Dry Cleaner | Food | Flower Shop | Flea Market | Field |
| **25931** | 75150 | Dallas | 1 | American Restaurant | Clothing Store | Fast Food Restaurant | Italian Restaurant | Video Game Store | Music Store | Sports Bar | Rental Car Location | Chinese Restaurant |
| **25950** | 75180 | Dallas | 1 | Fried Chicken Joint | Discount Store | Grocery Store | Arts & Crafts Store | Pharmacy | Seafood Restaurant | Mexican Restaurant | Asian Restaurant | Pizza Place |
| **25954** | 75201 | Dallas | 1 | American Restaurant | Performing Arts Venue | Art Museum | Mexican Restaurant | Theater | New American Restaurant | Hotel | Steakhouse | Opera House |
| **25955** | 75202 | Dallas | 1 | Coffee Shop | Plaza | Bar | Gift Shop | History Museum | Sandwich Place | American Restaurant | Convenience Store | Mexican Restaurant |
| **25956** | 75203 | Dallas | 1 | Business Service | Carpet Store | Women's Store | Electronics Store | Food Truck | Food | Flower Shop | Flea Market | Field |
| **25957** | 75204 | Dallas | 1 | Grocery Store | Clothing Store | Shoe Store | Sandwich Place | Mexican Restaurant | School | Coffee Shop | Electronics Store | Shopping Mall |
| **25959** | 75206 | Dallas | 1 | Sushi Restaurant | Bar | Cupcake Shop | Pizza Place | Nightclub | Clothing Store | Chinese Restaurant | Salon / Barbershop | Music Venue |
| **25960** | 75207 | Dallas | 1 | Antique Shop | Print Shop | Mexican Restaurant | Sandwich Place | Shipping Store | Brewery | Dance Studio | Art Museum | Italian Restaurant |
| **25961** | 75208 | Dallas | 1 | Park | Donut Shop | Golf Course | Italian Restaurant | Diner | Food | Flower Shop | Flea Market | Field |
| **25962** | 75209 | Dallas | 1 | American Restaurant | Smoothie Shop | Mexican Restaurant | Spa | Seafood Restaurant | Nail Salon | Sushi Restaurant | Bakery | Restaurant |
| **25963** | 75210 | Dallas | 1 | Garden | Grocery Store | Dance Studio | Dry Cleaner | Food | Flower Shop | Flea Market | Cupcake Shop | Field |
| **25964** | 75211 | Dallas | 1 | Home Service | Locksmith | Women's Store | Donut Shop | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25966** | 75214 | Dallas | 1 | Men's Store | Shop & Service | Women's Store | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25967** | 75215 | Dallas | 1 | Convenience Store | Women's Store | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant | Farmers Market | Electronics Store |
| **25968** | 75216 | Dallas | 1 | Locksmith | Deli / Bodega | Electronics Store | Football Stadium | Food Truck | Food | Flower Shop | Flea Market | Field |
| **25969** | 75217 | Dallas | 1 | Gas Station | Discount Store | Fast Food Restaurant | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field |
| **25971** | 75219 | Dallas | 1 | Bar | Sandwich Place | Tanning Salon | Fried Chicken Joint | Nail Salon | Clothing Store | Men's Store | Coffee Shop | Mexican Restaurant |
| **25972** | 75220 | Dallas | 1 | Convenience Store | Video Store | Fast Food Restaurant | Light Rail Station | Taco Place | Women's Store | Electronics Store | Food Truck | Food |
| **25973** | 75223 | Dallas | 1 | Mexican Restaurant | Fried Chicken Joint | Taco Place | Discount Store | Dive Bar | Gas Station | Sandwich Place | Liquor Store | Food |
| **25975** | 75225 | Dallas | 1 | Gym | Pizza Place | Mexican Restaurant | Donut Shop | Sandwich Place | Optical Shop | Liquor Store | Park | Bakery |
| **25976** | 75226 | Dallas | 1 | Art Gallery | Music Venue | BBQ Joint | Bar | American Restaurant | Taco Place | Cosmetics Shop | Noodle House | Coffee Shop |
| **25977** | 75227 | Dallas | 1 | Discount Store | Arts & Crafts Store | Mexican Restaurant | Women's Store | Football Stadium | Food Truck | Food | Flower Shop | Flea Market |
| **25978** | 75228 | Dallas | 1 | Recreation Center | Dessert Shop | Discount Store | Gym / Fitness Center | Auto Garage | Burger Joint | Sandwich Place | Mexican Restaurant | Electronics Store |
| **25979** | 75229 | Dallas | 1 | Aquarium | Recreation Center | Nightlife Spot | Campground | Donut Shop | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25980** | 75230 | Dallas | 1 | Intersection | Dry Cleaner | Football Stadium | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25981** | 75231 | Dallas | 1 | Football Stadium | Field | Locksmith | Women's Store | Electronics Store | Food Truck | Food | Flower Shop | Flea Market |
| **25982** | 75232 | Dallas | 1 | Grocery Store | Fried Chicken Joint | Donut Shop | Basketball Court | Discount Store | Salon / Barbershop | Sandwich Place | Convenience Store | Pawn Shop |
| **25983** | 75233 | Dallas | 1 | Storage Facility | Women's Store | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25984** | 75234 | Dallas | 1 | Baseball Field | Home Service | Pet Store | Lake | Park | Theater | Garden | Women's Store | Dry Cleaner |
| **25985** | 75235 | Dallas | 1 | Bus Stop | Rental Car Location | Gym | Women's Store | Dry Cleaner | Food | Flower Shop | Flea Market | Field |
| **25987** | 75237 | Dallas | 1 | Fried Chicken Joint | Discount Store | Department Store | Park | Restaurant | Coffee Shop | Seafood Restaurant | Burger Joint | Pizza Place |
| **25989** | 75240 | Dallas | 1 | Intersection | Restaurant | Gym / Fitness Center | Tennis Court | Women's Store | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25991** | 75243 | Dallas | 1 | Fried Chicken Joint | Burger Joint | Convenience Store | Discount Store | Pharmacy | Check Cashing Service | Mobile Phone Shop | Boutique | Sporting Goods Shop |
| **25992** | 75244 | Dallas | 1 | Fast Food Restaurant | Gym / Fitness Center | Mobile Phone Shop | Bar | Pawn Shop | Department Store | Outlet Store | Restaurant | Sandwich Place |
| **25993** | 75246 | Dallas | 1 | Sandwich Place | Taco Place | Convenience Store | Donut Shop | Mobile Phone Shop | Mexican Restaurant | Nail Salon | New American Restaurant | Fried Chicken Joint |
| **25997** | 75251 | Dallas | 1 | Gym | Gym / Fitness Center | Arts & Crafts Store | Japanese Restaurant | Residential Building (Apartment / Condo) | Tennis Court | American Restaurant | Warehouse Store | Fried Chicken Joint |
| **26000** | 75254 | Dallas | 1 | Taco Place | Pizza Place | Department Store | Park | Dry Cleaner | Fast Food Restaurant | Spa | Halal Restaurant | Gym / Fitness Center |
| **26001** | 75270 | Dallas | 1 | Hotel | Sandwich Place | Convenience Store | Cocktail Bar | Mexican Restaurant | Gym | American Restaurant | Italian Restaurant | Sports Bar |
| **26003** | 75390 | Dallas | 1 | BBQ Joint | Convenience Store | Thrift / Vintage Store | Sandwich Place | Liquor Store | Diner | Dry Cleaner | Food | Flower Shop |

