# Applied Data Science Capstone Project Report:
# The Battle of Neighborhoods: College Campuses

Submitted By: Shiv Vyas

## 1. Goal

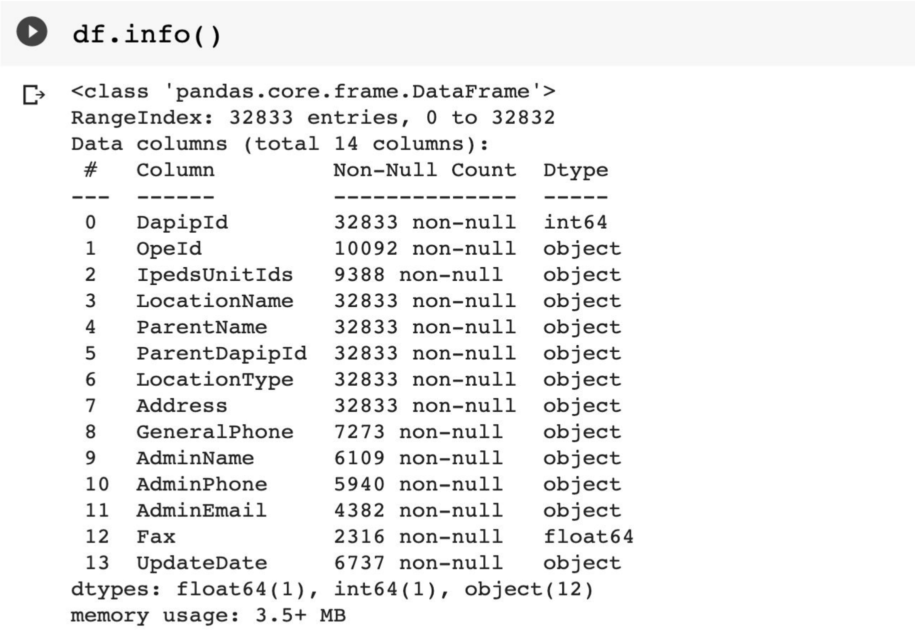
The goal of this project is to help students/parents to select a university/campus for college/schools especially international students who are totally new to the country and do not have any major idea about the locality of the campus.
Students can select the College/School/ Campus and find out the top & places nearest to the campus area such as shops, restaurants, hospitals which can help to decide the college/campus.

## 2. Why this Problem & Who can benefit from this project?

The goal of this project is to help students/parents to select a university/campus for college/schools especially international students who are totally new to the country and do not have any major idea about the locality of the campus.
I am an international student, and it was really difficult for me to select the campus without having any contact in the United States.
Although there is some information available about neighborhoods on the college website, this information is limited and not exactly in the way we want it.
University, Students, etc anyone can use this program to find out everything about the neighborhood not only around the campus but also any other residential places too.

