

Capstone Project - Battle of Neighborhood

Part I

Introduction:

1.1 Business Problem

The objective of this Capstone Project is to analyse and choose the safest borough in the New York City based on the total crimes. This will help the people to buy/rent a home who are newly arriving to NYC. Exploring the neighbourhood and select the best among the five boroughs Brooklyn, Queens, Manhattan, The Bronx and Staten Island it has.

1.2 Who will use it?

The target audience for this problem will be all the individual or the families moving to this new place to make a decision of which location is safe and will be suitable for there preferences.

```
[1]: import requests
import pandas as pd
import numpy as np
```

```
[2]: CLIENT_ID = 'X5DC02PSOJVVYTXTHFY2PGAGVOQZRAUZK3LLRJLWR3IBLLCP'
CLIENT_SECRET = 'MOQER4RYNVWEFMV3CC3NOVAV4KSAPU5E5FE33QIBGJLGCANR'

VERSION = '20180604'
LIMIT = 30

print('Your credentails:')
print('CLIENT_ID: ' + CLIENT_ID)
print('CLIENT_SECRET:' + CLIENT_SECRET)
```

Your credentails:

CLIENT_ID: X5DC02PSOJVVYTXTHFY2PGAGVOQZRAUZK3LLRJLWR3IBLLCP

CLIENT_SECRET:MOQER4RYNVWEFMV3CC3NOVAV4KSAPU5E5FE33QIBGJLGCANR

```
[3]: df = pd.read_csv("NYPD_Crime_Data.csv")
```

```
[4]: df.head()
```

```
[4]:   Cmplnt_Num  Cmplnt_Fr_Dt  Rpt_Dt  Ky_CD  Ofns_Desc \
0    574970069      1/1/19  1/1/19    341    PETIT LARCENY
1    695390287      1/1/19  1/1/19    109    GRAND LARCENY
```

2	553237569	11/25/18	1/1/19	114	ARSON
3	320312402	1/1/19	1/1/19	344	ASSAULT 3 & RELATED OFFENSES
4	936158061	1/1/19	1/1/19	578	HARRASSMENT 2

	PD_CD	LAW_CAT_CD	BORO_NM	Latitude	Longitude	\
0	338.0	MISDEMEANOR	BRONX	40.890285	-73.859106	
1	411.0	FELONY	MANHATTAN	40.851404	-73.932216	
2	264.0	FELONY	QUEENS	40.680003	-73.764022	
3	101.0	MISDEMEANOR	BROOKLYN	40.596940	-73.973665	
4	637.0	VIOLATION	MANHATTAN	40.856200	-73.934015	

	Lat_Lon
0	(40.89028471600005, -73.85910627199996)
1	(40.851403574000074, -73.93221569599996)
2	(40.68000300400007, -73.76402239699996)
3	(40.59694042900003, -73.97366455699995)
4	(40.85619961300006, -73.93401465599999)

```
[5]: df['value']=1
```

```
[6]: df.shape
```

```
[6]: (482337, 12)
```

```
[7]: df.columns = ['Crime_No',
    ↳ 'Crime_DT', 'Crime_Reported_DT', 'Classification_Code', 'Offence_Desc', 'Internal_Code', 'Level']
```

```
[8]: df.head()
```

	Crime_No	Crime_DT	Crime_Reported_DT	Classification_Code	\
0	574970069	1/1/19	1/1/19	341	
1	695390287	1/1/19	1/1/19	109	
2	553237569	11/25/18	1/1/19	114	
3	320312402	1/1/19	1/1/19	344	
4	936158061	1/1/19	1/1/19	578	

	Offence_Desc	Internal_Code	Level	Borough	\
0	PETIT LARCENY	338.0	MISDEMEANOR	BRONX	
1	GRAND LARCENY	411.0	FELONY	MANHATTAN	
2	ARSON	264.0	FELONY	QUEENS	
3	ASSAULT 3 & RELATED OFFENSES	101.0	MISDEMEANOR	BROOKLYN	
4	HARRASSMENT 2	637.0	VIOLATION	MANHATTAN	

	Latitude	Longitude	Lat_Lon	\
0	40.890285	-73.859106	(40.89028471600005, -73.85910627199996)	
1	40.851404	-73.932216	(40.851403574000074, -73.93221569599996)	
2	40.680003	-73.764022	(40.68000300400007, -73.76402239699996)	

```

3  40.596940 -73.973665  (40.59694042900003, -73.97366455699995)
4  40.856200 -73.934015  (40.85619961300006, -73.93401465599999)

```

```

      No_of_crimes
0                1
1                1
2                1
3                1
4                1

```

```
[9]: df.info()
```

```

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 482337 entries, 0 to 482336
Data columns (total 12 columns):
#   Column                Non-Null Count  Dtype
---  -
0   Crime_No              482337 non-null  int64
1   Crime_DT              482337 non-null  object
2   Crime_Reported_DT    482337 non-null  object
3   Classification_Code   482337 non-null  int64
4   Offence_Desc          482317 non-null  object
5   Internal_Code         481968 non-null  float64
6   Level                 482337 non-null  object
7   Borough              481961 non-null  object
8   Latitude              475612 non-null  float64
9   Longitude             475612 non-null  float64
10  Lat_Lon               475612 non-null  object
11  No_of_crimes          482337 non-null  int64
dtypes: float64(3), int64(3), object(6)
memory usage: 44.2+ MB

```

```
[10]: df['Borough'].value_counts()
```

```

[10]: BROOKLYN      138382
      MANHATTAN    121550
      BRONX        104825
      QUEENS       97201
      STATEN ISLAND 20003
      Name: Borough, dtype: int64

```

```
[11]: df['Level'].value_counts()
```

```

[11]: MISDEMEANOR   254977
      FELONY        152691
      VIOLATION     74669
      Name: Level, dtype: int64

```

```
[12]: NYPD_crime = pd.pivot_table(df, values=['No_of_crimes'],
                                index=['Borough'],
                                columns=['Level'],
                                aggfunc=np.sum, fill_value=0)

NYPD_crime.head()
```

```
[12]:
```

	No_of_crimes		
Level	FELONY	MISDEMEANOR	VIOLATION
Borough			
BRONX	30356	57102	17367
BROOKLYN	46631	70504	21247
MANHATTAN	38903	66785	15862
QUEENS	31369	49857	15975
STATEN ISLAND	5059	10727	4217

```
[13]: NYPD_crime.reset_index(inplace = True)
```

```
[14]: NYPD_crime['Total'] = NYPD_crime.sum(axis=1)
NYPD_crime.head(33)
```

```
[14]:
```

	Borough	No_of_crimes			Total
Level		FELONY	MISDEMEANOR	VIOLATION	
0	BRONX	30356	57102	17367	104825
1	BROOKLYN	46631	70504	21247	138382
2	MANHATTAN	38903	66785	15862	121550
3	QUEENS	31369	49857	15975	97201
4	STATEN ISLAND	5059	10727	4217	20003

```
[15]: NYPD_crime.columns = NYPD_crime.columns.map('').join)
NYPD_crime.head()
```

```
[15]:
```

	Borough	No_of_crimesFELONY	No_of_crimesMISDEMEANOR	\
0	BRONX	30356	57102	
1	BROOKLYN	46631	70504	
2	MANHATTAN	38903	66785	
3	QUEENS	31369	49857	
4	STATEN ISLAND	5059	10727	

	No_of_crimesVIOLATION	Total
0	17367	104825
1	21247	138382
2	15862	121550
3	15975	97201
4	4217	20003

```
[16]: NYPD_crime.columns = ['Borough', 'Felony', 'Misdemeanor', 'Violation', 'Total']
NYPD_crime.head()
```

```
[16]:
```

	Borough	Felony	Misdemeanor	Violation	Total
0	BRONX	30356	57102	17367	104825
1	BROOKLYN	46631	70504	21247	138382
2	MANHATTAN	38903	66785	15862	121550
3	QUEENS	31369	49857	15975	97201
4	STATEN ISLAND	5059	10727	4217	20003

```
[17]: !conda install -c anaconda lxml --yes
!conda install -c anaconda beautifulsoup4 --yes
#from bs4 import BeautifulSoup
import requests
from bs4 import BeautifulSoup
import xml
```

```
Collecting package metadata (current_repodata.json): done
Solving environment: done
```

```
## Package Plan ##
```

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

```
added / updated specs:
- lxml
```

```
The following packages will be downloaded:
```

package	build		
ca-certificates-2020.6.24	0	133 KB	anaconda
certifi-2020.6.20	py36_0	160 KB	anaconda
libxml2-2.9.10	he19cac6_1	1.3 MB	anaconda
libxslt-1.1.34	hc22bd24_0	573 KB	anaconda
lxml-4.5.2	py36hefd8a0e_0	1.4 MB	anaconda
openssl-1.1.1g	h7b6447c_0	3.8 MB	anaconda
Total:		7.3 MB	

```
The following NEW packages will be INSTALLED:
```

libxslt	anaconda/linux-64::libxslt-1.1.34-hc22bd24_0
lxml	anaconda/linux-64::lxml-4.5.2-py36hefd8a0e_0

```
The following packages will be UPDATED:
```

ca-certificates	conda-forge::ca-certificates-2020.6.2~ --> anaconda::ca-certificates-2020.6.24-0
-----------------	--

```
libxml2                conda-forge::libxml2-2.9.9-h13577e0_2 -->
anaconda::libxml2-2.9.10-he19cac6_1
```