**Cluster 2**

In [36]:

dal\_merged.loc[dal\_merged['Cluster Labels'] == 2, dal\_merged.columns[list(range(0,1)) + [6,7] + list(range(9, dal\_merged.shape[1]))]]

Out[36]:

|  | **zip** | **county\_name** | **Cluster Labels** | **2nd Most Common Venue** | **3rd Most Common Venue** | **4th Most Common Venue** | **5th Most Common Venue** | **6th Most Common Venue** | **7th Most Common Venue** | **8th Most Common Venue** | **9th Most Common Venue** | **10th Most Common Venue** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **25868** | 75048 | Dallas | 2 | Park | Women's Store | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25876** | 75060 | Dallas | 2 | Park | Women's Store | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25970** | 75218 | Dallas | 2 | Park | Women's Store | Donut Shop | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant | Farmers Market |
| **25996** | 75249 | Dallas | 2 | Park | Women's Store | Donut Shop | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant | Farmers Market |

**Cluster 3**

In [37]:

dal\_merged.loc[dal\_merged['Cluster Labels'] == 3, dal\_merged.columns[list(range(0,1)) + [6,7] + list(range(9, dal\_merged.shape[1]))]]

Out[37]:

|  | **zip** | **county\_name** | **Cluster Labels** | **2nd Most Common Venue** | **3rd Most Common Venue** | **4th Most Common Venue** | **5th Most Common Venue** | **6th Most Common Venue** | **7th Most Common Venue** | **8th Most Common Venue** | **9th Most Common Venue** | **10th Most Common Venue** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **25863** | 75040 | Dallas | 3 | Business Service | Electronics Store | Football Stadium | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25952** | 75182 | Dallas | 3 | Business Service | Women's Store | Electronics Store | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25988** | 75238 | Dallas | 3 | Women's Store | Electronics Store | Football Stadium | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |

**Cluster 4**

In [38]:

dal\_merged.loc[dal\_merged['Cluster Labels'] == 4, dal\_merged.columns[list(range(0,1)) + [6,7] + list(range(9, dal\_merged.shape[1]))]]

Out[38]:

|  | **zip** | **county\_name** | **Cluster Labels** | **2nd Most Common Venue** | **3rd Most Common Venue** | **4th Most Common Venue** | **5th Most Common Venue** | **6th Most Common Venue** | **7th Most Common Venue** | **8th Most Common Venue** | **9th Most Common Venue** | **10th Most Common Venue** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **25958** | 75205 | Dallas | 4 | Women's Store | Donut Shop | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant | Farmers Market |

It is possible that we don't have enough clusters for the data to be split into. We set the number of clusters to 10 and 20 to see if increasing the number of clusters makes our data more accurate.