## 3. Data

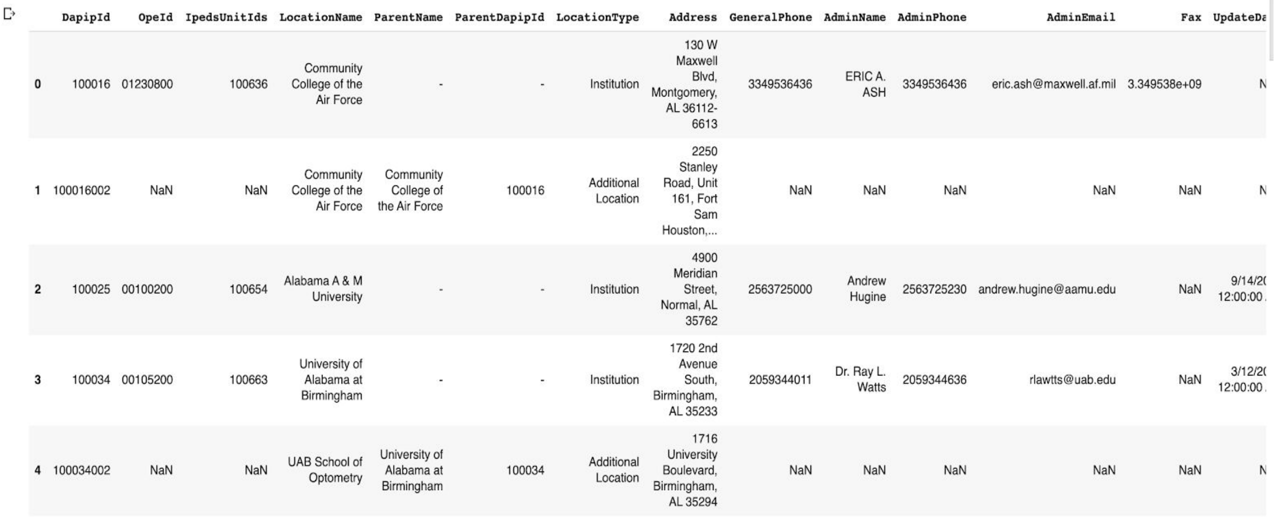
The main data is obtained from the website: [https://ope.ed.gov/dapip/#/home](https://ope.ed.gov/dapip/#/home)
The data has 32833 rows and 14 columns:



```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 32833 entries, 0 to 32832
Data columns (total 14 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   DapipId        32833 non-null  int64
 1   OpeId          10092 non-null  object
 2   IpedsUnitIds   9388 non-null   object
 3   LocationName   32833 non-null  object
 4   ParentName     32833 non-null  object
 5   ParentDapipId  32833 non-null  object
 6   LocationType   32833 non-null  object
 7   Address        32833 non-null  object
 8   GeneralPhone   7273 non-null   object
 9   AdminName      6109 non-null   object
 10  AdminPhone     5940 non-null   object
 11  AdminEmail     4382 non-null   object
 12  Fax            2316 non-null   float64
 13  UpdateDate     6737 non-null   object
dtypes: float64(1), int64(1), object(12)
memory usage: 3.5+ MB
```

The data is shown below:

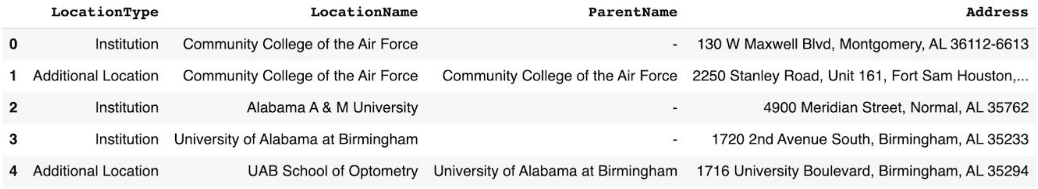


| | DapipId | OpeId | IpedsUnitIds | LocationName | ParentName | ParentDapipId | LocationType | Address | GeneralPhone | AdminName | AdminPhone | AdminEmail | Fax | UpdateDa |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 100016 | 01230800 | 100636 | Community College of the Air Force | - | - | Institution | 130 W Maxwell Blvd, Montgomery, AL 36112-6613 | 3349536436 | ERIC A. ASH | 3349536436 | eric.ash@maxwell.af.mil | 3.349538e+09 | N |
| 1 | 100016002 | NaN | NaN | Community College of the Air Force | Community College of the Air Force | 100016 | Additional Location | 2250 Stanley Road, Unit 161, Fort Sam Houston,... | NaN | NaN | NaN | NaN | NaN | N |
| 2 | 100025 | 00100200 | 100654 | Alabama A & M University | - | - | Institution | 4900 Meridian Street, Normal, AL 35762 | 2563725000 | Andrew Hugine | 2563725230 | andrew.hugine@aamu.edu | NaN | 9/14/2( 12:00:00 |
| 3 | 100034 | 00105200 | 100663 | University of Alabama at Birmingham | - | - | Institution | 1720 2nd Avenue South, Birmingham, AL 35233 | 2059344011 | Dr. Ray L. Watts | 2059344636 | rlawtts@uab.edu | NaN | 3/12/2( 12:00:00 |
| 4 | 100034002 | NaN | NaN | UAB School of Optometry | University of Alabama at Birmingham | 100034 | Additional Location | 1716 University Boulevard, Birmingham, AL 35294 | NaN | NaN | NaN | NaN | NaN | N |