The following packages will be SUPERSEDED by a higher-priority channel:

```
certifi                conda-forge::certifi-2020.6.20-py36h9~ -->
anaconda::certifi-2020.6.20-py36_0
openssl               conda-forge::openssl-1.1.1g-h516909a_0 -->
anaconda::openssl-1.1.1g-h7b6447c_0
```

Downloading and Extracting Packages

openssl-1.1.1g	3.8 MB	#####	100%
libxml2-2.9.10	1.3 MB	#####	100%
ca-certificates-2020	133 KB	#####	100%
certifi-2020.6.20	160 KB	#####	100%
lxml-4.5.2	1.4 MB	#####	100%
libxslt-1.1.34	573 KB	#####	100%

Preparing transaction: done

Verifying transaction: done

Executing transaction: done

Collecting package metadata (current_repodata.json): done

Solving environment: done

Package Plan

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

added / updated specs:

- beautifulsoup4

The following packages will be downloaded:

package	build		
beautifulsoup4-4.9.1	py36_0	168 KB	anaconda
soupsieve-2.0.1	py_0	33 KB	anaconda
Total:		201 KB	

The following NEW packages will be INSTALLED:

beautifulsoup4	anaconda/linux-64::beautifulsoup4-4.9.1-py36_0
soupsieve	anaconda/noarch::soupsieve-2.0.1-py_0

Downloading and Extracting Packages

```
soupsieve-2.0.1      | 33 KB      | ##### | 100%
beautifulsoup4-4.9.1 | 168 KB     | ##### | 100%
Preparing transaction: done
Verifying transaction: done
Executing transaction: done
```

```
[19]: wikipedia_link='https://www.citypopulation.de/en/usa/newyorkcity/'
raw_wikipedia_page= requests.get(wikipedia_link).text

soup = BeautifulSoup(raw_wikipedia_page,'xml')
table=soup.find('table')
print(soup.prettify())
```

```
<?xml version="1.0" encoding="utf-8"?>
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="utf-8">
      <meta content="New York City Boroughs (USA): Boroughs with population
statistics, charts and maps." name="description">
        <title>
          New York City Boroughs (USA): Boroughs - Population Statistics, Charts and
Map
        </title>
        <link href="/favicon.ico" rel="shortcut icon">
          <script>
            var pagemode = 'adminpage'; var pagecat = 'admin_city'; var isAdmin =
false; var pageid = 'usa-newyorkcity'; var pagelang = 'en'; var pagelabel = "New
York City Boroughs"; var popDate = 'E 2019-07-01'; var popcolnum = 4; var
start_x = -73.975; var start_y = 40.705; var start_level = 10; var swap_width =
1132; var hor_percent = 40; var vert_percent = 42; var swap = 'true'; var
mapcopyright = 'U.S. Census Bureau.'; var objid = ''; var objtype = ''; var
startmap = 'street'; var lev_num = 1; var edit_mode = ''; var placeLocale =
'en'; var nativeName = false; var wikiFromWD = false
          </script>
          <script src="/js/countries/usa.js"/>
          <script src="/jquery/jquery-3.1.1.min.js"/>
          <script src="/js/cp_data_m.js"/>
          <script src="/js/cp_phpbase_v3.js"/>
          <script>
            load_resources()
          </script>
          <script src="/js/cp_menu.js"/>
        </script>
        <style>
          article#admtable { top: 42%; }
          div#admmmap { height: 42%; }
```

```

@media all and (min-width: 1132px) {
    article#admtable { top: 26px; left: calc(180px + 40%); }
    div#admmmap { height: auto; bottom: -1px; width: 40% }
    header.admpage { left: calc(180px + 40%) }
    div#headline { left: calc(162px + 40%) }
}

</style>
</link>
<body itemscope="" itemtype="http://schema.org/City" onload="init_data();
start_maps()">
    <script>
        writeMenu('en')
    </script>
    <div class="mobiadv">
        <script>
            show_mobiadv();
        </script>
    </div>
    <div class="hor" id="headline">
        <div id="orient">
            <a href="/">
                Home
            </a>
            →
            <span itemprop="containedIn" itemscope=""
itemtype="http://schema.org/Continent">
                <a href="/America.html" itemprop="url">
                    <span itemprop="name">
                        America
                    </span>
                </a>
            </span>
            →
            <span itemprop="containedIn" itemscope=""
itemtype="http://schema.org/Country">
                <a href="/en/usa/" itemprop="url">
                    <span itemprop="name">
                        USA
                    </span>
                </a>
            </span>
        </div>
        <div id="social">
            <div class="changelang">
                <a href="javascript:cp.changePageLang('en','de')">
                    
                </a>
            </div>

```



```

</div>
<div class="info" id="inforowdiv" style="display:none"/>
<article class="cpage swapped" id="admtable">
  <header class="admpage">
    <a href="javascript:openMap()">
      
    <h1>
      <a href="/en/usa/">
        USA
      </a>
      :
      <span class="smalltext" itemprop="name">
        New York City Boroughs
      </span>
    </h1>
  </a>
  <script>
    handleArticleResize()
  </script>
  <h2>
    <span class="noviz">
      Contents:
    </span>
    Boroughs
  </h2>
  <p>
    The population of the boroughs of New York City according to census
results and latest official estimates.
  </p>
  <p class="small noprint">
    The
    
    icon links to further information about a selected division including
its population structure (gender, age groups, age distribution, »race«,
ethnicity).
  </img>
  <table class="data" id="ts">
    <thead>
      <tr>
        <th class="rname" data-coltype="name"
onclick="javascript:sort('ts',0,false)">
          <a href="javascript:sort('ts',0,false)">
            Name
          </a>
        </th>
        <th class="rstatus" data-coltype="status"

```

```

onclick="javascript:sort('ts',1,false)">
    <a href="javascript:sort('ts',1,false)">
        Status
    </a>
</th>
<th class="rpop prio4" data-coldate="1990-04-01" data-colhead="C
1990-04-01" data-coltype="pop" onclick="javascript:sort('ts',2,true)">
    <a href="javascript:sort('ts',2,true)">
        Population
    </a>
<br>
    <span class="unit">
        Census
    <br>
        1990-04-01
    </br>
    </span>
    <th class="rpop prio3" data-coldate="2000-04-01" data-colhead="C
2000-04-01" data-coltype="pop" onclick="javascript:sort('ts',3,true)">
    <a href="javascript:sort('ts',3,true)">
        Population
    </a>
<br>
    <span class="unit">
        Census
    <br>
        2000-04-01
    </br>
    </span>
    <th class="rpop prio2" data-coldate="2010-04-01" data-colhead="C
2010-04-01" data-coltype="pop" onclick="javascript:sort('ts',4,true)">
    <a href="javascript:sort('ts',4,true)">
        Population
    </a>
<br>
    <span class="unit">
        Census
    <br>
        2010-04-01
    </br>
    </span>
    <th class="rpop prio1" data-coldate="2019-07-01" data-
colhead="E 2019-07-01" data-coltype="pop"
onclick="javascript:sort('ts',5,true)">
    <a href="javascript:sort('ts',5,true)">
        Population
    </a>
<br>

```

```

        <span class="unit">
            Estimate
        <br>
            2019-07-01
        </br>
    </span>
    <th class="sc" data-coltype="other"/>
</br>
</th>
<tbody>
    <tr class="rname" itemscope=""
itemtype="http://schema.org/Place" onclick="javascript:sym('36005')">
        <td class="rname" data-area="108.91" data-density="13021.75"
data-wd="Q18426" data-wiki="The Bronx" id="i36005">
            <a href="javascript:sym('36005')">
                <span itemprop="name">
                    Bronx
                </span>
            </a>
        </td>
        <td class="rstatus">
            Borough
        </td>
        <td class="rpop prio4">
            1,203,789
        </td>
        <td class="rpop prio3">
            1,332,244
        </td>
        <td class="rpop prio2">
            1,384,580
        </td>
        <td class="rpop prio1">
            1,418,207
        </td>
        <td class="sc">
            <a href="/en/usa/newyorkcity/36005__bronx/" itemprop="url">
                →
            </a>
        </td>
    </tr>
    <tr class="rname" itemscope=""
itemtype="http://schema.org/Place" onclick="javascript:sym('36047')">
        <td class="rname" data-area="180.81" data-density="14157.68"
data-wd="Q18419" data-wiki="Brooklyn" id="i36047">
            <a href="javascript:sym('36047')">
                <span itemprop="name">
                    Brooklyn

```

```

        </span>
      </a>
      (
        <span itemprop="name">
          Kings County
        </span>
      )
    </td>
    <td class="rstatus">
      Borough
    </td>
    <td class="rpop prio4">
      2,300,664
    </td>
    <td class="rpop prio3">
      2,465,689
    </td>
    <td class="rpop prio2">
      2,504,721
    </td>
    <td class="rpop prio1">
      2,559,903
    </td>
    <td class="sc">
      <a href="/en/usa/newyorkcity/36047__brooklyn/"
itemprop="url">
        →
      </a>
    </td>
  </tr>
  <tr class="rname" itemscope=""
itemtype="http://schema.org/Place" onclick="javascript:sym('36061')">
    <td class="rname" data-area="58.68" data-density="27756.53"
data-wd="Q11299" data-wiki="Manhattan" id="i36061">
      <a href="javascript:sym('36061')">
        <span itemprop="name">
          Manhattan
        </span>
      </a>
      (
        <span itemprop="name">
          New York County
        </span>
      )
    </td>
    <td class="rstatus">
      Borough
    </td>