In [39]:

# set number of clusters

kclusters = 10

dal\_venues\_grouped\_clustering = dal\_venues\_grouped.drop('PostalCode', 1)

# run k-means clustering

kmeans\_k10 = KMeans(n\_clusters=kclusters, random\_state=0).fit(dal\_venues\_grouped\_clustering)

# check cluster labels generated for each row in the dataframe

kmeans\_k10.labels\_

Out[39]:

array([1, 8, 8, 7, 3, 1, 1, 1, 1, 4, 5, 4, 1, 1, 1, 1, 1, 1, 6, 0, 1, 1,

1, 1, 1, 3, 1, 1, 1, 1, 2, 1, 1, 1, 1, 1, 7, 8, 1, 1, 9, 1, 4, 1,

1, 1, 1, 1, 1, 1, 1, 9, 1, 1, 1, 1, 1, 0, 1, 3, 1, 1, 1, 1, 8, 4,

1, 1, 1, 1], dtype=int32)

In [40]:

kmeans\_k10.labels\_[4]

Out[40]:

3

In [41]:

a=kmeans\_k10.labels\_

unique, counts = np.unique(a, return\_counts=True)

dict(zip(unique, counts))

Out[41]:

{0: 2, 1: 50, 2: 1, 3: 3, 4: 4, 5: 1, 6: 1, 7: 2, 8: 4, 9: 2}

In [42]:

# set number of clusters equal to 20

kclusters = 20

dal\_venues\_grouped\_clustering = dal\_venues\_grouped.drop('PostalCode', 1)

# run k-means clustering

kmeans\_k20 = KMeans(n\_clusters=kclusters, random\_state=0).fit(dal\_venues\_grouped\_clustering)

# check cluster labels generated for each row in the dataframe

# kmeans\_k20.labels\_

unique, counts = np.unique(kmeans\_k20.labels\_, return\_counts=True)

#pd.DataFrame(dict(zip(unique, counts)))

In [43]:

dict(zip(unique, counts))

Out[43]:

{0: 1,

1: 1,

2: 13,

3: 3,

4: 2,

5: 1,

6: 2,

7: 2,

8: 1,

9: 1,

10: 1,

11: 2,

12: 1,

13: 1,

14: 31,

15: 1,

16: 1,

17: 2,

18: 1,

19: 2}

In [44]:

unique, counts = np.unique(kmeans\_k20.labels\_, return\_counts=True)

In [46]:

dal\_venues\_grouped\_clustering = dal\_venues\_grouped.drop('PostalCode', 1)

for i in ([2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20]):

# set number of clusters

kclusters = i

#LA\_venues\_grouped\_clustering = LA\_venues\_grouped.drop('PostalCode', 1)

# run k-means clustering

kmeans\_ki = KMeans(n\_clusters=kclusters, random\_state=0).fit(dal\_venues\_grouped\_clustering)

# check cluster labels generated for each row in the dataframe

# kmeans\_k20.labels\_

unique, counts = np.unique(kmeans\_ki.labels\_, return\_counts=True)

print("# of points per cluster for {} clusters: ".format(i))

print(dict(zip(unique, counts)))

