

# Capstone

June 3, 2020

## 1 Introduction

My fiancé Cody has always wanted to open a restaurant in Durham, North Carolina. This project will allow me to determine if there is demand for a specialty comfort food restaurant in Durham, and select the best neighborhood for the restaurant. I will select this neighborhood by identifying the concentration of both similar and different restaurants in each area of Durham. The ideal location will maximize the distance of this restaurant from similar locations. However, it will also minimize the distance to different types of restaurants to ensure that people who dine out will come to this area.

To determine whether a restaurant is similar to Cody's Kitchen, I will look for areas where restaurants are concentrated together. Once I identify some clusters of neighborhoods, I will compare the cuisine of restaurants in Durham's neighborhoods to Cody's Kitchen. Cody's Kitchen is an American Restaurant, with Southern, Mexican, and Italian influences.

## 2 Methods

As shown in the code below, I am using Foursquare location data to analyze the Durham restaurant landscape. I'll import data for Durham restaurants, and create a map of all restaurants. I'll then use K-Means clustering to find concentrated areas of restaurants. After that, I'll group the restaurants by category to find the locations of other American restaurants and avoid their competition.

```
[1]: import requests # library to handle requests
import pandas as pd # library for data analysis
import numpy as np # library to handle data in a vectorized manner
import random # library for random number generation

!conda install -c conda-forge geopy --yes
from geopy.geocoders import Nominatim # module to convert an address into
    ↪ latitude and longitude values

# libraries for displaying images
from IPython.display import Image
from IPython.core.display import HTML

# transforming json file into a pandas dataframe library
from pandas.io.json import json_normalize
```

```
!conda install -c conda-forge folium=0.5.0 --yes
import folium # plotting library

print('Folium installed')
print('Libraries imported.')
```

Collecting package metadata (current\_repodata.json): done  
Solving environment: done

## Package Plan ##

environment location: /home/jupyterlab/conda/envs/python

added / updated specs:

- geopy

The following packages will be downloaded:

package	build		
geographiclib-1.50	py_0	34 KB	conda-forge
geopy-1.22.0	pyh9f0ad1d_0	63 KB	conda-forge
Total:		97 KB	

The following NEW packages will be INSTALLED:

geographiclib	conda-forge/noarch::geographiclib-1.50-py_0
geopy	conda-forge/noarch::geopy-1.22.0-pyh9f0ad1d_0

Downloading and Extracting Packages

geopy-1.22.0	63 KB	#####	100%
geographiclib-1.50	34 KB	#####	100%

Preparing transaction: done

Verifying transaction: done

Executing transaction: done

Collecting package metadata (current\_repodata.json): done

Solving environment: failed with initial frozen solve. Retrying with flexible solve.

Collecting package metadata (repodata.json): done

Solving environment: done

## Package Plan ##

environment location: /home/jupyterlab/conda/envs/python

added / updated specs:

- folium=0.5.0

The following packages will be downloaded:

package	build		
altair-4.1.0	py_1	614 KB	conda-forge
branca-0.4.1	py_0	26 KB	conda-forge
brotlipy-0.7.0	py36h8c4c3a4_1000	346 KB	conda-forge
chardet-3.0.4	py36h9f0ad1d_1006	188 KB	conda-forge
cryptography-2.9.2	py36h45558ae_0	613 KB	conda-forge
folium-0.5.0	py_0	45 KB	conda-forge
pandas-1.0.4	py36h830a2c2_0	10.1 MB	conda-forge
pysocks-1.7.1	py36h9f0ad1d_1	27 KB	conda-forge
toolz-0.10.0	py_0	46 KB	conda-forge
vincent-0.4.4	py_1	28 KB	conda-forge
Total:		12.0 MB	

The following NEW packages will be INSTALLED:

altair	conda-forge/noarch::altair-4.1.0-py_1
attrs	conda-forge/noarch::attrs-19.3.0-py_0
branca	conda-forge/noarch::branca-0.4.1-py_0
brotlipy	conda-forge/linux-64::brotlipy-0.7.0-py36h8c4c3a4_1000
chardet	conda-forge/linux-64::chardet-3.0.4-py36h9f0ad1d_1006
cryptography	conda-forge/linux-64::cryptography-2.9.2-py36h45558ae_0
entrypoints	conda-forge/linux-64::entrypoints-0.3-py36h9f0ad1d_1001
folium	conda-forge/noarch::folium-0.5.0-py_0
idna	conda-forge/noarch::idna-2.9-py_1
importlib_metadata	conda-forge/noarch::importlib_metadata-1.6.0-0
jinja2	conda-forge/noarch::jinja2-2.11.2-pyh9f0ad1d_0
jsonschema	conda-forge/linux-64::jsonschema-3.2.0-py36h9f0ad1d_1
markupsafe	conda-forge/linux-64::markupsafe-1.1.1-py36h8c4c3a4_1
pandas	conda-forge/linux-64::pandas-1.0.4-py36h830a2c2_0
pyopenssl	conda-forge/noarch::pyopenssl-19.1.0-py_1
pyrsistent	conda-forge/linux-64::pyrsistent-0.16.0-py36h8c4c3a4_0
pysocks	conda-forge/linux-64::pysocks-1.7.1-py36h9f0ad1d_1
pytz	conda-forge/noarch::pytz-2020.1-pyh9f0ad1d_0
requests	conda-forge/noarch::requests-2.23.0-pyh8c360ce_2
toolz	conda-forge/noarch::toolz-0.10.0-py_0
urllib3	conda-forge/noarch::urllib3-1.25.9-py_0
vincent	conda-forge/noarch::vincent-0.4.4-py_1

#### Downloading and Extracting Packages

pysocks-1.7.1	27 KB	#####	100%
toolz-0.10.0	46 KB	#####	100%
chardet-3.0.4	188 KB	#####	100%
pandas-1.0.4	10.1 MB	#####	100%
folium-0.5.0	45 KB	#####	100%
branca-0.4.1	26 KB	#####	100%
cryptography-2.9.2	613 KB	#####	100%
brotlipy-0.7.0	346 KB	#####	100%
altair-4.1.0	614 KB	#####	100%
vincent-0.4.4	28 KB	#####	100%

Preparing transaction: done

Verifying transaction: done

Executing transaction: done

Folium installed

Libraries imported.

```
[2]: CLIENT_ID = 'YNXNXHPOMVMD4WCABJK5E1330NEYASNAQB2EBVU2DTODUSFO'
CLIENT_SECRET = 'PMX45J4KYMXL1TJ42JT15X4QGE21QUAGC5CTK5KGKR12SXXP' # your
↳Foursquare Secret
VERSION = '20180604'
LIMIT = 30
print('Your credentails:')
print('CLIENT_ID: ' + CLIENT_ID)
print('CLIENT_SECRET:' + CLIENT_SECRET)
```

Your credentails:

CLIENT\_ID: YNXNXHPOMVMD4WCABJK5E1330NEYASNAQB2EBVU2DTODUSFO

CLIENT\_SECRET:PMX45J4KYMXL1TJ42JT15X4QGE21QUAGC5CTK5KGKR12SXXP

```
[3]: address = 'Durham, NC'

geolocator = Nominatim(user_agent="foursquare_agent")
location = geolocator.geocode(address)
latitude = location.latitude
longitude = location.longitude
print(latitude, longitude)
```

35.996653 -78.9018053

```
[7]: search_query = 'Restaurant'
radius = 45061 #This is the radius of Durham, NC from point to point.
print(search_query + ' .... OK!')
```