```

```

        <td class="rpop prio4">
            1,487,536
        </td>
        <td class="rpop prio3">
            1,538,096
        </td>
        <td class="rpop prio2">
            1,586,381
        </td>
        <td class="rpop prio1">
            1,628,706
        </td>
        <td class="sc">
            <a href="/en/usa/newyorkcity/36061__manhattan/"
itemprop="url">
                →
            </a>
        </td>
    </tr>
    <tr class="rname" itemscope=""
itemtype="http://schema.org/Place" onclick="javascript:sym('36081')">
        <td class="rname" data-area="281.71" data-density="8000.69"
data-wd="Q18424" data-wiki="Queens" id="i36081">
            <a href="javascript:sym('36081')">
                <span itemprop="name">
                    Queens
                </span>
            </a>
        </td>
        <td class="rstatus">
            Borough
        </td>
        <td class="rpop prio4">
            1,951,598
        </td>
        <td class="rpop prio3">
            2,229,394
        </td>
        <td class="rpop prio2">
            2,230,619
        </td>
        <td class="rpop prio1">
            2,253,858
        </td>
        <td class="sc">
            <a href="/en/usa/newyorkcity/36081__queens/"
itemprop="url">
                →

```

```

        </a>
      </td>
    </tr>
    <tr class="rname" itemscope=""
itemtype="http://schema.org/Place" onclick="javascript:sym('36085')">
      <td class="rname" data-area="150.68" data-density="3159.96"
data-wd="Q18432" data-wiki="Staten Island" id="i36085">
        <a href="javascript:sym('36085')">
          <span itemprop="name">
            Staten Island
          </span>
        </a>
        (
          <span itemprop="name">
            Richmond County
          </span>
        )
      </td>
      <td class="rstatus">
        Borough
      </td>
      <td class="rpop prio4">
        378,977
      </td>
      <td class="rpop prio3">
        443,762
      </td>
      <td class="rpop prio2">
        468,730
      </td>
      <td class="rpop prio1">
        476,143
      </td>
      <td class="sc">
        <a href="/en/usa/newyorkcity/36085__staten_island/"
itemprop="url">
          →
        </a>
      </td>
    </tr>
  </tbody>
  <tbody class="admin0">
    <tr>
      <td class="rname">
        New York City
      </td>
      <td class="rstatus">
        City

```

```

</td>
<td class="rpop prio4">
  7,322,564
</td>
<td class="rpop prio3">
  8,009,185
</td>
<td class="rpop prio2">
  8,175,031
</td>
<td class="rpop prio1">
  8,336,817
</td>
<td class="sc"/>
</tr>
</tbody>
</br>
<section id="sourcesection">
  <p class="source">
    <strong>
      Source:
    </strong>
    U.S. Census Bureau (web).
  </p>
</section>
<hr id="hraddinfo">
<h3>
  Further information about the population structure:
</h3>
<div id="chartgrid">
  <section class="addinfo">
    <div class="addchart" id="addchart0"/>
    <table class="data">
      <thead>
        <tr>
          <th colspan="2">
            Gender (E 2019)
          </th>
        </tr>
      </thead>
      <tbody>
        <tr>
          <td>
            Males
          </td>
          <td class="rpop">
            3,978,439
          </td>
        </tr>
      </tbody>
    </table>
  </section>
</div>

```

```

</tr>
<tr>
  <td>
    Females
  </td>
  <td class="rpop">
    4,358,378
  </td>
</tr>
</tbody>
</table>
</section>
<section class="addinfo">
  <div class="addchart" id="addchart1"/>
  <table class="data">
    <thead>
      <tr>
        <th colspan="2">
          Age Groups (E 2019)
        </th>
      </tr>
    </thead>
    <tbody>
      <tr>
        <td>
          0-14 years
        </td>
        <td class="rpop">
          1,451,817
        </td>
      </tr>
      <tr>
        <td>
          15-64 years
        </td>
        <td class="rpop">
          5,604,595
        </td>
      </tr>
      <tr>
        <td>
          65+ years
        </td>
        <td class="rpop">
          1,280,405
        </td>
      </tr>
    </tbody>
  </table>

```



```

</table>
</section>
<section class="addinfo">
  <div class="addchart" id="addchart2"/>
  <table class="data">
    <thead>
      <tr>
        <th colspan="2">
          Age Distribution (E 2019)
        </th>
      </tr>
    </thead>
    <tbody>
      <tr>
        <td>
          0-9 years
        </td>
        <td class="rpop">
          1,008,031
        </td>
      </tr>
      <tr>
        <td>
          10-19 years
        </td>
        <td class="rpop">
          883,550
        </td>
      </tr>
      <tr>
        <td>
          20-29 years
        </td>
        <td class="rpop">
          1,273,671
        </td>
      </tr>
      <tr>
        <td>
          30-39 years
        </td>
        <td class="rpop">
          1,335,563
        </td>
      </tr>
      <tr>
        <td>
          40-49 years

```

```

        </td>
        <td class="rpop">
            1,043,319
        </td>
    </tr>
    <tr>
        <td>
            50-59 years
        </td>
        <td class="rpop">
            1,033,138
        </td>
    </tr>
    <tr>
        <td>
            60-69 years
        </td>
        <td class="rpop">
            878,204
        </td>
    </tr>
    <tr>
        <td>
            70-79 years
        </td>
        <td class="rpop">
            543,337
        </td>
    </tr>
    <tr>
        <td>
            80+ years
        </td>
        <td class="rpop">
            338,004
        </td>
    </tr>
</tbody>
</table>
</section>
<section class="addinfo">
    <div class="addchart" id="addchart3"/>
    <table class="data">
        <thead>
            <tr>
                <th colspan="2">
                    »Race« (E 2019)
                </th>
            </tr>
        </thead>
    </table>

```

```

</tr>
</thead>
<tbody>
<tr>
<td>
White
</td>
<td class="rpop">
4,393,042
</td>
</tr>
<tr>
<td>
Black/African American
</td>
<td class="rpop">
2,093,874
</td>
</tr>
<tr>
<td>
Indigenous
</td>
<td class="rpop">
116,497
</td>
</tr>
<tr>
<td>
Asian
</td>
<td class="rpop">
1,256,584
</td>
</tr>
<tr>
<td>
Pacific Islander
</td>
<td class="rpop">
17,682
</td>
</tr>
<tr>
<td>
2 or more
</td>
<td class="rpop">

```

```

                258,314
            </td>
        </tr>
    </tbody>
</table>
</section>
<section class="addinfo">
    <div class="addchart" id="addchart4"/>
    <table class="data">
        <thead>
            <tr>
                <th colspan="2">
                    Ethnicity (E 2019)
                </th>
            </tr>
        </thead>
        <tbody>
            <tr>
                <td>
                    Hispanic or Latino
                </td>
                <td class="rpop">
                    2,423,590
                </td>
            </tr>
            <tr>
                <td>
                    Other
                </td>
                <td class="rpop">
                    5,913,227
                </td>
            </tr>
        </tbody>
    </table>
</section>
</div>
<script>
    var addChartData = [{"name":"Gender","type":"pie","data":[[{"G
ender","Persons"], [{"Males",3978439}, {"Females",4358378}]}],
{"name":"Age Groups","type":"pie","data":[[{"Age Groups","Persons"}, {"0-14
years",1451817}, {"15-64 years",5604595}, {"65+ years",1280405}]}],
{"name":"Age Distribution","type":"column","data":[[{"Age
Distribution","Persons"}, {"0-9 years",1008031}, {"10-19 years",883550}, {"20-29
years",1273671}, {"30-39 years",1335563}, {"40-49 years",1043319}, {"50-59
years",1033138}, {"60-69 years",878204}, {"70-79 years",543337}, {"80+
years",338004}]}],
{"name": ">Race<", "type": "pie", "data": [[ ">Race<", "Persons"], ["White",4393042], ["B

```

```

lack/African
American",2093874],[["Indigenous",116497],[["Asian",1256584],[["Pacific
Islander",17682],[["2 or more",258314]]}],
{"name":"Ethnicity","type":"pie","data":[["Ethnicity","Persons"],["Hispanic or
Latino",2423590],[["Other",5913227]]}]
</script>
<script>
    var addMapData = ["genderM","genderF","ageX","ageX","age0"];
var addMapMetadata = [{ "maptype":"genderM", "date":"E 2019-07-01" },{
"maptype":"ageX", "date":"E 2019-07-01" }]
</script>
<div class="mobiadv">
    <script>
        show_mobiadv()
    </script>
</div>
<div id="advhor">
    <script>
        show_adv('h');
    </script>
</div>
<hr>
<section class="ytvideosec">
    <h2>
        Greater New York: COVID-19 cases, incidence rates and
growth by counties
    </h2>
    <iframe allow="accelerometer; autoplay; encrypted-media;
gyroscope; picture-in-picture" class="ytvideo"
src="https://www.youtube.com/embed/mKAGHkMhlXU"/>
    </section>
    <script>
        writeFooter('2020-07-11')
    </script>
</hr>
<div id="admmmap" itemprop="geo" itemscope=""
itemtype="http://schema.org/GeoCoordinates">
    <meta content="40.705" itemprop="latitude">
    <meta content="-73.975" itemprop="longitude">
    <div id="mapcontainer">
        <div id="mapdiv">
            <div id="maplconrl"/>
            <div id="maprconrl"/>
        </div>
    </div>
</meta>
<div id="alert"/>
<div id="helpdiv"/>