## 4. Exploratory Data Analysis | Data Cleaning & Data Visualization

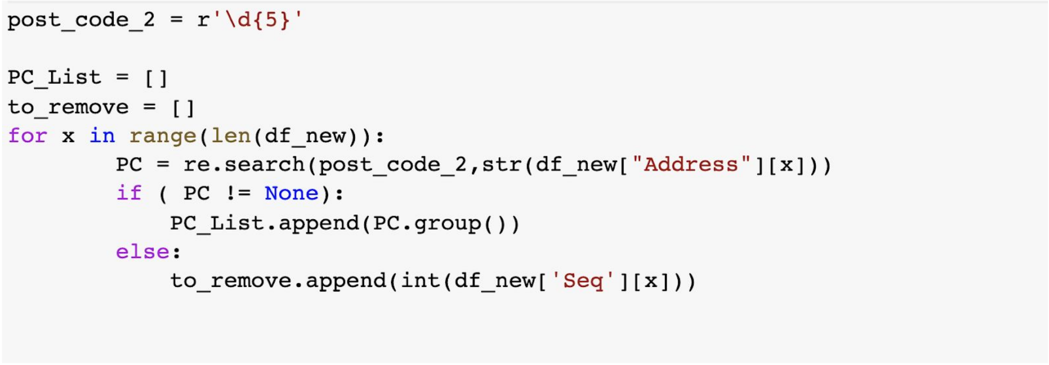
The main focus in this section is to obtain the Postal Code from the Address Column and Find the latitude and longitude of each institute.

Select the required features only, remove the unwanted features.



| | LocationType | LocationName | ParentName | Address |
|---|---|---|---|---|
| 0 | Institution | Community College of the Air Force | - | 130 W Maxwell Blvd, Montgomery, AL 36112-6613 |
| 1 | Additional Location | Community College of the Air Force | Community College of the Air Force | 2250 Stanley Road, Unit 161, Fort Sam Houston,... |
| 2 | Institution | Alabama A & M University | - | 4900 Meridian Street, Normal, AL 35762 |
| 3 | Institution | University of Alabama at Birmingham | - | 1720 2nd Avenue South, Birmingham, AL 35233 |
| 4 | Additional Location | UAB School of Optometry | University of Alabama at Birmingham | 1716 University Boulevard, Birmingham, AL 35294 |

Now, the remaining Postal codes were obtained from the Address column using the regex as shown below.



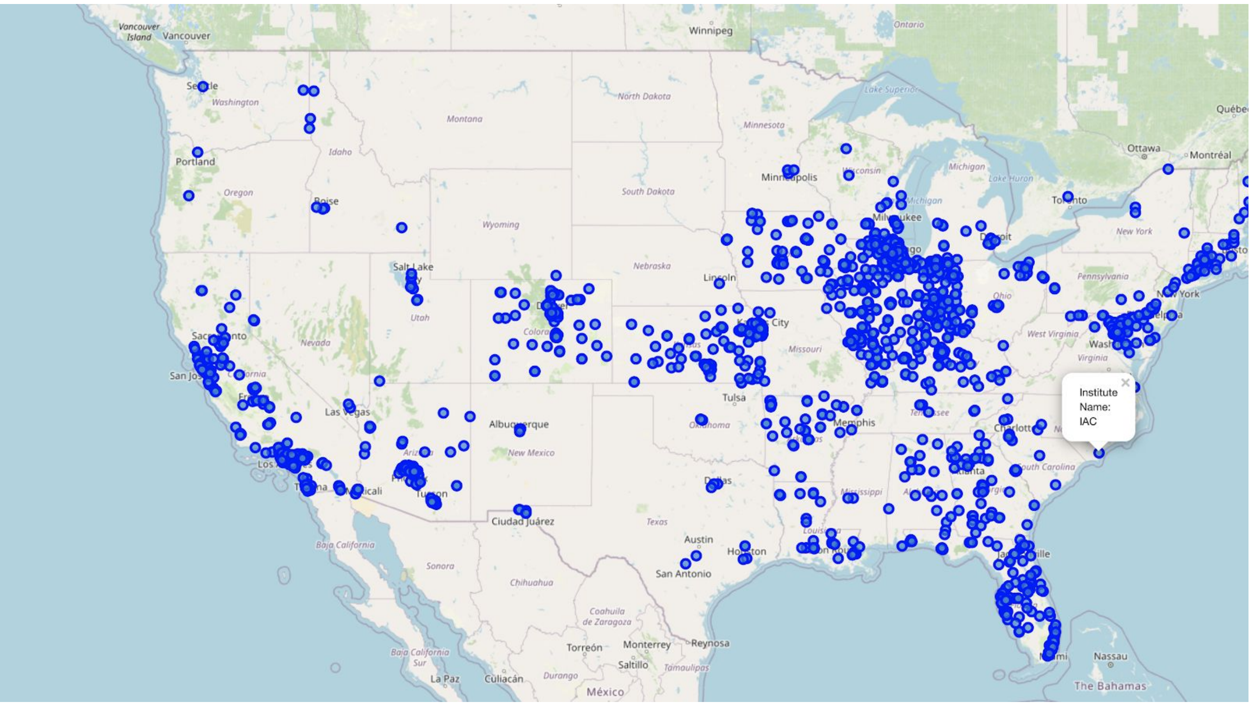
```
post_code_2 = r'\d{5}'

PC_List = []
to_remove = []
for x in range(len(df_new)):
        PC = re.search(post_code_2,str(df_new["Address"][x]))
        if ( PC != None):
            PC_List.append(PC.group())
        else:
            to_remove.append(int(df_new['Seq'][x]))
```