Restaurant ... OK!

```
[8]: url = 'https://api.foursquare.com/v2/venues/search?
      ↪client_id={}&client_secret={}&ll={},{}&v={}&query={}&radius={}&limit={}'.
      ↪format(CLIENT_ID, CLIENT_SECRET, latitude, longitude, VERSION, search_query,
      ↪radius, LIMIT)
      url
```

```
[8]: 'https://api.foursquare.com/v2/venues/search?client_id=YNXNXHPOMVMD4WCABJK5E1330
      NEYASNAQB2EBVU2DTODUSF0&client_secret=PMX45J4KYMXL1TJ42JT15X4QGE21QUAGC5CTK5KGKR
      12SXXP&ll=35.996653,-78.9018053&v=20180604&query=Restaurant&radius=45061&limit=3
      0'
```

```
[9]: results = requests.get(url).json()
      results
```

```
[9]: {'meta': {'code': 200, 'requestId': '5ed7059ac546f3001b45f934'},
      'response': {'venues': [{'id': '4adc7019f964a520512c21e3',
                                'name': 'Rue Cler Restaurant and Bakery Cafe',
                                'location': {'address': '401 E Chapel Hill St',
                                              'crossStreet': 'at Rigsbee Ave',
                                              'lat': 35.997086,
                                              'lng': -78.89976,
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                                              'distance': 190,
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                                              'country': 'United States',
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                                                                    'Durham, NC 27701',
                                                                    'United States']},
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                                                  'primary': True}],
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                                  'location': {'address': '800 W Main St',
                                                'crossStreet': 'Duke St',
```

```

'lat': 35.99947647798876,
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'country': 'United States',
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'United States']],
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  'primary': True}],
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```

```

'name': 'The Restaurant at The Durham',
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'name': 'Piedmont Restaurant',
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'cc': 'US',
'city': 'Durham',
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'United States']},
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```

```

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```



```

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```

```

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```

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```

```

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network&utm_medium=affiliate&utm_campaign=1131&utm_content=1797325',
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```

```

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'hasPerk': False},
{'id': '57ed5703498ea019ab1a035d',
'name': 'Pie Pushers',
'location': {'address': '117 W Main St',
'lat': 35.99536386965163,
'lng': -78.90144736010838,
'labeledLatLngs': [{'label': 'display',
'lat': 35.99536386965163,
'lng': -78.90144736010838},
{'label': 'entrance', 'lat': 35.995364, 'lng': -78.901423}]},
'distance': 147,
'postalCode': '27701',
'cc': 'US',
'city': 'Durham',
'state': 'NC',
'country': 'United States',
'formattedAddress': ['117 W Main St',

```

```

    'Durham, NC 27701',
    'United States']},
    'categories': [{ 'id': '4bf58dd8d48988d1ca941735',
        'name': 'Pizza Place',
        'pluralName': 'Pizza Places',
        'shortName': 'Pizza',
        'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/pizza_',
            'suffix': '.png'},
        'primary': True}],
    'referralId': 'v-1591150045',
    'hasPerk': False},
    { 'id': '4aedbf63f964a52089ce21e3',
        'name': 'Hong Kong Chinese Restaurant',
        'location': { 'address': '3003 Guess Rd',
            'crossStreet': 'at Fawn Ave',
            'lat': 36.03351587789929,
            'lng': -78.92947556140696,
            'labeledLatLngs': [{ 'label': 'display',
                'lat': 36.03351587789929,
                'lng': -78.92947556140696},
                { 'label': 'entrance', 'lat': 36.03361, 'lng': -78.929357}],
            'distance': 4800,
            'postalCode': '27705',
            'cc': 'US',
            'city': 'Durham',
            'state': 'NC',
            'country': 'United States',
            'formattedAddress': ['3003 Guess Rd (at Fawn Ave)',
                'Durham, NC 27705',
                'United States']},
        'categories': [{ 'id': '4bf58dd8d48988d145941735',
            'name': 'Chinese Restaurant',
            'pluralName': 'Chinese Restaurants',
            'shortName': 'Chinese',
            'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/asian_',
                'suffix': '.png'},
            'primary': True}],
        'delivery': { 'id': '1325793',
            'url': 'https://www.grubhub.com/restaurant/hong-kong-chinese-restaurant-3003-guess-road-durham/1325793?affiliate=1131&utm_source=foursquare-affiliate-network&utm_medium=affiliate&utm_campaign=1131&utm_content=1325793',
            'provider': { 'name': 'grubhub',
                'icon': { 'prefix': 'https://fastly.4sqi.net/img/general/cap/',
                    'sizes': [40, 50],
                    'name': '/delivery_provider_grubhub_20180129.png' }}}},
        'referralId': 'v-1591150045',
        'hasPerk': False},

```

```

{'id': '4f32254219836c91c7ba9e8d',
 'name': 'Uptown Seafood Restaurant',
 'location': {'address': '908 Fayetteville St',
 'lat': 35.986202,
 'lng': -78.898519,
 'labeledLatLngs': [{'label': 'display',
 'lat': 35.986202,
 'lng': -78.898519}],
 'distance': 1200,
 'postalCode': '27701',
 'cc': 'US',
 'city': 'Durham',
 'state': 'NC',
 'country': 'United States',
 'formattedAddress': ['908 Fayetteville St',
 'Durham, NC 27701',
 'United States']},
 'categories': [{'id': '4d4b7105d754a06374d81259',
 'name': 'Food',
 'pluralName': 'Food',
 'shortName': 'Food',
 'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/default_',
 'suffix': '.png'},
 'primary': True}],
 'referralId': 'v-1591150045',
 'hasPerk': False},
{'id': '4d3254b7b60937040909f6df',
 'name': 'GG restaurant',
 'location': {'address': '826 Fayetteville St',
 'lat': 35.98500745586643,
 'lng': -78.89964629849885,
 'labeledLatLngs': [{'label': 'display',
 'lat': 35.98500745586643,
 'lng': -78.89964629849885}],
 'distance': 1310,
 'postalCode': '27701',
 'cc': 'US',
 'city': 'Durham',
 'state': 'NC',
 'country': 'United States',
 'formattedAddress': ['826 Fayetteville St',
 'Durham, NC 27701',
 'United States']},
 'categories': [{'id': '4bf58dd8d48988d1ce941735',
 'name': 'Seafood Restaurant',
 'pluralName': 'Seafood Restaurants',
 'shortName': 'Seafood',

```

```

      'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/seafood_',
        'suffix': '.png'},
      'primary': True}],
    'referralId': 'v-1591150045',
    'hasPerk': False},
  {'id': '4ed9130f30f83fb79b01e61b',
    'name': 'Herndon Brothers Restaurant Supply House',
    'location': {'lat': 36.052272926303914,
      'lng': -78.90333788005077,
      'labeledLatLngs': [{'label': 'display',
        'lat': 36.052272926303914,
        'lng': -78.90333788005077}],
      'distance': 6193,
      'postalCode': '27704',
      'cc': 'US',
      'state': 'North Carolina',
      'country': 'United States',
      'formattedAddress': ['NC 27704', 'United States']}],
    'categories': [{'id': '4bf58dd8d48988d1ff941735',
      'name': 'Miscellaneous Shop',
      'pluralName': 'Miscellaneous Shops',
      'shortName': 'Shop',
      'icon': {'prefix':
'https://ss3.4sqi.net/img/categories_v2/shops/default_',
        'suffix': '.png'},
      'primary': True}],
    'referralId': 'v-1591150045',
    'hasPerk': False},
  {'id': '4b6dcc80f964a520d9902ce3',
    'name': 'Hong Kong Restaurant',
    'location': {'address': '4711 Hope Valley Rd',
      'crossStreet': 'at W Woodcroft Pkwy',
      'lat': 35.92205725146451,
      'lng': -78.95631983742723,
      'labeledLatLngs': [{'label': 'display',
        'lat': 35.92205725146451,
        'lng': -78.95631983742723},
      {'label': 'entrance', 'lat': 35.920842, 'lng': -78.956102}],
      'distance': 9647,
      'postalCode': '27707',
      'cc': 'US',
      'city': 'Durham',
      'state': 'NC',
      'country': 'United States',
      'formattedAddress': ['4711 Hope Valley Rd (at W Woodcroft Pkwy)',
        'Durham, NC 27707',
        'United States']}],