```

```

        <div id="adv">
            <script>
                show_adv();
            </script>
        </div>
        <script>
            var startChartID = "NYC"; var startChartType = "adm1";
            var minlat = 40.49; var minlng = -74.26; var maxlat = 40.92; var maxlng
= -73.69;
            var admCount = { "adm1": 5, "adm2": 0 };
            if (cp.getVizMode() == cp.VIZMODE_DESKTOP) cp.social.addSocial(false);
        </script>
        </meta>
    </div>
    <!-- create time: 0.0037448406219482 countries -->
    <!-- cache time: 0.00015115737915039 -->
    </hr>
    </th>
    </br>
    </th>
    </br>
    </th>
    </tr>
    </thead>
    </table>
    </p>
    </header>
    </article>
    </div>
    </body>
    </meta>
    </meta>
    </head>
</html>

```

```

[20]: NYC_table = pd.read_html('https://www.citypopulation.de/en/usa/newyorkcity/')
      NYC=NYC_table[0]
      NYC.head()

```

```

[20]:
      Name      Status  PopulationCensus1990-04-01  \
0      Bronx  Borough      1203789
1  Brooklyn (Kings County)  Borough      2300664
2  Manhattan (New York County)  Borough      1487536
3      Queens  Borough      1951598
4  Staten Island (Richmond County)  Borough      378977

```

```

      PopulationCensus2000-04-01  PopulationCensus2010-04-01  \

```

0	1332244	1384580
1	2465689	2504721
2	1538096	1586381
3	2229394	2230619
4	443762	468730

	PopulationEstimate2019-07-01	Unnamed: 6
0	1418207	→
1	2559903	→
2	1628706	→
3	2253858	→
4	476143	→

```
[21]: NYC.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6 entries, 0 to 5
Data columns (total 7 columns):
#   Column                                Non-Null Count  Dtype
---  -
0   Name                                  6 non-null     object
1   Status                               6 non-null     object
2   PopulationCensus1990-04-01           6 non-null     int64
3   PopulationCensus2000-04-01           6 non-null     int64
4   PopulationCensus2010-04-01           6 non-null     int64
5   PopulationEstimate2019-07-01         6 non-null     int64
6   Unnamed: 6                           5 non-null     object
dtypes: int64(4), object(3)
memory usage: 464.0+ bytes
```

```
[22]: NYC.columns = ['Borough',
                    'Status', 'Population-1990', 'Population-2000', 'Population-2010', 'Population-2019', 'Unnamed']
NYC.head()
```

	Borough	Status	Population-1990	Population-2000	\
0	Bronx	Borough	1203789	1332244	
1	Brooklyn (Kings County)	Borough	2300664	2465689	
2	Manhattan (New York County)	Borough	1487536	1538096	
3	Queens	Borough	1951598	2229394	
4	Staten Island (Richmond County)	Borough	378977	443762	

	Population-2010	Population-2019	Unnamed
0	1384580	1418207	→
1	2504721	2559903	→
2	1586381	1628706	→
3	2230619	2253858	→
4	468730	476143	→

```
[23]: NYC_Census=NYC.
      ↪drop(['Unnamed', 'Population-1990', 'Population-2000', 'Population-2010'],
      ↪axis=1)
      NYC_Census.head()
```

```
[23]:
```

	Borough	Status	Population-2019
0	Bronx	Borough	1418207
1	Brooklyn (Kings County)	Borough	2559903
2	Manhattan (New York County)	Borough	1628706
3	Queens	Borough	2253858
4	Staten Island (Richmond County)	Borough	476143

```
[24]: NYC_Census=NYC_Census.rename(columns={'B': 'Borough'})
```

```
[25]: NYC_Census.head()
```

```
[25]:
```

	Borough	Status	Population-2019
0	Bronx	Borough	1418207
1	Brooklyn (Kings County)	Borough	2559903
2	Manhattan (New York County)	Borough	1628706
3	Queens	Borough	2253858
4	Staten Island (Richmond County)	Borough	476143

```
[26]: NYC_Census["Borough"].replace({"Bronx": "BRONX",
                                     "Brooklyn (Kings County)": "BROOKLYN",
                                     "Manhattan (New York County)": "MANHATTAN",
                                     "Queens": "QUEENS",
                                     "Staten Island (Richmond County)": "STATEN_
                                     ↪ISLAND",
                                     "New York City": "NYC"}, inplace=True)
```

```
[27]: print(NYC_Census)
```

	Borough	Status	Population-2019
0	BRONX	Borough	1418207
1	BROOKLYN	Borough	2559903
2	MANHATTAN	Borough	1628706
3	QUEENS	Borough	2253858
4	STATEN ISLAND	Borough	476143
5	NYC	City	8336817

```
[28]: NYC_Crime_Table = pd.merge(NYPD_crime, NYC_Census, on='Borough')
      NYC_Crime_Table.head()
```

```
[28]:
```

	Borough	Felony	Misdemeanor	Violation	Total	Status	\
0	BRONX	30356	57102	17367	104825	Borough	
1	BROOKLYN	46631	70504	21247	138382	Borough	

2	MANHATTAN	38903	66785	15862	121550	Borough
3	QUEENS	31369	49857	15975	97201	Borough
4	STATEN ISLAND	5059	10727	4217	20003	Borough

	Population-2019
0	1418207
1	2559903
2	1628706
3	2253858
4	476143

```
[29]: NYC_Crime_Table = NYC_Crime_Table[['Borough', 'Felony', 'Misdemeanor', 'Violation',
                                         'Status', 'Population-2019', 'Total']]
NYC_Crime_Table
```

[29]:	Borough	Felony	Misdemeanor	Violation	Status	Population-2019	\
0	BRONX	30356	57102	17367	Borough	1418207	
1	BROOKLYN	46631	70504	21247	Borough	2559903	
2	MANHATTAN	38903	66785	15862	Borough	1628706	
3	QUEENS	31369	49857	15975	Borough	2253858	
4	STATEN ISLAND	5059	10727	4217	Borough	476143	

	Total
0	104825
1	138382
2	121550
3	97201
4	20003

```
[30]: NYC_Crime_Table.describe()
```

[30]:		Felony	Misdemeanor	Violation	Population-2019	\
count	5.000000	5.000000	5.000000	5.000000	5.000000e+00	
mean	30463.600000	50995.000000	14933.600000	1.667363e+06		
std	15643.156037	23927.115883	6375.194334	8.098120e+05		
min	5059.000000	10727.000000	4217.000000	4.761430e+05		
25%	30356.000000	49857.000000	15862.000000	1.418207e+06		
50%	31369.000000	57102.000000	15975.000000	1.628706e+06		
75%	38903.000000	66785.000000	17367.000000	2.253858e+06		
max	46631.000000	70504.000000	21247.000000	2.559903e+06		

	Total
count	5.000000
mean	96392.200000
std	45560.768087
min	20003.000000
25%	97201.000000

```

50%    104825.000000
75%    121550.000000
max     138382.000000

```

```

[31]: NYC_Crime_Table.sort_values(['Total'], ascending = False, axis = 0, inplace =
      ↪ True )
NYC_Crime_Table

```

```

[31]:
      Borough  Felony  Misdemeanor  Violation  Status  Population-2019  \
1    BROOKLYN   46631         70504      21247  Borough      2559903
2    MANHATTAN   38903         66785      15862  Borough      1628706
0     BRONX     30356         57102      17367  Borough      1418207
3     QUEENS    31369         49857      15975  Borough      2253858
4  STATEN ISLAND   5059         10727       4217  Borough      476143

      Total
1  138382
2  121550
0  104825
3   97201
4   20003