# of points per cluster for 2 clusters:

{0: 66, 1: 4}

# of points per cluster for 3 clusters:

{0: 63, 1: 3, 2: 4}

# of points per cluster for 4 clusters:

{0: 62, 1: 3, 2: 4, 3: 1}

# of points per cluster for 5 clusters:

{0: 4, 1: 58, 2: 4, 3: 3, 4: 1}

# of points per cluster for 6 clusters:

{0: 3, 1: 4, 2: 57, 3: 1, 4: 1, 5: 4}

# of points per cluster for 7 clusters:

{0: 7, 1: 3, 2: 4, 3: 4, 4: 47, 5: 4, 6: 1}

# of points per cluster for 8 clusters:

{0: 54, 1: 3, 2: 6, 3: 1, 4: 3, 5: 1, 6: 1, 7: 1}

# of points per cluster for 9 clusters:

{0: 2, 1: 11, 2: 3, 3: 42, 4: 2, 5: 1, 6: 1, 7: 6, 8: 2}

# of points per cluster for 10 clusters:

{0: 2, 1: 50, 2: 1, 3: 3, 4: 4, 5: 1, 6: 1, 7: 2, 8: 4, 9: 2}

# of points per cluster for 11 clusters:

{0: 6, 1: 19, 2: 1, 3: 3, 4: 1, 5: 2, 6: 2, 7: 1, 8: 2, 9: 27, 10: 6}

# of points per cluster for 12 clusters:

{0: 2, 1: 2, 2: 48, 3: 4, 4: 2, 5: 3, 6: 1, 7: 1, 8: 2, 9: 1, 10: 2, 11: 2}

# of points per cluster for 13 clusters:

{0: 5, 1: 3, 2: 4, 3: 2, 4: 1, 5: 3, 6: 2, 7: 1, 8: 1, 9: 5, 10: 1, 11: 40, 12: 2}

# of points per cluster for 14 clusters:

{0: 2, 1: 25, 2: 3, 3: 1, 4: 3, 5: 20, 6: 2, 7: 1, 8: 1, 9: 3, 10: 1, 11: 1, 12: 2, 13: 5}

# of points per cluster for 15 clusters:

{0: 2, 1: 48, 2: 2, 3: 1, 4: 1, 5: 1, 6: 2, 7: 2, 8: 1, 9: 1, 10: 4, 11: 2, 12: 1, 13: 1, 14: 1}

# of points per cluster for 16 clusters:

{0: 2, 1: 9, 2: 3, 3: 3, 4: 2, 5: 1, 6: 35, 7: 1, 8: 1, 9: 1, 10: 2, 11: 1, 12: 1, 13: 1, 14: 1, 15: 6}

# of points per cluster for 17 clusters:

{0: 2, 1: 2, 2: 4, 3: 4, 4: 41, 5: 1, 6: 2, 7: 1, 8: 2, 9: 1, 10: 1, 11: 1, 12: 1, 13: 1, 14: 2, 15: 2, 16: 2}

# of points per cluster for 18 clusters:

{0: 1, 1: 2, 2: 5, 3: 33, 4: 1, 5: 1, 6: 2, 7: 1, 8: 2, 9: 2, 10: 1, 11: 1, 12: 2, 13: 1, 14: 1, 15: 1, 16: 2, 17: 11}

# of points per cluster for 19 clusters:

{0: 39, 1: 4, 2: 1, 3: 1, 4: 1, 5: 1, 6: 2, 7: 1, 8: 1, 9: 1, 10: 2, 11: 3, 12: 2, 13: 1, 14: 1, 15: 6, 16: 1, 17: 1, 18: 1}

# of points per cluster for 20 clusters:

{0: 1, 1: 1, 2: 13, 3: 3, 4: 2, 5: 1, 6: 2, 7: 2, 8: 1, 9: 1, 10: 1, 11: 2, 12: 1, 13: 1, 14: 31, 15: 1, 16: 1, 17: 2, 18: 1, 19: 2}

With the further analysis done above, we have determined the number of data points associated with each clusters very cluster numbers varying from 1-20.

Based on the list generated above, it seems as though k=7 is the most optimal number of clusters to use for the data moving forward. With the number of points per cluster being {0: 7, 1: 3, 2: 4, 3: 4, 4: 47, 5: 4, 6: 1}, we can re-run our k-means clustering and display it on the map like we did above.

In [47]:

kclusters=7

# Recreate the map with k=7 clusters

map\_clusters = folium.Map(location=[latitude, longitude], zoom\_start=10)

# set color scheme for the clusters

x = np.arange(kclusters)

ys = [i + x + (i\*x)\*\*2 for i in range(kclusters)]

colors\_array = cm.rainbow(np.linspace(0, 1, len(ys)))

rainbow = [colors.rgb2hex(i) for i in colors\_array]

# add markers to the map

markers\_colors = []

for lati, long, city, poi, cluster in zip(dal\_merged['lat'], dal\_merged['lng'], dal\_merged['city'], dal\_merged['zip'], dal\_merged['Cluster Labels']):

label = folium.Popup(str(city) + ', ' + str(poi) + ', Cluster ' + str(cluster), parse\_html=True)

folium.CircleMarker(

[lati, long],

radius=5,

popup=label,

color=rainbow[cluster-1],

fill=True,

fill\_color=rainbow[cluster-1],

fill\_opacity=0.99).add\_to(map\_clusters)

map\_clusters

Out[47]:

As we can see the map has changed. Now we have 7 clusters to assign each zip code to, and we will analyze each cluster below like we did before.