Although some addresses were not proper and were forced to be removed.

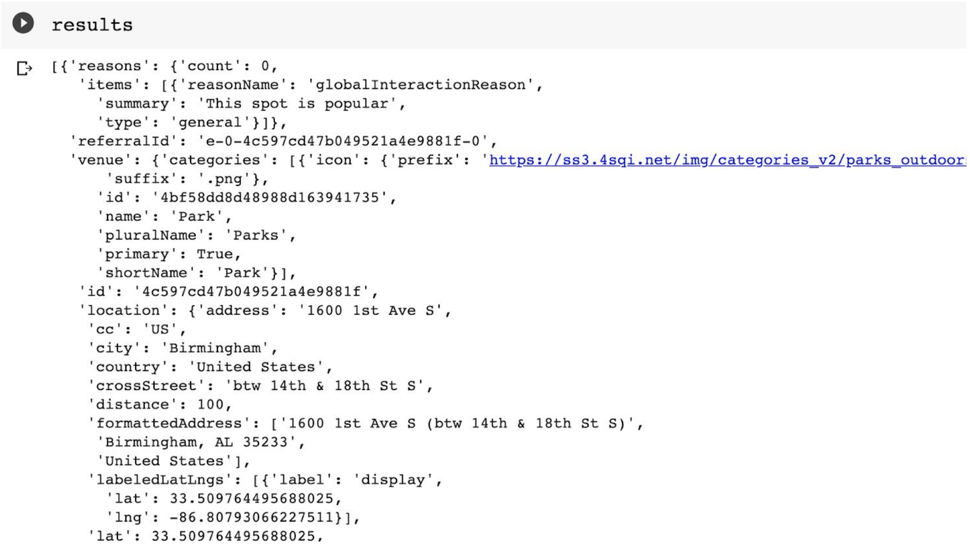
Geopy and Folium were used to find the latitude and the longitude of the institution and plot them on the map of the USA.

The map is shown below.