```

```

[32]: import matplotlib.pyplot as plt
NYC_V = NYC_Crime_Table[['Borough','Total']]

NYC_V.set_index('Borough',inplace = True)

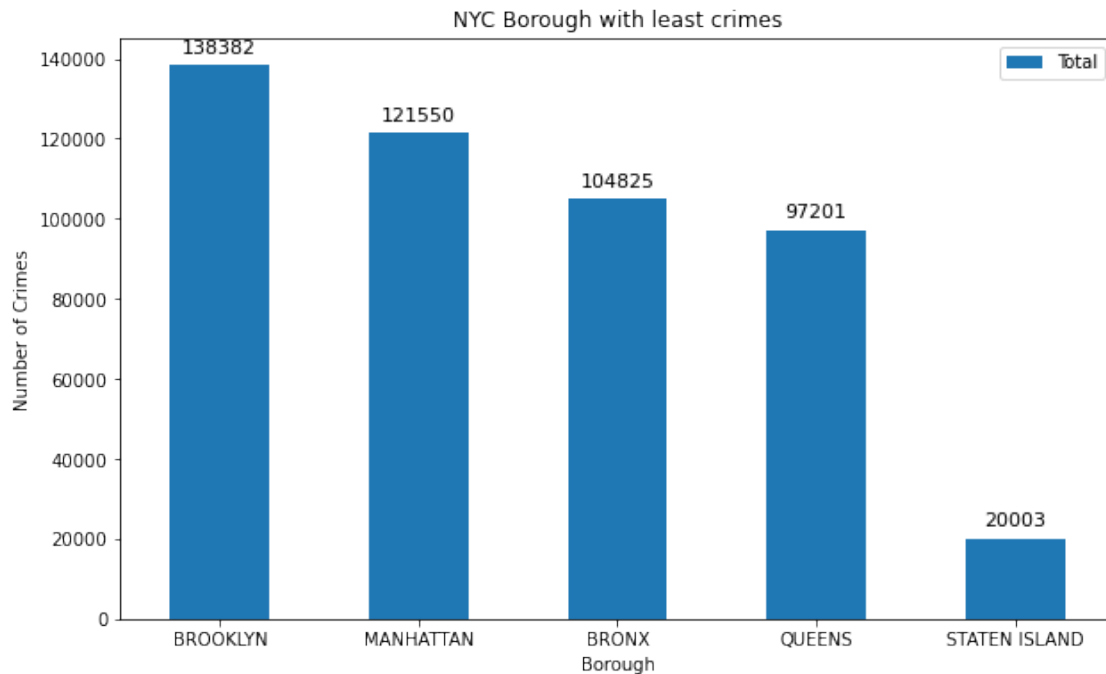
a = NYC_V.plot(kind='bar', figsize=(10, 6), rot=0)

a.set_ylabel('Number of Crimes')
a.set_xlabel('Borough')
a.set_title('NYC Borough with least crimes')

for p in a.patches:
    a.annotate(np.round(p.get_height(),decimals=2),
               (p.get_x()+p.get_width()/2., p.get_height()),
               ha='center',
               va='center',
               xytext=(0, 10),
               textcoords='offset points',
               fontsize = 11
              )

plt.show()

```



```
[33]: NYC_V1 = NYC_Crime_Table[NYC_Crime_Table['Borough'] == 'STATEN ISLAND']

NYC = NYC_V1[['Borough','Felony','Misdemeanor','Violation',
              'Status','Total']]

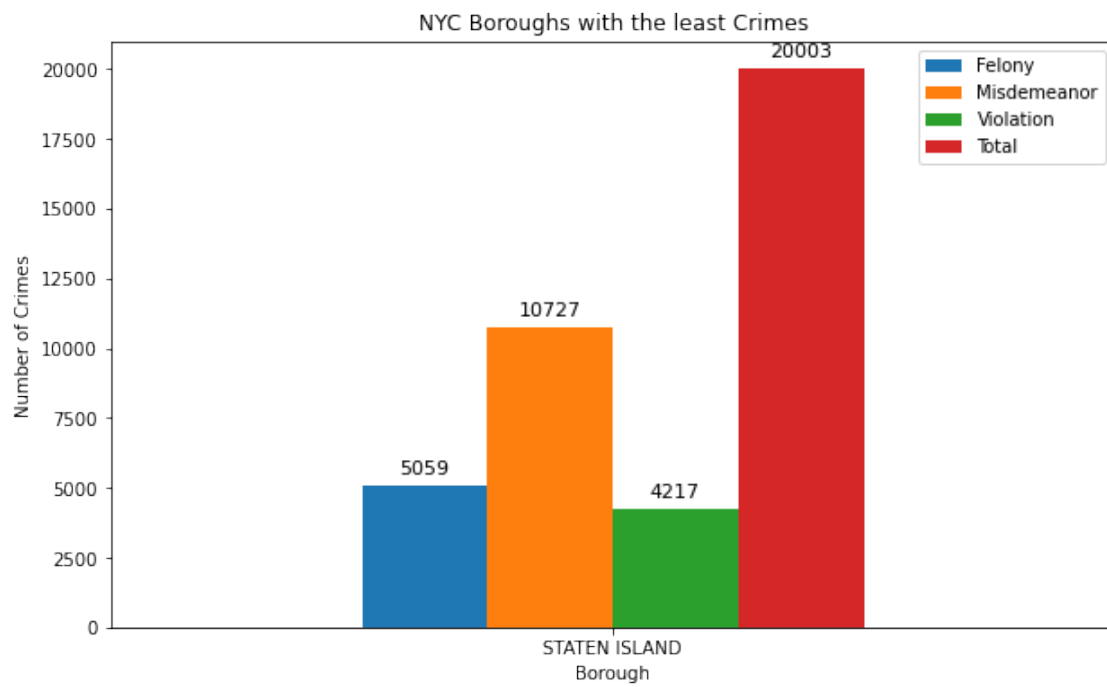
NYC.set_index('Borough',inplace = True)

a = NYC.plot(kind='bar', figsize=(10, 6), rot=0)

a.set_ylabel('Number of Crimes')
a.set_xlabel('Borough')
a.set_title('NYC Boroughs with the least Crimes')

for p in a.patches:
    a.annotate(np.round(p.get_height(),decimals=2),
               (p.get_x()+p.get_width()/2., p.get_height()),
               ha='center',
               va='center',
               xytext=(0, 10),
               textcoords='offset points',
               fontsize = 11
    )
```

```
plt.show()
```



Part II

1. Downloading the Data to Explore

```
[1]: import numpy as np
import pandas as pd
import json

print('Libraries imported.')
```

Libraries imported.

```
[2]: !wget -q -O 'newyork_data.json' https://cocl.us/new_york_dataset
print('Data downloaded!')
```

Data downloaded!

```
[3]: with open('newyork_data.json') as json_data:
    newyork_data = json.load(json_data)
```

```
[ ]: newyork_data
```

```
[4]: neighborhoods_data = newyork_data['features']
```

```
[5]: neighborhoods_data[0]
```

```
[5]: {'type': 'Feature',
      'id': 'nyu_2451_34572.1',
      'geometry': {'type': 'Point',
                   'coordinates': [-73.84720052054902, 40.89470517661]},
      'geometry_name': 'geom',
      'properties': {'name': 'Wakefield',
                     'stacked': 1,
                     'annoline1': 'Wakefield',
                     'annoline2': None,
                     'annoline3': None,
                     'annoangle': 0.0,
                     'borough': 'Bronx',
                     'bbox': [-73.84720052054902,
                              40.89470517661,
```

```
-73.84720052054902,  
40.89470517661]]}]}
```

```
[6]: column_names = ['Borough', 'Neighborhood', 'Latitude', 'Longitude']  
  
neighborhoods = pd.DataFrame(columns=column_names)
```

```
[7]: neighborhoods
```

```
[7]: Empty DataFrame  
Columns: [Borough, Neighborhood, Latitude, Longitude]  
Index: []
```

```
[8]: for data in neighborhoods_data:  
    borough = neighborhood_name = data['properties']['borough']  
    neighborhood_name = data['properties']['name']  
  
    neighborhood_latlon = data['geometry']['coordinates']  
    neighborhood_lat = neighborhood_latlon[1]  
    neighborhood_lon = neighborhood_latlon[0]  
  
    neighborhoods = neighborhoods.append({'Borough': borough,  
                                         'Neighborhood': neighborhood_name,  
                                         'Latitude': neighborhood_lat,  
                                         'Longitude': neighborhood_lon},  
                                         ignore_index=True)
```

```
[9]: neighborhoods.head()
```

```
[9]:   Borough Neighborhood  Latitude  Longitude  
0   Bronx    Wakefield  40.894705  -73.847201  
1   Bronx    Co-op City  40.874294  -73.829939  
2   Bronx    Eastchester 40.887556  -73.827806  
3   Bronx    Fieldston  40.895437  -73.905643  
4   Bronx    Riverdale  40.890834  -73.912585
```

```
[10]: print('The dataframe has {} boroughs and {} neighborhoods.'.format(  
        len(neighborhoods['Borough'].unique()),  
        neighborhoods.shape[0]  
    )  
)
```

The dataframe has 5 boroughs and 306 neighborhoods.

```
[11]: !conda install -c conda-forge geopy --yes  
from geopy.geocoders import Nominatim  
address = 'New York City, NY'
```

```

geolocator = Nominatim(user_agent="ny_explorer")
location = geolocator.geocode(address)
latitude = location.latitude
longitude = location.longitude
print('The geograpical coordinate of New York City are {}, {}.'.
      ↪format(latitude, longitude))

```

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-2.0.0	pyh9f0ad1d_0	63 KB	conda-forge
openssl-1.1.1g	h516909a_1	2.1 MB	conda-forge
Total:		2.2 MB	

The following NEW packages will be INSTALLED:

geographiclib	conda-forge/noarch::geographiclib-1.50-py_0
geopy	conda-forge/noarch::geopy-2.0.0-pyh9f0ad1d_0

The following packages will be UPDATED:

openssl	anaconda::openssl-1.1.1g-h7b6447c_0 --> conda-forge::openssl-1.1.1g-h516909a_1
---------	--

The following packages will be SUPERSEDED by a higher-priority channel:

ca-certificates	anaconda::ca-certificates-2020.6.24-0 --> conda-forge::ca-certificates-2020.6.20-hecda079_0
certifi	anaconda::certifi-2020.6.20-py36_0 --> conda-forge::certifi-2020.6.20-py36h9f0ad1d_0