**Cluster 0**

In [48]:

dal\_merged.loc[dal\_merged['Cluster Labels'] == 0, dal\_merged.columns[list(range(0,1)) + [6,7] + list(range(9, dal\_merged.shape[1]))]]

Out[48]:

|  | **zip** | **county\_name** | **Cluster Labels** | **2nd Most Common Venue** | **3rd Most Common Venue** | **4th Most Common Venue** | **5th Most Common Venue** | **6th Most Common Venue** | **7th Most Common Venue** | **8th Most Common Venue** | **9th Most Common Venue** | **10th Most Common Venue** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **25850** | 75019 | Dallas | 0 | Park | Women's Store | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25965** | 75212 | Dallas | 0 | Women's Store | Dry Cleaner | Football Stadium | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25986** | 75236 | Dallas | 0 | Home Service | Women's Store | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25994** | 75247 | Dallas | 0 | Warehouse Store | Women's Store | Donut Shop | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |

**Cluster 1**

In [49]:

dal\_merged.loc[dal\_merged['Cluster Labels'] == 1, dal\_merged.columns[list(range(0,1)) + [6,7] + list(range(9, dal\_merged.shape[1]))]]

Out[49]:

|  | **zip** | **county\_name** | **Cluster Labels** | **2nd Most Common Venue** | **3rd Most Common Venue** | **4th Most Common Venue** | **5th Most Common Venue** | **6th Most Common Venue** | **7th Most Common Venue** | **8th Most Common Venue** | **9th Most Common Venue** | **10th Most Common Venue** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **25843** | 75001 | Dallas | 1 | Music Store | Bakery | Diner | Jewelry Store | Rental Car Location | Art Studio | Business Service | Hardware Store | Furniture / Home Store |
| **25845** | 75006 | Dallas | 1 | Construction & Landscaping | History Museum | Park | Women's Store | Donut Shop | Food | Flower Shop | Flea Market | Field |
| **25861** | 75038 | Dallas | 1 | Golf Course | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant | Farmers Market |
| **25864** | 75041 | Dallas | 1 | Bakery | Food | Mexican Restaurant | Other Repair Shop | Construction & Landscaping | Diner | Farmers Market | Food Truck | Department Store |
| **25865** | 75042 | Dallas | 1 | Movie Theater | Cosmetics Shop | Construction & Landscaping | Business Service | Music Venue | Electronics Store | Food | Flower Shop | Flea Market |
| **25866** | 75043 | Dallas | 1 | Pizza Place | Baseball Field | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25867** | 75044 | Dallas | 1 | Video Store | Café | Trail | Gym / Fitness Center | Gym | Women's Store | Dog Run | Flea Market | Field |
| **25870** | 75051 | Dallas | 1 | Women's Store | Dry Cleaner | Football Stadium | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25877** | 75061 | Dallas | 1 | Fast Food Restaurant | Discount Store | Gym / Fitness Center | Salvadoran Restaurant | Park | Gas Station | Mexican Restaurant | Women's Store | Dry Cleaner |
| **25878** | 75062 | Dallas | 1 | Market | Boutique | Grocery Store | Burger Joint | Convenience Store | Farmers Market | Football Stadium | Food Truck | Department Store |
| **25879** | 75063 | Dallas | 1 | American Restaurant | Mediterranean Restaurant | South Indian Restaurant | Smoothie Shop | Shipping Store | Sandwich Place | Plaza | Pizza Place | New American Restaurant |
| **25891** | 75080 | Dallas | 1 | Dessert Shop | Hookah Bar | Go Kart Track | Pharmacy | Discount Store | Organic Grocery | College Bookstore | Restaurant | Clothing Store |
| **25892** | 75081 | Dallas | 1 | Chinese Restaurant | Sports Bar | Flower Shop | Donut Shop | Automotive Shop | Music Store | Dry Cleaner | Farmers Market | Food Truck |
| **25895** | 75088 | Dallas | 1 | Lake | Donut Shop | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant | Farmers Market |
| **25905** | 75104 | Dallas | 1 | Women's Store | Donut Shop | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant | Farmers Market |
| **25910** | 75115 | Dallas | 1 | Gym | Donut Shop | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant | Farmers Market |
| **25911** | 75116 | Dallas | 1 | Pizza Place | Department Store | Video Store | Discount Store | Fast Food Restaurant | Gym / Fitness Center | Grocery Store | Dry Cleaner | Food |
| **25921** | 75137 | Dallas | 1 | Flea Market | Other Repair Shop | Women's Store | Dry Cleaner | Food Truck | Flower Shop | Field | Fast Food Restaurant | Farmers Market |
| **25930** | 75149 | Dallas | 1 | Sporting Goods Shop | Skating Rink | Lake | Baseball Field | Dry Cleaner | Food | Flower Shop | Flea Market | Field |
| **25931** | 75150 | Dallas | 1 | American Restaurant | Clothing Store | Fast Food Restaurant | Italian Restaurant | Video Game Store | Music Store | Sports Bar | Rental Car Location | Chinese Restaurant |
| **25950** | 75180 | Dallas | 1 | Fried Chicken Joint | Discount Store | Grocery Store | Arts & Crafts Store | Pharmacy | Seafood Restaurant | Mexican Restaurant | Asian Restaurant | Pizza Place |
| **25954** | 75201 | Dallas | 1 | American Restaurant | Performing Arts Venue | Art Museum | Mexican Restaurant | Theater | New American Restaurant | Hotel | Steakhouse | Opera House |
| **25955** | 75202 | Dallas | 1 | Coffee Shop | Plaza | Bar | Gift Shop | History Museum | Sandwich Place | American Restaurant | Convenience Store | Mexican Restaurant |
| **25956** | 75203 | Dallas | 1 | Business Service | Carpet Store | Women's Store | Electronics Store | Food Truck | Food | Flower Shop | Flea Market | Field |