```



```

'categories': [{ 'id': '4bf58dd8d48988d145941735',
  'name': 'Chinese Restaurant',
  'pluralName': 'Chinese Restaurants',
  'shortName': 'Chinese',
  'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/asian_',
    'suffix': '.png' },
  'primary': True }],
'delivery': { 'id': '1765766',
  'url': 'https://www.grubhub.com/restaurant/hong-kong-4711-hope-valley-road-durham/1765766?affiliate=1131&utm_source=foursquare-affiliate-network&utm_medium=affiliate&utm_campaign=1131&utm_content=1765766',
  'provider': { 'name': 'grubhub',
    'icon': { 'prefix': 'https://fastly.4sqi.net/img/general/cap/',
      'sizes': [40, 50],
      'name': '/delivery_provider_grubhub_20180129.png' } } },
'referralId': 'v-1591150045',
'hasPerk': False },
{ 'id': '4f4386fc19834bc91f5756d3',
  'name': 'Emerald Inn Garden Restaurant',
  'location': { 'address': '1813 Chapel Hill Rd',
    'lat': 35.989641,
    'lng': -78.924086,
    'labeledLatLngs': [ { 'label': 'display',
      'lat': 35.989641,
      'lng': -78.924086 },
      { 'label': 'entrance', 'lat': 35.989708, 'lng': -78.92424 } ],
    'distance': 2153,
    'postalCode': '27707',
    'cc': 'US',
    'city': 'Durham',
    'state': 'NC',
    'country': 'United States',
    'formattedAddress': [ '1813 Chapel Hill Rd',
      'Durham, NC 27707',
      'United States' ] },
  'categories': [ { 'id': '4d4b7105d754a06374d81259',
    'name': 'Food',
    'pluralName': 'Food',
    'shortName': 'Food',
    'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/default_',
      'suffix': '.png' },
    'primary': True } ],
  'referralId': 'v-1591150045',
  'hasPerk': False },
{ 'id': '4b69afd5f964a52099ad2be3',
  'name': "Pulcinella's Italian Restaurant",
  'location': { 'address': '4711 Hope Valley Rd Ste 1E',

```

```

'crossStreet': 'at Woodcroft Pkwy',
'lat': 35.9207316,
'lng': -78.9573303,
'labeledLatLngs': [{ 'label': 'display',
  'lat': 35.9207316,
  'lng': -78.9573303},
{ 'label': 'entrance', 'lat': 35.920842, 'lng': -78.956102}],
'distance': 9821,
'postalCode': '27707',
'cc': 'US',
'city': 'Durham',
'state': 'NC',
'country': 'United States',
'formattedAddress': ['4711 Hope Valley Rd Ste 1E (at Woodcroft Pkwy)',
'Durham, NC 27707',
'United States']],
'categories': [{ 'id': '4bf58dd8d48988d110941735',
  'name': 'Italian Restaurant',
  'pluralName': 'Italian Restaurants',
  'shortName': 'Italian',
  'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/italian_',
    'suffix': '.png'},
  'primary': True}],
'referralId': 'v-1591150045',
'hasPerk': False},
{ 'id': '4f32399919836c91c7c27b13',
  'name': 'La Hacienda Mexican Restaurant',
  'location': { 'address': '1813 Chapel Hill Rd',
    'lat': 35.989789,
    'lng': -78.924372,
    'labeledLatLngs': [{ 'label': 'display',
      'lat': 35.989789,
      'lng': -78.924372}],
    'distance': 2171,
    'postalCode': '27707',
    'cc': 'US',
    'city': 'Durham',
    'state': 'NC',
    'country': 'United States',
    'formattedAddress': ['1813 Chapel Hill Rd',
      'Durham, NC 27707',
      'United States']],
  'categories': [{ 'id': '4bf58dd8d48988d1c1941735',
    'name': 'Mexican Restaurant',
    'pluralName': 'Mexican Restaurants',
    'shortName': 'Mexican',
    'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/mexican_',

```

```

      'suffix': '.png'},
      'primary': True]],
      'referralId': 'v-1591150045',
      'hasPerk': False},
    {'id': '4b396402f964a520da5b25e3',
      'name': 'TràLi Irish Pub & Restaurant',
      'location': {'address': '10370 Moncreiffe Rd',
        'crossStreet': 'at Brier Creek Pkwy',
        'lat': 35.90037026485244,
        'lng': -78.79211708353618,
        'labeledLatLngs': [{'label': 'display',
          'lat': 35.90037026485244,
          'lng': -78.79211708353618}],
        'distance': 14580,
        'postalCode': '27617',
        'cc': 'US',
        'city': 'Raleigh',
        'state': 'NC',
        'country': 'United States',
        'formattedAddress': ['10370 Moncreiffe Rd (at Brier Creek Pkwy)',
          'Raleigh, NC 27617',
          'United States']},
      'categories': [{'id': '52e81612bcbc57f1066b7a06',
        'name': 'Irish Pub',
        'pluralName': 'Irish Pubs',
        'shortName': 'Irish',
        'icon': {'prefix':
          'https://ss3.4sqi.net/img/categories_v2/nightlife/pub_',
          'suffix': '.png'},
        'primary': True}],
      'referralId': 'v-1591150045',
      'hasPerk': False},
    {'id': '4ae0cbc5f964a520968221e3',
      'name': 'International Delights Restaurant',
      'location': {'address': '740 9th St',
        'lat': 36.00914057473797,
        'lng': -78.92197948589934,
        'labeledLatLngs': [{'label': 'display',
          'lat': 36.00914057473797,
          'lng': -78.92197948589934},
        {'label': 'entrance', 'lat': 36.009151, 'lng': -78.921949}],
        'distance': 2287,
        'postalCode': '27705',
        'cc': 'US',
        'city': 'Durham',
        'state': 'NC',
        'country': 'United States',

```

```

    'formattedAddress': ['740 9th St', 'Durham, NC 27705', 'United States']],
    'categories': [{ 'id': '4bf58dd8d48988d10e941735',
        'name': 'Greek Restaurant',
        'pluralName': 'Greek Restaurants',
        'shortName': 'Greek',
        'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/greek_',
            'suffix': '.png'},
        'primary': True}],
    'delivery': { 'id': '271557',
        'url': 'https://www.grubhub.com/restaurant/international-delights-740-9th-
st-durham/271557?affiliate=1131&utm_source=foursquare-affiliate-
network&utm_medium=affiliate&utm_campaign=1131&utm_content=271557',
        'provider': { 'name': 'grubhub',
            'icon': { 'prefix': 'https://fastly.4sqi.net/img/general/cap/',
                'sizes': [40, 50],
                'name': '/delivery_provider_grubhub_20180129.png' } } },
    'referralId': 'v-1591150045',
    'hasPerk': False},
{ 'id': '4ae8ca92f964a52056b221e3',
    'name': "Torero's Mexican Restaurant",
    'location': { 'address': '4600 Durham Chapel Hill Blvd',
        'crossStreet': 'at Garrett Rd',
        'lat': 35.961152381748825,
        'lng': -78.97924831004038,
        'labeledLatLngs': [ { 'label': 'display',
            'lat': 35.961152381748825,
            'lng': -78.97924831004038 } ],
        'distance': 8017,
        'postalCode': '27707',
        'cc': 'US',
        'city': 'Durham',
        'state': 'NC',
        'country': 'United States',
        'formattedAddress': ['4600 Durham Chapel Hill Blvd (at Garrett Rd)',
            'Durham, NC 27707',
            'United States'] },
    'categories': [{ 'id': '4bf58dd8d48988d1c1941735',
        'name': 'Mexican Restaurant',
        'pluralName': 'Mexican Restaurants',
        'shortName': 'Mexican',
        'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/mexican_',
            'suffix': '.png'},
        'primary': True}],
    'referralId': 'v-1591150045',
    'hasPerk': False},
{ 'id': '4aeb738bf964a5202fc221e3',
    'name': 'Los Tres Mexican Restaurant',