Downloading and Extracting Packages

```
openssl-1.1.1g      | 2.1 MB      | ##### | 100%
geographiclib-1.50  | 34 KB       | ##### | 100%
geopy-2.0.0         | 63 KB       | ##### | 100%
```

Preparing transaction: done

Verifying transaction: done

Executing transaction: done

The geographical coordinate of New York City are 40.7127281, -74.0060152.

```
[ ]: !conda install -c conda-forge folium=0.5.0 --yes
import folium

map_newyork = folium.Map(location=[latitude, longitude], zoom_start=10)

# add markers to map
for lat, lng, borough, neighborhood in zip(neighborhoods['Latitude'],
↳neighborhoods['Longitude'], neighborhoods['Borough'],
↳neighborhoods['Neighborhood']):
    label = '{} {}'.format(neighborhood, borough)
    label = folium.Popup(label, parse_html=True)
    folium.CircleMarker(
        [lat, lng],
        radius=5,
        popup=label,
        color='blue',
        fill=True,
        fill_color='#3186cc',
        fill_opacity=0.7,
        parse_html=False).add_to(map_newyork)

map_newyork
```

2. Exploring the Neighborhood of Staten Island our safest borough.

```
[12]: Staten_Island = neighborhoods[neighborhoods['Borough'] == 'Staten Island'].
↳reset_index(drop=True)
Staten_Island.head()
```

```
[12]:
```

	Borough	Neighborhood	Latitude	Longitude
0	Staten Island	St. George	40.644982	-74.079353
1	Staten Island	New Brighton	40.640615	-74.087017
2	Staten Island	Stapleton	40.626928	-74.077902
3	Staten Island	Rosebank	40.615305	-74.069805
4	Staten Island	West Brighton	40.631879	-74.107182


```
[13]: address = 'Staten Island, NY'

geolocator = Nominatim(user_agent="ny_explorer")
location = geolocator.geocode(address)
latitude = location.latitude
longitude = location.longitude
print('The geograpical coordinate of Staten Island are {}, {}.'.
      ↪format(latitude, longitude))
```

The geograpical coordinate of Staten Island are 40.5834557, -74.1496048.

```
[ ]: # create map of Staten island using latitude and longitude values
map_statenisland = folium.Map(location=[latitude, longitude], zoom_start=11)

# add markers to map
for lat, lng, label in zip(Staten_Island['Latitude'], ↪
      ↪Staten_Island['Longitude'], Staten_Island['Neighborhood']):
    label = folium.Popup(label, parse_html=True)
    folium.CircleMarker(
        [lat, lng],
        radius=5,
        popup=label,
        color='blue',
        fill=True,
        fill_color='#3186cc',
        fill_opacity=0.7,
        parse_html=False).add_to(map_statenisland)

map_statenisland
```

```
[14]: CLIENT_ID = 'X5DC02PSOJVYTXTIHFY2PGAGVOQZRAUZK3LLRJLWR3IBLLCP'
CLIENT_SECRET = 'MOQER4RYNVWEFMV3CC3NOVAV4KSAPU5E5FE33QIBGJLGCANR'

VERSION = '20180604'
LIMIT = 30

print('Your credentails:')
print('CLIENT_ID: ' + CLIENT_ID)
print('CLIENT_SECRET: ' + CLIENT_SECRET)
```

Your credentails:

CLIENT_ID: X5DC02PSOJVYTXTIHFY2PGAGVOQZRAUZK3LLRJLWR3IBLLCP

CLIENT_SECRET:MOQER4RYNVWEFMV3CC3NOVAV4KSAPU5E5FE33QIBGJLGCANR

```
[15]: Staten_Island.loc[0, 'Neighborhood']
```

```
[15]: 'St. George'
```

```
[16]: neighborhood_latitude = Staten_Island.loc[0, 'Latitude'] # neighborhood
      ↪ latitude value
neighborhood_longitude = Staten_Island.loc[0, 'Longitude'] # neighborhood
      ↪ longitude value

neighborhood_name = Staten_Island.loc[0, 'Neighborhood'] # neighborhood name

print('Latitude and longitude values of {} are {}, {}'.format(neighborhood_name,
      ↪ neighborhood_latitude,
      ↪ neighborhood_longitude))
```

Latitude and longitude values of St. George are 40.6449815710044,
-74.07935312512797.

```
[17]: radius = 500 # define radius
LIMIT = 100 # limit of number of venues returned by Foursquare API
url = 'https://api.foursquare.com/v2/venues/explore?
      ↪ &client_id={} &client_secret={} &v={} &ll={}, {} &radius={} &limit={}'.format(
      CLIENT_ID,
      CLIENT_SECRET,
      VERSION,
      neighborhood_latitude,
      neighborhood_longitude,
      radius,
      LIMIT)
url
```

```
[17]: 'https://api.foursquare.com/v2/venues/explore?&client_id=X5DC02PS0JVYTXTHFY2PGA
      GVOQZRAUZK3LLRJLWR3IBLLCP&client_secret=MOQER4RYNVWEFMV3CC3NOVAV4KSAPU5E5FE33QIB
      GJLGCANR&v=20180604&ll=40.6449815710044,-74.07935312512797&radius=500&limit=100'
```

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

```
[18]: {'meta': {'code': 200, 'requestId': '5f24c280d46d721c6523aebf'},
      'response': {'suggestedFilters': {'header': 'Tap to show:',
      'filters': [{'name': 'Open now', 'key': 'openNow'},
      {'name': '$-$$$$', 'key': 'price'}]},
      'headerLocation': 'Current map view',
      'headerFullLocation': 'Current map view',
      'headerLocationGranularity': 'unknown',
      'totalResults': 37,
      'suggestedBounds': {'ne': {'lat': 40.6494815755044,
```

```

    'lng': -74.07343346476772},
    'sw': {'lat': 40.6404815665044, 'lng': -74.08527278548821}},
    'groups': [{'type': 'Recommended Places',
        'name': 'recommended',
        'items': [{'reasons': {'count': 0,
            'items': [{'summary': 'This spot is popular',
                'type': 'general',
                'reasonName': 'globalInteractionReason'}]}]},
        'venue': {'id': '4a214841f964a520cd7c1fe3',
            'name': 'Beso',
            'location': {'address': '11 Schuyler St',
                'crossStreet': 'btwn Richmond Terrace & Stuyvesant Pl',
                'lat': 40.64330638739738,
                'lng': -74.07650808873225,
                'labeledLatLngs': [{'label': 'display',
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                    'lng': -74.07650808873225},
                    {'label': 'entrance', 'lat': 40.643278, 'lng': -74.07686}],
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                'postalCode': '10301',
                'cc': 'US',
                'city': 'Staten Island',
                'state': 'NY',
                'country': 'United States',
                'formattedAddress': ['11 Schuyler St (btwn Richmond Terrace & Stuyvesant
Pl)',
                    'Staten Island, NY 10301',
                    'United States']},
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                'name': 'Tapas Restaurant',
                'pluralName': 'Tapas Restaurants',
                'shortName': 'Tapas',
                'icon': {'prefix':
'https://ss3.4sqi.net/img/categories_v2/food/tapas_',
                    'suffix': '.png'},
                'primary': True}],
            'delivery': {'id': '2027805',
                'url': 'https://www.seamless.com/menu/beso-11-schuyler-street-staten-
island/2027805?affiliate=1131&utm_source=foursquare-affiliate-
network&utm_medium=affiliate&utm_campaign=1131&utm_content=2027805',
                'provider': {'name': 'seamless',
                    'icon': {'prefix': 'https://fastly.4sqi.net/img/general/cap/',
                        'sizes': [40, 50],
                        'name': '/delivery_provider_seamless_20180129.png'}}},
            'photos': {'count': 0, 'groups': []}},
            'referralId': 'e-0-4a214841f964a520cd7c1fe3-0'},
        {'reasons': {'count': 0,

```

```

    'items': [{ 'summary': 'This spot is popular',
                  'type': 'general',
                  'reasonName': 'globalInteractionReason' } ] },
    'venue': { 'id': '4bb6924c46d4a5938e7ac6c0',
                'name': 'A&S Pizzeria',
                'location': { 'address': '87 Stuyvesant Pl',
                              'crossStreet': 'Wall st',
                              'lat': 40.64393953223924,
                              'lng': -74.0776259226109,
                              'labeledLatLngs': [ { 'label': 'display',
                                                       'lat': 40.64393953223924,
                                                       'lng': -74.0776259226109 },
                                                    { 'label': 'entrance', 'lat': 40.643963, 'lng': -74.077595 } ] },
                'distance': 186,
                'postalCode': '10301',
                'cc': 'US',
                'city': 'Staten Island',
                'state': 'NY',
                'country': 'United States',
                'formattedAddress': [ '87 Stuyvesant Pl (Wall st)',
                                      'Staten Island, NY 10301',
                                      '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 } ],
    'photos': { 'count': 0, 'groups': [] },
    'referralId': 'e-0-4bb6924c46d4a5938e7ac6c0-1' },
    'reasons': { 'count': 0,
                  'items': [ { 'summary': 'This spot is popular',
                                'type': 'general',
                                'reasonName': 'globalInteractionReason' } ] },
    'venue': { 'id': '4bf9c5c08d30d13a6bce0218',
                'name': 'Staten Island September 11 Memorial',
                'location': { 'lat': 40.64676748643786,
                              'lng': -74.07650993161968,
                              'labeledLatLngs': [ { 'label': 'display',
                                                       'lat': 40.64676748643786,
                                                       'lng': -74.07650993161968 } ] },
                'distance': 311,
                'postalCode': '10301',
                'cc': 'US',
                'city': 'Staten Island',