| **25957** | 75204 | Dallas | 1 | Grocery Store | Clothing Store | Shoe Store | Sandwich Place | Mexican Restaurant | School | Coffee Shop | Electronics Store | Shopping Mall |
| **25959** | 75206 | Dallas | 1 | Sushi Restaurant | Bar | Cupcake Shop | Pizza Place | Nightclub | Clothing Store | Chinese Restaurant | Salon / Barbershop | Music Venue |
| **25960** | 75207 | Dallas | 1 | Antique Shop | Print Shop | Mexican Restaurant | Sandwich Place | Shipping Store | Brewery | Dance Studio | Art Museum | Italian Restaurant |
| **25961** | 75208 | Dallas | 1 | Park | Donut Shop | Golf Course | Italian Restaurant | Diner | Food | Flower Shop | Flea Market | Field |
| **25962** | 75209 | Dallas | 1 | American Restaurant | Smoothie Shop | Mexican Restaurant | Spa | Seafood Restaurant | Nail Salon | Sushi Restaurant | Bakery | Restaurant |
| **25963** | 75210 | Dallas | 1 | Garden | Grocery Store | Dance Studio | Dry Cleaner | Food | Flower Shop | Flea Market | Cupcake Shop | Field |
| **25964** | 75211 | Dallas | 1 | Home Service | Locksmith | Women's Store | Donut Shop | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25966** | 75214 | Dallas | 1 | Men's Store | Shop & Service | Women's Store | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25967** | 75215 | Dallas | 1 | Convenience Store | Women's Store | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant | Farmers Market | Electronics Store |
| **25968** | 75216 | Dallas | 1 | Locksmith | Deli / Bodega | Electronics Store | Football Stadium | Food Truck | Food | Flower Shop | Flea Market | Field |
| **25969** | 75217 | Dallas | 1 | Gas Station | Discount Store | Fast Food Restaurant | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field |
| **25971** | 75219 | Dallas | 1 | Bar | Sandwich Place | Tanning Salon | Fried Chicken Joint | Nail Salon | Clothing Store | Men's Store | Coffee Shop | Mexican Restaurant |
| **25972** | 75220 | Dallas | 1 | Convenience Store | Video Store | Fast Food Restaurant | Light Rail Station | Taco Place | Women's Store | Electronics Store | Food Truck | Food |
| **25973** | 75223 | Dallas | 1 | Mexican Restaurant | Fried Chicken Joint | Taco Place | Discount Store | Dive Bar | Gas Station | Sandwich Place | Liquor Store | Food |
| **25975** | 75225 | Dallas | 1 | Gym | Pizza Place | Mexican Restaurant | Donut Shop | Sandwich Place | Optical Shop | Liquor Store | Park | Bakery |
| **25976** | 75226 | Dallas | 1 | Art Gallery | Music Venue | BBQ Joint | Bar | American Restaurant | Taco Place | Cosmetics Shop | Noodle House | Coffee Shop |
| **25977** | 75227 | Dallas | 1 | Discount Store | Arts & Crafts Store | Mexican Restaurant | Women's Store | Football Stadium | Food Truck | Food | Flower Shop | Flea Market |
| **25978** | 75228 | Dallas | 1 | Recreation Center | Dessert Shop | Discount Store | Gym / Fitness Center | Auto Garage | Burger Joint | Sandwich Place | Mexican Restaurant | Electronics Store |
| **25979** | 75229 | Dallas | 1 | Aquarium | Recreation Center | Nightlife Spot | Campground | Donut Shop | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25980** | 75230 | Dallas | 1 | Intersection | Dry Cleaner | Football Stadium | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25981** | 75231 | Dallas | 1 | Football Stadium | Field | Locksmith | Women's Store | Electronics Store | Food Truck | Food | Flower Shop | Flea Market |
| **25982** | 75232 | Dallas | 1 | Grocery Store | Fried Chicken Joint | Donut Shop | Basketball Court | Discount Store | Salon / Barbershop | Sandwich Place | Convenience Store | Pawn Shop |
| **25983** | 75233 | Dallas | 1 | Storage Facility | Women's Store | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25984** | 75234 | Dallas | 1 | Baseball Field | Home Service | Pet Store | Lake | Park | Theater | Garden | Women's Store | Dry Cleaner |
| **25985** | 75235 | Dallas | 1 | Bus Stop | Rental Car Location | Gym | Women's Store | Dry Cleaner | Food | Flower Shop | Flea Market | Field |
| **25987** | 75237 | Dallas | 1 | Fried Chicken Joint | Discount Store | Department Store | Park | Restaurant | Coffee Shop | Seafood Restaurant | Burger Joint | Pizza Place |
| **25989** | 75240 | Dallas | 1 | Intersection | Restaurant | Gym / Fitness Center | Tennis Court | Women's Store | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25991** | 75243 | Dallas | 1 | Fried Chicken Joint | Burger Joint | Convenience Store | Discount Store | Pharmacy | Check Cashing Service | Mobile Phone Shop | Boutique | Sporting Goods Shop |
| **25992** | 75244 | Dallas | 1 | Fast Food Restaurant | Gym / Fitness Center | Mobile Phone Shop | Bar | Pawn Shop | Department Store | Outlet Store | Restaurant | Sandwich Place |
| **25993** | 75246 | Dallas | 1 | Sandwich Place | Taco Place | Convenience Store | Donut Shop | Mobile Phone Shop | Mexican Restaurant | Nail Salon | New American Restaurant | Fried Chicken Joint |
| **25997** | 75251 | Dallas | 1 | Gym | Gym / Fitness Center | Arts & Crafts Store | Japanese Restaurant | Residential Building (Apartment / Condo) | Tennis Court | American Restaurant | Warehouse Store | Fried Chicken Joint |
| **26000** | 75254 | Dallas | 1 | Taco Place | Pizza Place | Department Store | Park | Dry Cleaner | Fast Food Restaurant | Spa | Halal Restaurant | Gym / Fitness Center |
| **26001** | 75270 | Dallas | 1 | Hotel | Sandwich Place | Convenience Store | Cocktail Bar | Mexican Restaurant | Gym | American Restaurant | Italian Restaurant | Sports Bar |
| **26003** | 75390 | Dallas | 1 | BBQ Joint | Convenience Store | Thrift / Vintage Store | Sandwich Place | Liquor Store | Diner | Dry Cleaner | Food | Flower Shop |