```

```

'location': {'address': '6905 Fayetteville Rd',
'crossStreet': 'in Renaissance Center',
'lat': 35.90398347979283,
'lng': -78.93667256591978,
'labeledLatLngs': [{'label': 'display',
'lat': 35.90398347979283,
'lng': -78.93667256591978},
{'label': 'entrance', 'lat': 35.903956, 'lng': -78.937004}],
'distance': 10783,
'postalCode': '27713',
'cc': 'US',
'city': 'Durham',
'state': 'NC',
'country': 'United States',
'formattedAddress': ['6905 Fayetteville Rd (in Renaissance Center)',
'Durham, NC 27713',
'United States']},
'categories': [{'id': '4bf58dd8d48988d1c1941735',
'name': 'Mexican Restaurant',
'pluralName': 'Mexican Restaurants',
'shortName': 'Mexican',
'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/mexican_',
'suffix': '.png'},
'primary': True}],
'referralId': 'v-1591150045',
'hasPerk': False},
{'id': '4f44e4fa19836ed001974a6b',
'name': "Libby's Restaurant",
'location': {'address': '2022 Angier Ave',
'lat': 35.9821,
'lng': -78.8793,
'labeledLatLngs': [{'label': 'display', 'lat': 35.9821, 'lng': -78.8793},
{'label': 'entrance', 'lat': 35.982128, 'lng': -78.878182}],
'distance': 2594,
'postalCode': '27703',
'cc': 'US',
'city': 'Durham',
'state': 'NC',
'country': 'United States',
'formattedAddress': ['2022 Angier Ave',
'Durham, NC 27703',
'United States']},
'categories': [{'id': '4d4b7105d754a06374d81259',
'name': 'Food',
'pluralName': 'Food',
'shortName': 'Food',
'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/default_',

```

```

    'suffix': '.png'},
    'primary': True]],
    'referralId': 'v-1591150045',
    'hasPerk': False},
    {'id': '4b6af069f964a520d4e72be3',
     'name': 'Azteca Grill Mexican Restaurant',
     'location': {'address': '1929 Chapel Hill Rd',
                  'crossStreet': 'at W Lakewood Ave',
                  'lat': 35.987224,
                  'lng': -78.925844,
                  'labeledLatLngs': [{'label': 'display',
                                       'lat': 35.987224,
                                       'lng': -78.925844}],
                  {'label': 'entrance', 'lat': 35.987206, 'lng': -78.926002}],
     'distance': 2406,
     'postalCode': '27707',
     'cc': 'US',
     'city': 'Durham',
     'state': 'NC',
     'country': 'United States',
     'formattedAddress': ['1929 Chapel Hill Rd (at W Lakewood Ave)',
                          'Durham, NC 27707',
                          'United States']},
     'categories': [{'id': '4bf58dd8d48988d1c1941735',
                     'name': 'Mexican Restaurant',
                     'pluralName': 'Mexican Restaurants',
                     'shortName': 'Mexican',
                     'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/mexican_',
                              'suffix': '.png'},
                     'primary': True}],
     'referralId': 'v-1591150045',
     'hasPerk': False},
    {'id': '4bb898683db7b7135466219a',
     'name': 'Palace International Restaurant',
     'location': {'address': '1104 Broad St',
                  'crossStreet': 'Englewood Ave',
                  'lat': 36.01576457491558,
                  'lng': -78.91907766386966,
                  'labeledLatLngs': [{'label': 'display',
                                       'lat': 36.01576457491558,
                                       'lng': -78.91907766386966}],
     'distance': 2635,
     'postalCode': '27705',
     'cc': 'US',
     'city': 'Durham',
     'state': 'NC',
     'country': 'United States',

```

```

'formattedAddress': ['1104 Broad St (Englewood Ave)',
'Durham, NC 27705',
'United States']},
'categories': [{'id': '4bf58dd8d48988d1c8941735',
'name': 'African Restaurant',
'pluralName': 'African Restaurants',
'shortName': 'African',
'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/african_',
'suffix': '.png'},
'primary': True}],
'venuePage': {'id': '49955459'},
'referralId': 'v-1591150045',
'hasPerk': False}]}}

```

[83]: *# assign relevant part of JSON to venues*

```
venues = results['response']['venues']
```

*# transform venues into a dataframe*

```
dataframe = json_normalize(venues)
```

```
dataframe.head()
```

```

/home/jupyterlab/conda/envs/python/lib/python3.6/site-
packages/ipykernel_launcher.py:5: FutureWarning: pandas.io.json.json_normalize
is deprecated, use pandas.json_normalize instead
"""

```

```

[83]:

```

	id	name \
0	4adc7019f964a520512c21e3	Rue Cler Restaurant and Bakery Cafe
1	4b0d7050f964a520564823e3	Torero's Mexican Restaurant
2	4e3477e62271b2cf066d9167	201 Restaurant
3	5b6b2b3bdff815003939f39e	The Restaurant at The Durham
4	4b3fbd59f964a5209ead25e3	Piedmont Restaurant

	categories	referralId	hasPerk \
0	[{'id': '4bf58dd8d48988d10c941735', 'name': 'F...}	v-1591150045	False
1	[{'id': '4bf58dd8d48988d1c1941735', 'name': 'M...}	v-1591150045	False
2	[{'id': '4bf58dd8d48988d157941735', 'name': 'N...}	v-1591150045	False
3	[{'id': '4bf58dd8d48988d1c4941735', 'name': 'R...}	v-1591150045	False
4	[{'id': '4bf58dd8d48988d14e941735', 'name': 'A...}	v-1591150045	False

	location.address	location.crossStreet	location.lat	location.lng \
0	401 E Chapel Hill St	at Rigsbee Ave	35.997086	-78.899760
1	800 W Main St	Duke St	35.999476	-78.908394
2	NaN	NaN	35.996895	-78.901884
3	325 E Chapel Hill St.	NaN	35.997240	-78.900918
4	401 Foster St	at Hunt St	35.999491	-78.901727

	location.labeledLatLngs	location.state
0	[{'label': 'display', 'lat': 35.997086, 'lng': ...}	NC
1	[{'label': 'display', 'lat': 35.99947647798876...}	NC
2	[{'label': 'display', 'lat': 35.99689456446115...}	North Carolina
3	[{'label': 'display', 'lat': 35.99724, 'lng': ...}	NC
4	[{'label': 'display', 'lat': 35.9994913551702,...}	NC

	location.country	location.formattedAddress
0	United States	[401 E Chapel Hill St (at Rigsbee Ave), Durham...
1	United States	[800 W Main St (Duke St), Durham, NC 27701, Un...
2	United States	[North Carolina, United States]
3	United States	[325 E Chapel Hill St., Durham, NC 27701, Unit...
4	United States	[401 Foster St (at Hunt St), Durham, NC 27701,...

	delivery.id	delivery.url	delivery.provider.name
0	NaN	NaN	NaN
1	NaN	NaN	NaN
2	NaN	NaN	NaN
3	NaN	NaN	NaN
4	NaN	NaN	NaN

	delivery.provider.icon.prefix	delivery.provider.icon.sizes
0	NaN	NaN
1	NaN	NaN
2	NaN	NaN
3	NaN	NaN
4	NaN	NaN

	delivery.provider.icon.name	venuePage.id
0	NaN	NaN
1	NaN	NaN
2	NaN	NaN
3	NaN	NaN
4	NaN	NaN

[5 rows x 24 columns]

```
[84]: # keep only columns that include venue name, and anything that is associated
      ↪with location
      filtered_columns = ['name', 'categories'] + [col for col in dataframe.columns
      ↪if col.startswith('location.')] + ['id']
      dataframe_filtered = dataframe.loc[:, filtered_columns]

      # 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']

# filter the category for each row
dataframe_filtered['categories'] = dataframe_filtered.apply(get_category_type,
    ↪axis=1)

# clean column names by keeping only last term
dataframe_filtered.columns = [column.split('.')[ -1] for column in
    ↪dataframe_filtered.columns]

dataframe_filtered

```

```

[84]:

```

	name	categories \
0	Rue Cler Restaurant and Bakery Cafe	French Restaurant
1	Torero's Mexican Restaurant	Mexican Restaurant
2	201 Restaurant	New American Restaurant
3	The Restaurant at The Durham	Restaurant
4	Piedmont Restaurant	American Restaurant
5	Tosca Restaurant	Italian Restaurant
6	Devines Restaurant & Sports Bar	Sports Bar
7	Shanghai Chinese Restaurant	Chinese Restaurant
8	Restaurant El Guanajuato de Durham	Mexican Restaurant
9	M Sushi	Sushi Restaurant
10	La Cocina Mexican Restaurant #9	Mexican Restaurant
11	Hunan Chinese Restaurant	Chinese Restaurant
12	Vista Restaurant	Breakfast Spot
13	Redds Restaurant Supply	Gourmet Shop
14	Pie Pushers	Pizza Place
15	Hong Kong Chinese Restaurant	Chinese Restaurant
16	Uptown Seafood Restaurant	Food
17	GG restaurant	Seafood Restaurant
18	Herndon Brothers Restaurant Supply House	Miscellaneous Shop
19	Hong Kong Restaurant	Chinese Restaurant
20	Emerald Inn Garden Restaurant	Food
21	Pulcinella's Italian Restaurant	Italian Restaurant
22	La Hacienda Mexican Restaurant	Mexican Restaurant
23	TràLi Irish Pub & Restaurant	Irish Pub
24	International Delights Restaurant	Greek Restaurant
25	Torero's Mexican Restaurant	Mexican Restaurant
26	Los Tres Mexican Restaurant	Mexican Restaurant
27	Libby's Restaurant	Food

28	Azteca Grill Mexican Restaurant	Mexican Restaurant
29	Palace International Restaurant	African Restaurant

	address	crossStreet \
0	401 E Chapel Hill St	at Rigsbee Ave
1	800 W Main St	Duke St
2	NaN	NaN
3	325 E Chapel Hill St.	NaN
4	401 Foster St	at Hunt St
5	604 W Morgan St	NaN
6	904 W Main St	N Gregson St
7	3433 Hillsborough Rd	NaN
8	NaN	NaN
9	311 Holland St	NaN
10	2121 Tw Alexander Dr Ste 119	at Page Rd
11	910 W Main St	NaN
12	3001 Cameron Blvd	at Washington Duke Inn & Golf Club
13	907 Ramseur St	NaN
14	117 W Main St	NaN
15	3003 Guess Rd	at Fawn Ave
16	908 Fayetteville St	NaN
17	826 Fayetteville St	NaN
18	NaN	NaN
19	4711 Hope Valley Rd	at W Woodcroft Pkwy
20	1813 Chapel Hill Rd	NaN
21	4711 Hope Valley Rd Ste 1E	at Woodcroft Pkwy
22	1813 Chapel Hill Rd	NaN
23	10370 Moncreiffe Rd	at Brier Creek Pkwy
24	740 9th St	NaN
25	4600 Durham Chapel Hill Blvd	at Garrett Rd
26	6905 Fayetteville Rd	in Renaissance Center
27	2022 Angier Ave	NaN
28	1929 Chapel Hill Rd	at W Lakewood Ave
29	1104 Broad St	Englewood Ave

	lat	lng	labeledLatLngs \
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5	36.000014	-78.905655	[{'label': 'display', 'lat': 36.00001358333333...
6	36.000396	-78.909359	[{'label': 'display', 'lat': 36.00039587940071...
7	36.018903	-78.947654	[{'label': 'display', 'lat': 36.01890328574686...
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9	35.997263	-78.901195	[{'label': 'display', 'lat': 35.99726294142017...
10	35.920273	-78.810116	[{'label': 'display', 'lat': 35.9202730060122,...

```

11 36.000635 -78.909777 [{'label': 'display', 'lat': 36.000634999999999...
12 35.992515 -78.947868 [{'label': 'display', 'lat': 35.99251518598061...
13 35.987046 -78.893228 [{'label': 'display', 'lat': 35.987046, 'lng':...
14 35.995364 -78.901447 [{'label': 'display', 'lat': 35.99536386965163...
15 36.033516 -78.929476 [{'label': 'display', 'lat': 36.03351587789929...
16 35.986202 -78.898519 [{'label': 'display', 'lat': 35.986202, 'lng':...
17 35.985007 -78.899646 [{'label': 'display', 'lat': 35.98500745586643...
18 36.052273 -78.903338 [{'label': 'display', 'lat': 36.05227292630391...
19 35.922057 -78.956320 [{'label': 'display', 'lat': 35.92205725146451...
20 35.989641 -78.924086 [{'label': 'display', 'lat': 35.989641, 'lng':...
21 35.920732 -78.957330 [{'label': 'display', 'lat': 35.9207316, 'lng'...
22 35.989789 -78.924372 [{'label': 'display', 'lat': 35.989789, 'lng':...
23 35.900370 -78.792117 [{'label': 'display', 'lat': 35.90037026485244...
24 36.009141 -78.921979 [{'label': 'display', 'lat': 36.00914057473797...
25 35.961152 -78.979248 [{'label': 'display', 'lat': 35.96115238174882...
26 35.903983 -78.936673 [{'label': 'display', 'lat': 35.90398347979283...
27 35.982100 -78.879300 [{'label': 'display', 'lat': 35.9821, 'lng': -...
28 35.987224 -78.925844 [{'label': 'display', 'lat': 35.987224, 'lng':...
29 36.015765 -78.919078 [{'label': 'display', 'lat': 36.01576457491558...

```

	distance	postalCode	cc	city	state	country \
0	190	27701	US	Durham	NC	United States
1	671	27701	US	Durham	NC	United States
2	27	NaN	US	NaN North Carolina		United States
3	103	27701	US	Durham	NC	United States
4	316	27701	US	Durham	NC	United States
5	510	27701	US	Durham	NC	United States
6	797	27701	US	Durham	NC	United States
7	4814	27705	US	Durham	NC	United States
8	2549	NaN	US	Durham	NC	United States
9	87	27701	US	Durham	NC	United States
10	11855	27560	US	Morrisville	NC	United States
11	843	27701	US	Durham	NC	United States
12	4174	27705	US	Durham	NC	United States
13	1319	27701	US	Durham	NC	United States
14	147	27701	US	Durham	NC	United States
15	4800	27705	US	Durham	NC	United States
16	1200	27701	US	Durham	NC	United States
17	1310	27701	US	Durham	NC	United States
18	6193	27704	US	NaN North Carolina		United States
19	9647	27707	US	Durham	NC	United States
20	2153	27707	US	Durham	NC	United States
21	9821	27707	US	Durham	NC	United States
22	2171	27707	US	Durham	NC	United States
23	14580	27617	US	Raleigh	NC	United States
24	2287	27705	US	Durham	NC	United States
25	8017	27707	US	Durham	NC	United States

26	10783	27713	US	Durham	NC	United States
27	2594	27703	US	Durham	NC	United States
28	2406	27707	US	Durham	NC	United States
29	2635	27705	US	Durham	NC	United States

```

                                formattedAddress \
0  [401 E Chapel Hill St (at Rigsbee Ave), Durham...
1  [800 W Main St (Duke St), Durham, NC 27701, Un...
2      [North Carolina, United States]
3  [325 E Chapel Hill St., Durham, NC 27701, Unit...
4  [401 Foster St (at Hunt St), Durham, NC 27701,...
5  [604 W Morgan St, Durham, NC 27701, United Sta...
6  [904 W Main St (N Gregson St), Durham, NC 2770...
7  [3433 Hillsborough Rd, Durham, NC 27705, Unite...
8      [Durham, NC, United States]
9  [311 Holland St, Durham, NC 27701, United States]
10 [2121 Tw Alexander Dr Ste 119 (at Page Rd), Mo...
11 [910 W Main St, Durham, NC 27701, United States]
12 [3001 Cameron Blvd (at Washington Duke Inn & G...
13 [907 Ramseur St, Durham, NC 27701, United States]
14 [117 W Main St, Durham, NC 27701, United States]
15 [3003 Guess Rd (at Fawn Ave), Durham, NC 27705...
16 [908 Fayetteville St, Durham, NC 27701, United...
17 [826 Fayetteville St, Durham, NC 27701, United...
18      [NC 27704, United States]
19 [4711 Hope Valley Rd (at W Woodcroft Pkwy), Du...
20 [1813 Chapel Hill Rd, Durham, NC 27707, United...
21 [4711 Hope Valley Rd Ste 1E (at Woodcroft Pkwy...
22 [1813 Chapel Hill Rd, Durham, NC 27707, United...
23 [10370 Moncreiffe Rd (at Brier Creek Pkwy), Ra...
24      [740 9th St, Durham, NC 27705, United States]
25 [4600 Durham Chapel Hill Blvd (at Garrett Rd),...
26 [6905 Fayetteville Rd (in Renaissance Center),...
27 [2022 Angier Ave, Durham, NC 27703, United Sta...
28 [1929 Chapel Hill Rd (at W Lakewood Ave), Durh...
29 [1104 Broad St (Englewood Ave), Durham, NC 277...