## 5. Foursquare

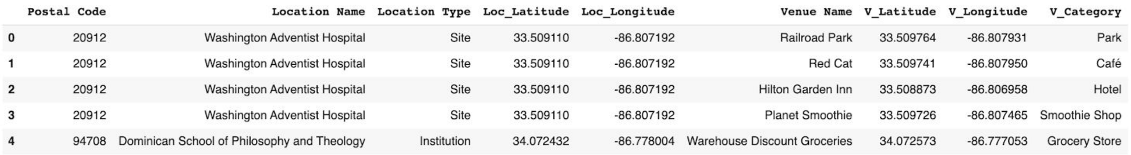
Foursquare api was used to find the neighbours of the university.
Foursquare returned a json file which was processed to find the top “N” nearest venues.
The results by using foursquare api were obtained as follows:



```
results
```

```
[{'reasons': {'count': 0,
   'items': [{'reasonName': 'globalInteractionReason',
     'summary': 'This spot is popular',
     'type': 'general'}]},
  'referralId': 'e-0-4c597cd47b049521a4e9881f-0',
  'venue': {'categories': [{'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/parks_outdoor
      'suffix': '.png'},
     'id': '4bf58dd8d48988d163941735',
     'name': 'Park',
     'pluralName': 'Parks',
     'primary': True,
     'shortName': 'Park'}],
   'id': '4c597cd47b049521a4e9881f',
   'location': {'address': '1600 1st Ave S',
    'cc': 'US',
    'city': 'Birmingham',
    'country': 'United States',
    'crossStreet': 'btw 14th & 18th St S',
    'distance': 100,
    'formattedAddress': ['1600 1st Ave S (btw 14th & 18th St S)',
     'Birmingham, AL 35233',
     'United States'],
    'labeledLatLngs': [{'label': 'display',
      'lat': 33.509764495688025,
      'lng': -86.80793066227511}],
    'lat': 33.509764495688025,
```

After taking important features into account from results, the following data frame was created.



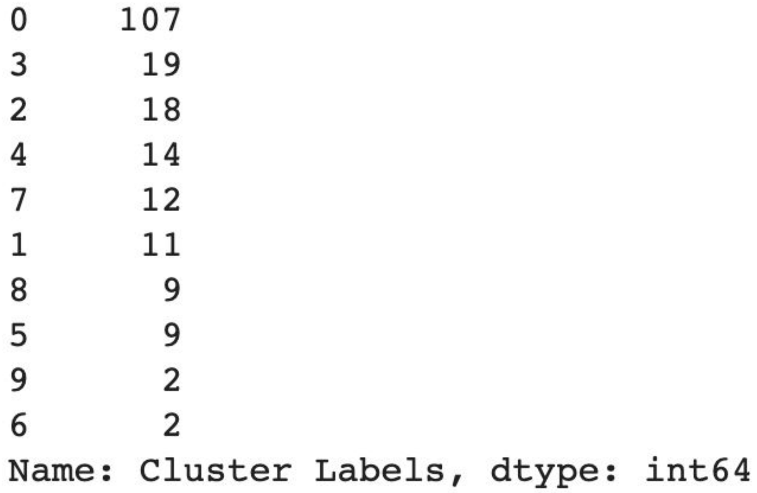
| | Postal Code | Location Name | Location Type | Loc_Latitude | Loc_Longitude | Venue Name | V_Latitude | V_Longitude | V_Category |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 20912 | Washington Adventist Hospital | Site | 33.509110 | -86.807192 | Railroad Park | 33.509764 | -86.807931 | Park |
| 1 | 20912 | Washington Adventist Hospital | Site | 33.509110 | -86.807192 | Red Cat | 33.509741 | -86.807950 | Café |
| 2 | 20912 | Washington Adventist Hospital | Site | 33.509110 | -86.807192 | Hilton Garden Inn | 33.508873 | -86.806958 | Hotel |
| 3 | 20912 | Washington Adventist Hospital | Site | 33.509110 | -86.807192 | Planet Smoothie | 33.509726 | -86.807465 | Smoothie Shop |
| 4 | 94708 | Dominican School of Philosophy and Theology | Institution | 34.072432 | -86.778004 | Warehouse Discount Groceries | 34.072573 | -86.777053 | Grocery Store |

## 6. Analysis of the Institutes and Top Venues

The data frame obtained in (5) was processed with foursquare api to obtain the top venues.
The result can be seen  below:

## 7. Clustering

Top 5 Venues near each institute were searched, so that students can visualize the locality and places where they can find regular stuff.
K-means clustering is one of the simplest and popular unsupervised machine learning algorithms.
AndreyBu, who has more than 5 years of machine learning experience and currently teaches people his skills, says that “the objective of K-means is simple: group similar data points together and discover underlying patterns. To achieve this objective, K-means looks for a fixed number (*k*) of clusters in a dataset.”
As, per the category the venues were clustered into a total group of 10 clusters.