**Cluster 2**

In [50]:

dal\_merged.loc[dal\_merged['Cluster Labels'] == 2, dal\_merged.columns[list(range(0,1)) + [6,7] + list(range(9, dal\_merged.shape[1]))]]

Out[50]:

|  | **zip** | **county\_name** | **Cluster Labels** | **2nd Most Common Venue** | **3rd Most Common Venue** | **4th Most Common Venue** | **5th Most Common Venue** | **6th Most Common Venue** | **7th Most Common Venue** | **8th Most Common Venue** | **9th Most Common Venue** | **10th Most Common Venue** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **25868** | 75048 | Dallas | 2 | Park | Women's Store | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25876** | 75060 | Dallas | 2 | Park | Women's Store | Dry Cleaner | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25970** | 75218 | Dallas | 2 | Park | Women's Store | Donut Shop | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant | Farmers Market |
| **25996** | 75249 | Dallas | 2 | Park | Women's Store | Donut Shop | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant | Farmers Market |

**Cluster 3**

In [52]:

dal\_merged.loc[dal\_merged['Cluster Labels'] == 3, dal\_merged.columns[list(range(0,1)) + [6,7] + list(range(9, dal\_merged.shape[1]))]]

Out[52]:

|  | **zip** | **county\_name** | **Cluster Labels** | **2nd Most Common Venue** | **3rd Most Common Venue** | **4th Most Common Venue** | **5th Most Common Venue** | **6th Most Common Venue** | **7th Most Common Venue** | **8th Most Common Venue** | **9th Most Common Venue** | **10th Most Common Venue** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **25863** | 75040 | Dallas | 3 | Business Service | Electronics Store | Football Stadium | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25952** | 75182 | Dallas | 3 | Business Service | Women's Store | Electronics Store | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |
| **25988** | 75238 | Dallas | 3 | Women's Store | Electronics Store | Football Stadium | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant |

**Cluster 4**

In [53]:

dal\_merged.loc[dal\_merged['Cluster Labels'] == 4, dal\_merged.columns[list(range(0,1)) + [6,7] + list(range(9, dal\_merged.shape[1]))]]

Out[53]:

|  | **zip** | **county\_name** | **Cluster Labels** | **2nd Most Common Venue** | **3rd Most Common Venue** | **4th Most Common Venue** | **5th Most Common Venue** | **6th Most Common Venue** | **7th Most Common Venue** | **8th Most Common Venue** | **9th Most Common Venue** | **10th Most Common Venue** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **25958** | 75205 | Dallas | 4 | Women's Store | Donut Shop | Food Truck | Food | Flower Shop | Flea Market | Field | Fast Food Restaurant | Farmers Market |