```

```

                                id
0  4adc7019f964a520512c21e3
1  4b0d7050f964a520564823e3
2  4e3477e62271b2cf066d9167
3  5b6b2b3bdff815003939f39e
4  4b3fbd59f964a5209ead25e3
5  4adfda23f964a520c57d21e3
6  4adfd5a3f964a520b17d21e3
7  4b4e5c29f964a520ccea26e3
8  53ed121d498ebc4dc45cfa8f

```

```

9  56b24374498e8704e41de430
10 4de8ff4cc65b72347a1dbffa
11 4f32b0da19836c91c7f04325
12 4cf79b0766585481e186cf98
13 4f05c671be7bf2206f1b320f
14 57ed5703498ea019ab1a035d
15 4aedbf63f964a52089ce21e3
16 4f32254219836c91c7ba9e8d
17 4d3254b7b60937040909f6df
18 4ed9130f30f83fb79b01e61b
19 4b6dcc80f964a520d9902ce3
20 4f4386fc19834bc91f5756d3
21 4b69afd5f964a52099ad2be3
22 4f32399919836c91c7c27b13
23 4b396402f964a520da5b25e3
24 4ae0cbc5f964a520968221e3
25 4ae8ca92f964a52056b221e3
26 4aeb738bf964a5202fc221e3
27 4f44e4fa19836ed001974a6b
28 4b6af069f964a520d4e72be3
29 4bb898683db7b7135466219a

```

```

[85]: venues_map = folium.Map(location=[latitude, longitude], zoom_start=13) #
      ↪ generate map centred around Durham

# add a red circle marker to represent the Conrad Hotel
folium.features.CircleMarker(
    [latitude, longitude],
    radius=10,
    color='red',
    popup='Durham',
    fill = True,
    fill_color = 'red',
    fill_opacity = 0.6
).add_to(venues_map)

# add the Italian restaurants as blue circle markers
for lat, lng, label in zip(dataframe_filtered.lat, dataframe_filtered.lng,
      ↪ dataframe_filtered.categories):
    folium.features.CircleMarker(
        [lat, lng],
        radius=5,
        color='blue',
        popup=label,
        fill = True,
        fill_color='blue',
        fill_opacity=0.6
    ).add_to(venues_map)

```

```

    ).add_to(venues_map)

# display map
venues_map

```

[85]: <folium.folium.Map at 0x7f943ead3400>

```

[86]: from sklearn.cluster import DBSCAN
import sklearn.utils
from sklearn.preprocessing import StandardScaler
sklearn.utils.check_random_state(1000)
Clus_dataSet = dataframe_filtered[['lat', 'lng']]
Clus_dataSet = np.nan_to_num(Clus_dataSet)
Clus_dataSet = StandardScaler().fit_transform(Clus_dataSet)

# Compute DBSCAN
db = DBSCAN(eps=0.15, min_samples=10).fit(Clus_dataSet)
core_samples_mask = np.zeros_like(db.labels_, dtype=bool)
core_samples_mask[db.core_sample_indices_] = True
labels = db.labels_
dataframe_filtered["Clus_Db"] = labels

realClusterNum = len(set(labels)) - (1 if -1 in labels else 0)
clusterNum = len(set(labels))

# A sample of clusters
dataframe_filtered[["name", "categories", "Clus_Db"]].head(20)

```

```

[86]:

```

	name	categories	Clus_Db
0	Rue Cler Restaurant and Bakery Cafe	French Restaurant	-1
1	Torero's Mexican Restaurant	Mexican Restaurant	-1
2	201 Restaurant	New American Restaurant	-1
3	The Restaurant at The Durham	Restaurant	-1
4	Piedmont Restaurant	American Restaurant	-1
5	Tosca Restaurant	Italian Restaurant	-1
6	Devines Restaurant & Sports Bar	Sports Bar	-1
7	Shanghai Chinese Restaurant	Chinese Restaurant	-1
8	Restaurant El Guanajuato de Durham	Mexican Restaurant	-1
9	M Sushi	Sushi Restaurant	-1
10	La Cocina Mexican Restaurant #9	Mexican Restaurant	-1
11	Hunan Chinese Restaurant	Chinese Restaurant	-1
12	Vista Restaurant	Breakfast Spot	-1
13	Redds Restaurant Supply	Gourmet Shop	-1
14	Pie Pushers	Pizza Place	-1
15	Hong Kong Chinese Restaurant	Chinese Restaurant	-1
16	Uptown Seafood Restaurant	Food	-1