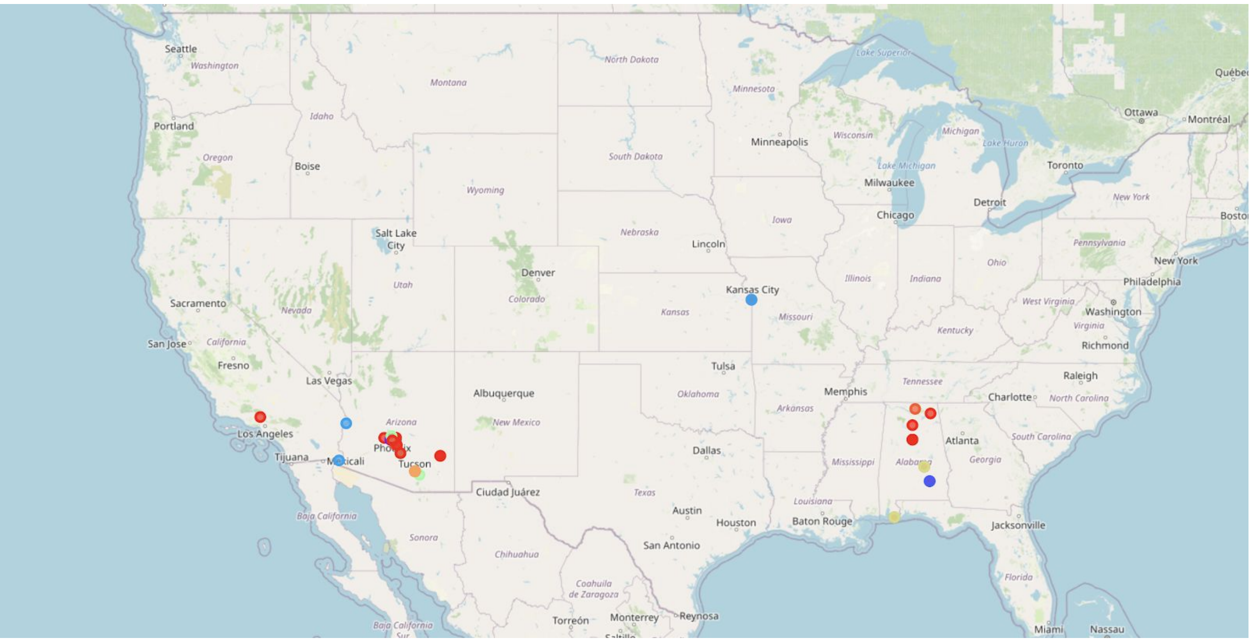
```
0    107
3     19
2     18
4     14
7     12
1     11
8      9
5      9
9      2
6      2
Name: Cluster Labels, dtype: int64
```

## 8. Results & Conclusions

Conclusion : Using K-Means Clustering Algorithm it is found that there most of the Neighborhood fall in Cluster : 0 (107)

# 9. Visualizing Result Clusters on US Map

(Please note due to limit in request calls for foursquare api only 100 rows were used)



Seattle
Washington
Montana
North Dakota
Lake Superior
Minnesota
Québec
Portland
Idaho
Ottawa
Montréal
Minneapolis
Wisconsin
Michigan
Lake Huron
Oregon
Boise
South Dakota
Toronto
Wyoming
Lake Michigan
Milwaukee
Detroit
New York
Chicago
Iowa
Boston
Salt Lake City
Nebraska
Lincoln
Pennsylvania
Ohio
New York
Denver
Philadelphia
Utah
Illinois
Indiana
Kansas City
Sacramento
Nevada
Colorado
Kansas
West Virginia
Washington
Missouri
Virginia
Kentucky
San Jose
California
Richmond
Fresno
Tulsa
Raleigh
Tennessee
Las Vegas
Memphis
Albuquerque
Oklahoma
Charlotte
North Carolina
Arkansas
Arizona
New Mexico
Los Angeles
Atlanta
South Carolina
Phoenix
Dallas
Tijuana
Mexicali
Tucson
Mississippi
Alabama
Georgia
Ciudad Juárez
Texas
Louisiana
Austin
Houston
Baton Rouge
Jacksonville
Baja California
Sonora
San Antonio
Chihuahua
Florida
Coahuila de Zaragoza
Torreón
Monterrey
Reynosa
Baja California Sur
Saltillo
Miami
Nassau