**Cluster 5**

In [76]:

dal\_merged.loc[dal\_merged['Cluster Labels'] == 5, dal\_merged.columns[list(range(0,1)) + [6,7] + list(range(9, dal\_merged.shape[1]))]]

Out[76]:

|  | **zip** | **county\_name** | **Cluster Labels** | **2nd Most Common Venue** | **3rd Most Common Venue** | **4th Most Common Venue** | **5th Most Common Venue** | **6th Most Common Venue** | **7th Most Common Venue** | **8th Most Common Venue** | **9th Most Common Venue** | **10th Most Common Venue** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

**Cluster 6**

In [54]:

dal\_merged.loc[dal\_merged['Cluster Labels'] == 6, dal\_merged.columns[list(range(0,1)) + [6,7] + list(range(9, dal\_merged.shape[1]))]]

Out[54]:

|  | **zip** | **county\_name** | **Cluster Labels** | **2nd Most Common Venue** | **3rd Most Common Venue** | **4th Most Common Venue** | **5th Most Common Venue** | **6th Most Common Venue** | **7th Most Common Venue** | **8th Most Common Venue** | **9th Most Common Venue** | **10th Most Common Venue** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

**We choose Cluster 1 as our cluster for finding the new restaurant**

This re-affirms that we will choose cluster 1 as our cluster, which will determine the exact zip code where the new Iranian restaurant will go. After we run our kmeans algorithm for many values of k (from k=1 to k=20), we see that the more discriminating result is with k=7. Number of points per cluster for k=7 {0: 7, 1: 3, 2: 4, 3: 4, 4: 47, 5: 4, 6: 1} We'll explore the results in the Results section of this report. At this stage we realized that the number of clusters was crucial in the way our kmeans algorithm could actually efficiently do some classifying tasks. We've also seen how we had to work on the features we extracted got with the Foursquare API to make more relevant features to solve our problem. It is both thanks to working on many values of k for kmeans and thanks to features modifications that we could reach the results we present in the next section of our report.

**Results**

This is where we discuss the methodology section. We made sure to discuss our code along the way during the methodology section, however we will have the final dissertation here.

Again, our objective was that we were trying to determine the best cluster of zip codes, so that the restaurant owners could narrow down the list of where they should open up their second restaurant. Once they determine the best cluster, they will have the list of preferable zip codes which will give their second restaurant the best chance for being successful.

We used 7 clusters, and we determined that Cluster 1 would be the best cluster to place the new restaurant. Analyzing the data above, we can see that it contains the most distinct number of data points in that cluster. Upon further analysis, we can see that the cluster contains zip codes that have a good blend of zip codes that contain restaurants as their top 5 most common venues and zip codes that don't contain them. You want to place your restaurant in an area that has a fair amount of restaurants, because that means that there is enough foot traffic there for customers to come try your restaurant. However, you don't want a zip code where there are too many restaurants because your restaurant is less likely to become successful with "getting lost in the sea" of restaurants. Cluster 1 is the best choice because it contains zip codes that do have restaurants around, but not too many restaurants.

**Discussion**

There was one observation that I noted during the methodology section. Whenever I had the dataframe that listed each zip code with their top 10 most common venues, the next thing I had to do was choose the correct k value for the number of clusters, so that I could perform k means clustering. With the k means clustering, we would be able to cluster the zip codes into certain groups based on their similarities (i.e. their most common venues). I made the assumption that 5 clusters would be the optimal amount of clusters to distinguish the data. I made this assumption based on previous labs, however I knew that I would need to choose more k values to get the best number of clusters. One way to choose the best number of clusters is to get a list of the distinct data points for each cluster in a certain cluster range. That's what I did, because at first I arbitrarily used k=5 then k=10 and k=20 in order to determine the best number of clusters to use, however this is a more accurate and efficient way to determine the correct number of clusters.

If you're doing a project similar to this one, my recommendations are to follow the path taken above. If you're trying to run k-means clustering, you must find similarities between your data points. Whatever that metric is, make sure that it is consistent and useful towards your findings at the end of your report. So if you're trying to find an ideal location to open up a new type of venue, classify your data points by venues in order to see the similarities, dissimilarites, and that will help determine the most optimal spot for you to open up a new venue.

**Conclusion**

The purpose of this report was to help determine the best zip codes to open up a new Iranian restaurant in Dallas. We imported location data for Dallas, determined the top venue types of each zip code, and used that to determine which cluster each zip code belonged to. We were able to say that Cluster 1 contained the best zip codes that gave the new restaurant it's best chance at succeeding. We will pass on this information to the restaurant owners so that they may be able to narrow down their choice to the best zip code, giving their restaurant the most optimal chance to succeed. Best of luck to them!