17	GG restaurant	Seafood Restaurant	-1
18	Herndon Brothers Restaurant Supply House	Miscellaneous Shop	-1
19	Hong Kong Restaurant	Chinese Restaurant	-1

```
[87]: set(labels)
```

```
[87]: {-1}
```

```
[88]: from mpl_toolkits.basemap import Basemap
import matplotlib.pyplot as plt
from pylab import rcParams
%matplotlib inline
rcParams['figure.figsize'] = (14,10)

venues_map = Basemap(projection='merc',
                      resolution = 'l', area_thresh = 1000.0,
                      llcrnrlon=-77, llcrnrlat=35, #min longitude (llcrnrlon) and
↳latitude (llcrnrlat)
                      urcrnrlon=-79, urcrnrlat=37) #max longitude (urcrnrlon) and
↳latitude (urcrnrlat)

venues_map.drawcoastlines()
venues_map.drawcountries()
#my_map.drawmapboundary()
venues_map.fillcontinents(color = 'white', alpha = 0.3)
venues_map.shadedrelief()

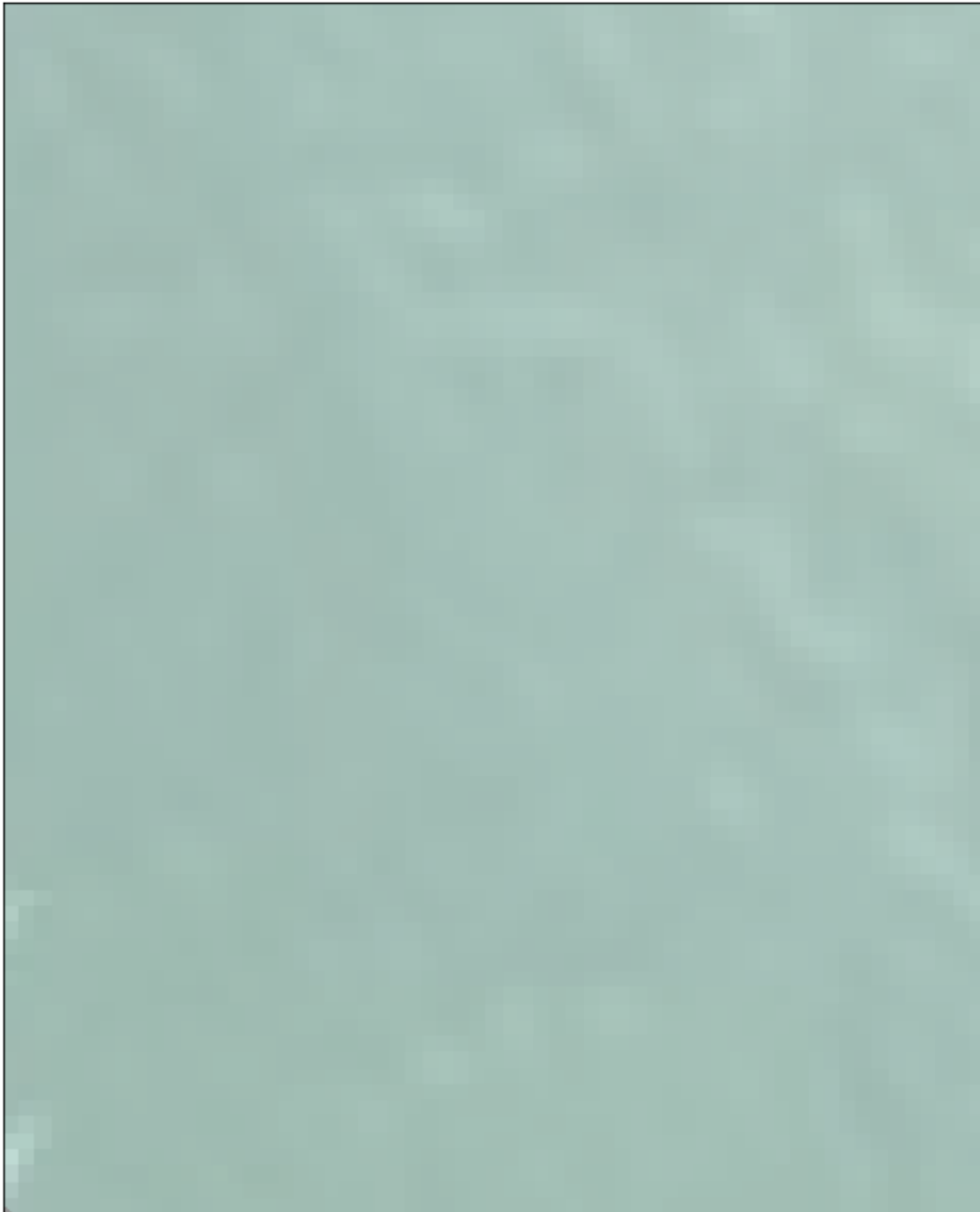
# To create a color map
colors = plt.get_cmap('jet')(np.linspace(0.0, 1.0, clusterNum))

#Visualization1
for clust_number in set(labels):
    c=([0.4,0.4,0.4]) if clust_number == -1 else colors[np.int(clust_number)]
    clust_set = dataframe_filtered[dataframe_filtered.Clus_Db == clust_number]
    venues_map.scatter(clust_set.lat, clust_set.lng, color =c, marker='o', s=
↳20, alpha = 0.85)
    if clust_number != -1:
        cenx=np.mean(clust_set.lat)
        ceny=np.mean(clust_set.lng)
        plt.text(cenx,ceny,str(clust_number), fontsize=25, color='red',)
        print ("Cluster "+str(clust_number)+', Avg Temp: '+ str(np.
↳mean(clust_set.Tm)))
```

```
/home/jupyterlab/conda/envs/python/lib/python3.6/site-
packages/ipykernel_launcher.py:10: MatplotlibDeprecationWarning:
```

The dedent function was deprecated in Matplotlib 3.1 and will be removed in 3.3.  
Use inspect.cleandoc instead.

```
# Remove the CWD from sys.path while we load stuff.  
/home/jupyterlab/conda/envs/python/lib/python3.6/site-  
packages/ipykernel_launcher.py:13: MatplotlibDeprecationWarning:  
The dedent function was deprecated in Matplotlib 3.1 and will be removed in 3.3.  
Use inspect.cleandoc instead.  
del sys.path[0]
```





Through this K Means clustering did not work out, it was worth a try. For some reason only one cluster was designated. Anyone with a way to remedy, please let me know!

```
[89]: df = dataframe_filtered.groupby(['categories']).count()
df.head
```

```
[89]: <bound method NDFrame.head of
crossStreet lat lng labeledLatLngs \
categories
African Restaurant      1      1      1      1      1      1
American Restaurant     1      1      1      1      1      1
Breakfast Spot          1      1      1      1      1      1
Chinese Restaurant      4      4      2      4      4      4
Food                    3      3      0      3      3      3
French Restaurant       1      1      1      1      1      1
Gourmet Shop            1      1      0      1      1      1
Greek Restaurant        1      1      0      1      1      1
Irish Pub                1      1      1      1      1      1
Italian Restaurant      2      2      1      2      2      2
Mexican Restaurant      7      6      5      7      7      7
Miscellaneous Shop      1      0      0      1      1      1
New American Restaurant 1      0      0      1      1      1
Pizza Place             1      1      0      1      1      1
Restaurant              1      1      0      1      1      1
Seafood Restaurant      1      1      0      1      1      1
Sports Bar              1      1      1      1      1      1
Sushi Restaurant        1      1      0      1      1      1
```

```
distance postalCode cc city state country \
categories
African Restaurant      1      1      1      1      1      1
American Restaurant     1      1      1      1      1      1
Breakfast Spot          1      1      1      1      1      1
Chinese Restaurant      4      4      4      4      4      4
Food                    3      3      3      3      3      3
French Restaurant       1      1      1      1      1      1
Gourmet Shop            1      1      1      1      1      1
Greek Restaurant        1      1      1      1      1      1
Irish Pub                1      1      1      1      1      1
Italian Restaurant      2      2      2      2      2      2
Mexican Restaurant      7      6      7      7      7      7
Miscellaneous Shop      1      1      0      1      1      1
New American Restaurant 1      0      1      0      1      1
Pizza Place             1      1      1      1      1      1
Restaurant              1      1      1      1      1      1
```

Seafood Restaurant	1	1	1	1	1	1
Sports Bar	1	1	1	1	1	1
Sushi Restaurant	1	1	1	1	1	1

	formattedAddress	id	Clus_Db
categories			
African Restaurant		1	1
American Restaurant		1	1
Breakfast Spot		1	1
Chinese Restaurant		4	4
Food		3	3
French Restaurant		1	1
Gourmet Shop		1	1
Greek Restaurant		1	1
Irish Pub		1	1
Italian Restaurant		2	2
Mexican Restaurant		7	7
Miscellaneous Shop		1	1
New American Restaurant		1	1
Pizza Place		1	1
Restaurant		1	1
Seafood Restaurant		1	1
Sports Bar		1	1
Sushi Restaurant		1	1

```
[91]: df.sort_values(by='name', ascending = False)
```

```
[91]:
```

	name	address	crossStreet	lat	lng	labeledLatLngs	\
categories							
Mexican Restaurant	7	6	5	7	7	7	
Chinese Restaurant	4	4	2	4	4	4	
Food	3	3	0	3	3	3	
Italian Restaurant	2	2	1	2	2	2	
Sports Bar	1	1	1	1	1	1	
Seafood Restaurant	1	1	0	1	1	1	
Restaurant	1	1	0	1	1	1	
Pizza Place	1	1	0	1	1	1	
New American Restaurant	1	0	0	1	1	1	
Miscellaneous Shop	1	0	0	1	1	1	
African Restaurant	1	1	1	1	1	1	
American Restaurant	1	1	1	1	1	1	
Irish Pub	1	1	1	1	1	1	
Greek Restaurant	1	1	0	1	1	1	
Gourmet Shop	1	1	0	1	1	1	
French Restaurant	1	1	1	1	1	1	
Breakfast Spot	1	1	1	1	1	1	
Sushi Restaurant	1	1	0	1	1	1	