```

```

    'state': 'NY',
    'country': 'United States',
    'formattedAddress': ['Staten Island, NY 10301', 'United States']],
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        'pluralName': 'Monuments / Landmarks',
        'shortName': 'Landmark',
        'icon': { 'prefix':
'https://ss3.4sqi.net/img/categories_v2/building/government_monument_',
        'suffix': '.png'},
        'primary': True}],
    'photos': { 'count': 0, 'groups': []},
    'referralId': 'e-0-4bf9c5c08d30d13a6bce0218-2'},
    { 'reasons': { 'count': 0,
        'items': [{ 'summary': 'This spot is popular',
            'type': 'general',
            'reasonName': 'globalInteractionReason' } ]},
    'venue': { 'id': '4e62c75a483bd9a9747d8cd8',
        'name': 'Richmond County Bank Ballpark',
        'location': { 'address': '75 Richmond Ter',
            'crossStreet': 'at Wall St',
            'lat': 40.645055836227534,
            'lng': -74.07686368914352,
            'labeledLatLngs': [{ 'label': 'display',
                'lat': 40.645055836227534,
                'lng': -74.07686368914352 } ]},
        'distance': 210,
        'postalCode': '10301',
        'cc': 'US',
        'city': 'Staten Island',
        'state': 'NY',
        'country': 'United States',
        'formattedAddress': ['75 Richmond Ter (at Wall St)',
            'Staten Island, NY 10301',
            'United States' ]},
    'categories': [{ 'id': '4bf58dd8d48988d18c941735',
        'name': 'Baseball Stadium',
        'pluralName': 'Baseball Stadiums',
        'shortName': 'Baseball',
        'icon': { 'prefix':
'https://ss3.4sqi.net/img/categories_v2/arts_entertainment/stadium_baseball_',
        'suffix': '.png'},
        'primary': True}],
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    'venuePage': { 'id': '32831204' },
    'referralId': 'e-0-4e62c75a483bd9a9747d8cd8-3'},
    { 'reasons': { 'count': 0,

```

```

    'items': [{ 'summary': 'This spot is popular',
                  'type': 'general',
                  'reasonName': 'globalInteractionReason' } ] ],
    'venue': { 'id': '5df19589ecb0ba00082b90d3',
                'name': 'Shake Shack',
                'location': { 'address': '35 Richmond Terrace, Space 323',
                              'lat': 40.64366,
                              'lng': -74.075891,
                              'labeledLatLngs': [ { 'label': 'display',
                                                       'lat': 40.64366,
                                                       'lng': -74.075891 } ] ],
                'distance': 327,
                'postalCode': '10301',
                'cc': 'US',
                'city': 'Staten Island',
                'state': 'NY',
                'country': 'United States',
                'formattedAddress': [ '35 Richmond Terrace, Space 323',
                                       'Staten Island, NY 10301',
                                       'United States' ] ],
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                                   'name': 'Burger Joint',
                                   'pluralName': 'Burger Joints',
                                   'shortName': 'Burgers',
                                   'icon': { 'prefix':
'https://ss3.4sqi.net/img/categories_v2/food/burger_',
                                   'suffix': '.png' },
                                   'primary': True } ],
                'delivery': { 'id': '1532403',
                              'url': 'https://www.seamless.com/menu/shake-shack-35-richmond-ter-
staten-island/1532403?affiliate=1131&utm_source=foursquare-affiliate-
network&utm_medium=affiliate&utm_campaign=1131&utm_content=1532403',
                              'provider': { 'name': 'seamless',
                                             'icon': { 'prefix': 'https://fastly.4sqi.net/img/general/cap/',
                                                         'sizes': [40, 50],
                                                         'name': '/delivery_provider_seamless_20180129.png' } } },
                              'photos': { 'count': 0, 'groups': [ ] } ],
                'referralId': 'e-0-5df19589ecb0ba00082b90d3-4' },
    { 'reasons': { 'count': 0,
                  'items': [ { 'summary': 'This spot is popular',
                                'type': 'general',
                                'reasonName': 'globalInteractionReason' } ] ],
      'venue': { 'id': '42644a00f964a5202b211fe3',
                  'name': 'Ruddy & Dean',
                  'location': { 'address': '44 Richmond Ter',
                                'lat': 40.64407377863496,
                                'lng': -74.07668273426954,

```

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    'labeledLatLngs': [{'label': 'display',
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      'lng': -74.07668273426954}],
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    'postalCode': '10301',
    'cc': 'US',
    'city': 'Staten Island',
    'state': 'NY',
    'country': 'United States',
    'formattedAddress': ['44 Richmond Ter',
      'Staten Island, NY 10301',
      'United States']],
    'categories': [{'id': '4bf58dd8d48988d116941735',
      'name': 'Bar',
      'pluralName': 'Bars',
      'shortName': 'Bar',
      'icon': {'prefix':
'https://ss3.4sqi.net/img/categories_v2/nightlife/pub_',
      'suffix': '.png'},
      'primary': True}],
    'photos': {'count': 0, 'groups': []},
    'referralId': 'e-0-42644a00f964a5202b211fe3-5'},
    {'reasons': {'count': 0,
      'items': [{'summary': 'This spot is popular',
        'type': 'general',
        'reasonName': 'globalInteractionReason'}]}},
    'venue': {'id': '590928301de7651d663ae087',
      'name': "Marie's 2",
      'location': {'address': '5 Hyatt St',
        'lat': 40.642176,
        'lng': -74.076669,
        'labeledLatLngs': [{'label': 'display',
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          'lng': -74.076669}],
        'distance': 385,
        'postalCode': '10301',
        'cc': 'US',
        'city': 'New York',
        'state': 'NY',
        'country': 'United States',
        'formattedAddress': ['5 Hyatt St',
          'New York, NY 10301',
          '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}],
      'photos': {'count': 0, 'groups': []}},
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          'reasonName': 'globalInteractionReason'}]},
        'venue': {'id': '4b6da712f964a52080832ce3',
          'name': 'St. George Theatre',
          'location': {'address': '35 Hyatt St',
            'lat': 40.642253453825425,
            'lng': -74.0774964872446,
            'labeledLatLngs': [{'label': 'display',
              'lat': 40.642253453825425,
              'lng': -74.0774964872446},
                {'label': 'entrance', 'lat': 40.641917, 'lng': -74.077435}],
            'distance': 341,
            'postalCode': '10301',
            'cc': 'US',
            'city': 'Staten Island',
            'state': 'NY',
            'country': 'United States',
            'formattedAddress': ['35 Hyatt St',
              'Staten Island, NY 10301',
              'United States']}],
          'categories': [{'id': '4bf58dd8d48988d137941735',
            'name': 'Theater',
            'pluralName': 'Theaters',
            'shortName': 'Theater',
            'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_enterta
inment/performingarts_theater_',
              'suffix': '.png'},
            'primary': True}],
          'photos': {'count': 0, 'groups': []},
          'venuePage': {'id': '98508518'}},
          'referralId': 'e-0-4b6da712f964a52080832ce3-7'},
          {'reasons': {'count': 0,
            'items': [{'summary': 'This spot is popular',
              'type': 'general',
              'reasonName': 'globalInteractionReason'}]},
            'venue': {'id': '5d30d366e299c90008c07c7c',
              'name': 'Columbia Factory Store',
              'location': {'address': '55 Richmond Ter Ste 209-210',
                'lat': 40.645342,
```



```

'lng': -74.07668699999999,
'labeledLatLngs': [{ 'label': 'display',
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  'lng': -74.07668699999999}],
'distance': 228,
'postalCode': '10301',
'cc': 'US',
'city': 'Staten Island',
'state': 'NY',
'country': 'United States',
'formattedAddress': ['55 Richmond Ter Ste 209-210',
  'Staten Island, NY 10301',
  'United States']],
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  'name': 'Clothing Store',
  'pluralName': 'Clothing Stores',
  'shortName': 'Apparel',
  'icon': { 'prefix':
'https://ss3.4sqi.net/img/categories_v2/shops/apparel_',
  'suffix': '.png'},
  'primary': True}],
'photos': { 'count': 0, 'groups': []},
'referralId': 'e-0-5d30d366e299c90008c07c7c-8'},
'reasons': { 'count': 0,
  'items': [{ 'summary': 'This spot is popular',
  'type': 'general',
  'reasonName': 'globalInteractionReason'}]},
'venue': { 'id': '4a3bc85ef964a520c0a01fe3',
  'name': "Steiny's Pub",
  'location': { 'address': '3 Hyatt St',
  'crossStreet': 'btwn Stuyvesant & St Marks Pl',
  'lat': 40.642185270821706,
  'lng': -74.07659916524223,
  'labeledLatLngs': [{ 'label': 'display',
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  'lng': -74.07659916524223},
  { 'label': 'entrance', 'lat': 40.642277, 'lng': -74.076628}],
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  'postalCode': '10301',
  'cc': 'US',
  'city': 'Staten Island',
  'state': 'NY',
  'country': 'United States',
  'formattedAddress': ['3 Hyatt St (btwn Stuyvesant & St Marks Pl)',
  'Staten Island, NY 10301',
  'United States']],
'categories': [{ 'id': '4bf58dd8d48988d116941735',