	distance	postalCode	cc	city	state	country	\
categories							
Mexican Restaurant	7	6	7	7	7	7	
Chinese Restaurant	4	4	4	4	4	4	
Food	3	3	3	3	3	3	
Italian Restaurant	2	2	2	2	2	2	
Sports Bar	1	1	1	1	1	1	
Seafood Restaurant	1	1	1	1	1	1	
Restaurant	1	1	1	1	1	1	
Pizza Place	1	1	1	1	1	1	
New American Restaurant	1	0	1	0	1	1	
Miscellaneous Shop	1	1	1	0	1	1	
African Restaurant	1	1	1	1	1	1	
American Restaurant	1	1	1	1	1	1	
Irish Pub	1	1	1	1	1	1	
Greek Restaurant	1	1	1	1	1	1	
Gourmet Shop	1	1	1	1	1	1	
French Restaurant	1	1	1	1	1	1	
Breakfast Spot	1	1	1	1	1	1	
Sushi Restaurant	1	1	1	1	1	1	

	formattedAddress	id	Clus_Db
categories			
Mexican Restaurant		7	7
Chinese Restaurant		4	4
Food		3	3
Italian Restaurant		2	2
Sports Bar		1	1
Seafood Restaurant		1	1
Restaurant		1	1
Pizza Place		1	1
New American Restaurant		1	1
Miscellaneous Shop		1	1
African Restaurant		1	1
American Restaurant		1	1
Irish Pub		1	1
Greek Restaurant		1	1
Gourmet Shop		1	1
French Restaurant		1	1
Breakfast Spot		1	1
Sushi Restaurant		1	1

Mexican restaurnts are the most common restaurant in the Durham area, so Cody should take this into consideration, and may want to include fewer Mexican-influenced items on the menu to stand out. There are only two American restaurants listed here, so we will avoid those when choosing a location. There are only two Italian restaurants, and no Southern restaurants, so Cody will want

to play up the southern elements in his menu to stand out from the crowd.

However, there are three restaurants categorized as “food”, and one categorized as “restaurant”, which doesn’t give us enough detail to determine whether or not these venues will be similar or different from Cody’s place. Let’s review and see if I can add more specific information from my personal knowledge of Durham Restaurants.

```
[92]: dataframe_filtered.loc[dataframe_filtered['categories'] == 'Food']
```

```
[92]:
```

	name	categories	address	crossStreet	\
16	Uptown Seafood Restaurant	Food	908 Fayetteville St	NaN	
20	Emerald Inn Garden Restaurant	Food	1813 Chapel Hill Rd	NaN	
27	Libby's Restaurant	Food	2022 Angier Ave	NaN	

	lat	lng	labeledLatLngs	\
16	35.986202	-78.898519	[{'label': 'display', 'lat': 35.986202, 'lng': ...	
20	35.989641	-78.924086	[{'label': 'display', 'lat': 35.989641, 'lng': ...	
27	35.982100	-78.879300	[{'label': 'display', 'lat': 35.9821, 'lng': -...	

	distance	postalCode	cc	city	state	country	\
16	1200	27701	US	Durham	NC	United States	
20	2153	27707	US	Durham	NC	United States	
27	2594	27703	US	Durham	NC	United States	

	formattedAddress	\
16	[908 Fayetteville St, Durham, NC 27701, United...	
20	[1813 Chapel Hill Rd, Durham, NC 27707, United...	
27	[2022 Angier Ave, Durham, NC 27703, United Sta...	

	id	Clus_Db
16	4f32254219836c91c7ba9e8d	-1
20	4f4386fc19834bc91f5756d3	-1
27	4f44e4fa19836ed001974a6b	-1

Though I’m not familiar with these restaurants, the first restaurant is clearly a seafood restaurant. The Emerald appears to have closed down, and Libby’s is a Southern Place. So, we’ll remove Emerald and update the other two fields.

```
[93]: dataframe_filtered = dataframe_filtered.set_index("name")
dataframe_filtered = dataframe_filtered.drop("Emerald Inn Garden Restaurant",
↪axis=0)
dataframe_filtered.loc[dataframe_filtered['categories'] == 'Food']
```

```
[93]:
```

	categories	address	crossStreet	\
name				
Uptown Seafood Restaurant	Food	908 Fayetteville St	NaN	
Libby's Restaurant	Food	2022 Angier Ave	NaN	

	lat	lng	\
name			
Uptown Seafood Restaurant	35.986202	-78.898519	
Libby's Restaurant	35.982100	-78.879300	

	labeledLatLngs	\
name		
Uptown Seafood Restaurant	[{'label': 'display', 'lat': 35.986202, 'lng': ...	
Libby's Restaurant	[{'label': 'display', 'lat': 35.9821, 'lng': -...	

	distance	postalCode	cc	city	state	\
name						
Uptown Seafood Restaurant	1200	27701	US	Durham	NC	
Libby's Restaurant	2594	27703	US	Durham	NC	

	country	\
name		
Uptown Seafood Restaurant	United States	
Libby's Restaurant	United States	

	formattedAddress	\
name		
Uptown Seafood Restaurant	[908 Fayetteville St, Durham, NC 27701, United...	
Libby's Restaurant	[2022 Angier Ave, Durham, NC 27703, United Sta...	

	id	Clus_Db
name		
Uptown Seafood Restaurant	4f32254219836c91c7ba9e8d	-1
Libby's Restaurant	4f44e4fa19836ed001974a6b	-1

```
[94]: dataframe_filtered.loc[dataframe_filtered['categories'] == 'Restaurant']
```

```
[94]:
```

	categories	address	crossStreet	\
name				
The Restaurant at The Durham	Restaurant	325 E Chapel Hill St.	NaN	

	lat	lng	\
name			
The Restaurant at The Durham	35.99724	-78.900918	

	labeledLatLngs	\
name		
The Restaurant at The Durham	[{'label': 'display', 'lat': 35.99724, 'lng': ...	

	distance	postalCode	cc	city	state	\
name						

```

The Restaurant at The Durham      103      27701  US  Durham    NC

                                country \
name
The Restaurant at The Durham  United States

                                formattedAddress
\
name
The Restaurant at The Durham  [325 E Chapel Hill St., Durham, NC 27701, Unit...

                                id  Clus_Db
name
The Restaurant at The Durham  5b6b2b3bdf815003939f39e      -1

```

I know this restaurant, and would consider it an American restaurant. More importantly, I consider it a direct competitor to Cody's Kitchen. So, I'll replace "Restaurant" with "American Restaurant".

```
[103]: df1 = dataframe_filtered.replace('Restaurant', 'American Restaurant')
```

```
[104]: df1.loc[df1['categories'] == 'American Restaurant']
```

```

[104]:
                                categories      address \
name
The Restaurant at The Durham  American Restaurant  325 E Chapel Hill St.
Piedmont Restaurant          American Restaurant    401 Foster St

                                crossStreet      lat      lng \
name
The Restaurant at The Durham      NaN  35.997240 -78.900918
Piedmont Restaurant              at Hunt St  35.999491 -78.901727

                                labeledLatLngs
\
name
The Restaurant at The Durham  [{'label': 'display', 'lat': 35.99724, 'lng': ...
Piedmont Restaurant          [{'label': 'display', 'lat': 35.9994913551702,...

                                distance postalCode  cc      city state \
name
The Restaurant at The Durham      103      27701  US  Durham    NC
Piedmont Restaurant              316      27701  US  Durham    NC

                                country \
name
The Restaurant at The Durham  United States
Piedmont Restaurant          United States

```

	formattedAddress
\	
name	
The Restaurant at The Durham	[325 E Chapel Hill St., Durham, NC 27701, Unit...
Piedmont Restaurant	[401 Foster St (at Hunt St), Durham, NC 27701,...

	id	Clus_Db
name		
The Restaurant at The Durham	5b6b2b3bdf815003939f39e	-1
Piedmont Restaurant	4b3fbd59f964a5209ead25e3	-1

Now that we know which other restaurants are American, we know that we don't want to set up a competing restaurant style next to either of these restaurants. Based on the analysis of this report, I recommend that Cody set up a restaurant in Downtown Durham, avoid locations that are too close to the Durham or the Piedmont Restaurant.