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    'name': 'Bar',
    'pluralName': 'Bars',
    'shortName': 'Bar',
    'icon': {'prefix':
'https://ss3.4sqi.net/img/categories_v2/nightlife/pub_',
    'suffix': '.png'},
    'primary': True}],
    'photos': {'count': 0, 'groups': []}},
    'referralId': 'e-0-4a3bc85ef964a520c0a01fe3-9'},
    {'reasons': {'count': 0,
    'items': [{'summary': 'This spot is popular',
    'type': 'general',
    'reasonName': 'globalInteractionReason'}]},
    'venue': {'id': '515b679fe4b053e60388194e',
    'name': 'Hypno-Tronic Comics',
    'location': {'lat': 40.642476023573096,
    'lng': -74.07658737714057,
    'labeledLatLngs': [{'label': 'display',
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    'lng': -74.07658737714057}]},
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    'state': 'NY',
    'country': 'United States',
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    'pluralName': 'Toy / Game Stores',
    'shortName': 'Toys & Games',
    'icon': {'prefix':
'https://ss3.4sqi.net/img/categories_v2/shops/toys_',
    'suffix': '.png'},
    'primary': True}],
    'photos': {'count': 0, 'groups': []}},
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    'items': [{'summary': 'This spot is popular',
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    'reasonName': 'globalInteractionReason'}]},
    'venue': {'id': '4ce9c578baa6a1cd7fbd356c',
    'name': 'The Gavel Grill',
    'location': {'address': '9 Hyatt St',
    'crossStreet': 'Styvesent Ave',
    'lat': 40.642156612084584,
    'lng': -74.07667388544122,
    'labeledLatLngs': [{'label': 'display',

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    'lat': 40.642156612084584,
    'lng': -74.07667388544122},
    {'label': 'entrance', 'lat': 40.64221, 'lng': -74.07678}],
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    'cc': 'US',
    'city': 'Staten Island',
    'state': 'NY',
    'country': 'United States',
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    'Staten Island, NY 10301',
    'United States']],
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    'name': 'American Restaurant',
    'pluralName': 'American Restaurants',
    'shortName': 'American',
    'icon': {'prefix':
'https://ss3.4sqi.net/img/categories_v2/food/default_',
    'suffix': '.png'},
    'primary': True}],
    'photos': {'count': 0, 'groups': []}},
    'referralId': 'e-0-4ce9c578baa6a1cd7fbd356c-11'},
    {'reasons': {'count': 0,
    'items': [{'summary': 'This spot is popular',
    'type': 'general',
    'reasonName': 'globalInteractionReason'}]}},
    'venue': {'id': '4a271f0cf964a5205c911fe3',
    'name': 'Enoteca Maria',
    'location': {'address': '27 Hyatt St',
    'crossStreet': 'btwn Central Ave & St Marks Pl',
    'lat': 40.64194106346249,
    'lng': -74.07732026660736,
    'labeledLatLngs': [{'label': 'display',
    'lat': 40.64194106346249,
    'lng': -74.07732026660736},
    {'label': 'entrance', 'lat': 40.641983, 'lng': -74.077287}],
    'distance': 379,
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    'cc': 'US',
    'city': 'Staten Island',
    'state': 'NY',
    'country': 'United States',
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    'Staten Island, NY 10301',
    'United States']],
    'categories': [{'id': '4bf58dd8d48988d110941735',
    'name': 'Italian Restaurant',

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        'pluralName': 'Italian Restaurants',
        'shortName': 'Italian',
        'icon': {'prefix':
'https://ss3.4sqi.net/img/categories_v2/food/italian_',
        'suffix': '.png'},
        'primary': True}],
        'photos': {'count': 0, 'groups': []}},
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{'reasons': {'count': 0,
        'items': [{'summary': 'This spot is popular',
        'type': 'general',
        'reasonName': 'globalInteractionReason'}]},
'venue': {'id': '5dbdd128ee17d000084dee80',
        'name': 'Nike',
        'location': {'lat': 40.643615,
        'lng': -74.074738,
        'labeledLatLngs': [{'label': 'display',
        'lat': 40.643615,
        'lng': -74.074738}],
        'distance': 418,
        'postalCode': '10301',
        'cc': 'US',
        'city': 'New York',
        'state': 'NY',
        'country': 'United States',
        'formattedAddress': ['New York, NY 10301', 'United States']}},
'categories': [{'id': '4bf58dd8d48988d1f2941735',
        'name': 'Sporting Goods Shop',
        'pluralName': 'Sporting Goods Shops',
        'shortName': 'Sporting Goods',
        'icon': {'prefix':
'https://ss3.4sqi.net/img/categories_v2/shops/sports_outdoors_',
        'suffix': '.png'},
        'primary': True}],
        'photos': {'count': 0, 'groups': []}},
        'referralId': 'e-0-5dbdd128ee17d000084dee80-13'},
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        'United States']],
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        'pluralName': 'Sporting Goods Shops',
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            'lng': -74.07802076119599,
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            'icon': { 'prefix':

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      'shortName': 'Apparel',
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    'shortName': 'Donuts',
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    'suffix': '.png'},
    'primary': True}],
    'delivery': {'id': '1160131',
    'url': 'https://www.seamless.com/menu/dunkin-97-stuyvesant-pl-staten-
island/1160131?affiliate=1131&utm_source=foursquare-affiliate-
network&utm_medium=affiliate&utm_campaign=1131&utm_content=1160131',
    'provider': {'name': 'seamless',
    'icon': {'prefix': 'https://fastly.4sqi.net/img/general/cap/',
    'sizes': [40, 50],
    'name': '/delivery_provider_seamless_20180129.png'}}},
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    'shortName': 'Apparel',
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    'primary': True}],
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    'lng': -74.07578845993015,
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    'shortName': 'Apparel',
    'icon': { 'prefix':
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    'primary': True}],
    'photos': { 'count': 0, 'groups': [] },
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'country': 'United States',
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        'primary': True}],
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                'lng': -74.074553 } ]],
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Island)',
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'United States']},
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'lng': -74.07668033171674,
'labeledLatLngs': [{'label': 'display',
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{'label': 'entrance', 'lat': 40.644017, 'lng': -74.076729}],
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'city': 'Staten Island',
'state': 'NY',
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'Staten Island, NY 10301',
'United States']],
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                    'primary': True}],
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                                'location': {'address': '100 Stuyvesant Pl',
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                                    'lat': 40.643639,
                                    'lng': -74.077919,
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        'suffix': '.png'},
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        'url': 'https://www.seamless.com/menu/the-burrito-shoppe-100-stuyvesant-
place-staten-island/346662?affiliate=1131&utm_source=foursquare-affiliate-
network&utm_medium=affiliate&utm_campaign=1131&utm_content=346662',
        'provider': { 'name': 'seamless',
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                'name': '/delivery_provider_seamless_20180129.png' } } },
        'photos': { 'count': 0, 'groups': [] },
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                'country': 'United States',
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                    'United States' ] },
                'categories': [{ 'id': '4bf58dd8d48988d1e0941735',
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                    'pluralName': 'Harbors / Marinas',

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    'shortName': 'Harbor / Marina',
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    'location': {'address': '5 Hyatt St',
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    'lng': -74.076728,
    'labeledLatLngs': [{'label': 'display',
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    'lng': -74.076728},
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    'distance': 366,
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    'cc': 'US',
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    'state': 'NY',
    'country': 'United States',
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    'United States']},
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    'pluralName': 'Pizza Places',
    'shortName': 'Pizza',
    'icon': {'prefix':
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    'suffix': '.png'},
    'primary': True}],
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    'name': 'St. George Esplanade',
    'location': {'lat': 40.64554513232871,
    'lng': -74.07493747680437,

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    'reasonName': 'globalInteractionReason']]],
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'name': 'MTA Bus - SI Ferry & Ramp D (S40/S42/S44/S52/S90/S94)',
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'lat': 40.643311510335884,
'lng': -74.0743255374318,
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'lng': -74.0743255374318}]},
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'cc': 'US',
'city': 'Staten Island',
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'country': 'United States',
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'Staten Island, NY 10301',
'United States']},
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'name': 'Bus Station',
'pluralName': 'Bus Stations',
'shortName': 'Bus Station',
'icon': {'prefix':
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'suffix': '.png'},
'primary': True}],
'photos': {'count': 0, 'groups': []}},
'referralId': 'e-0-4cb3acd8aef16dcbf933ca54-32'},
'reasons': {'count': 0,
'items': [{'summary': 'This spot is popular',
'type': 'general',
'reasonName': 'globalInteractionReason']]],
'venue': {'id': '4b3e6419f964a520669c25e3',
'name': 'Barrett Triangle',
'location': {'address': '1-31 Bay St',
'lat': 40.64173127388491,
'lng': -74.07585918903351,
'labeledLatLngs': [{'label': 'display',
'lat': 40.64173127388491,
'lng': -74.07585918903351}]},
'distance': 466,
'postalCode': '10301',
'cc': 'US',
'city': 'Staten Island',
'state': 'NY',

```

```

    'country': 'United States',
    'formattedAddress': ['1-31 Bay St',
        'Staten Island, NY 10301',
        'United States']],
    'categories': [{ 'id': '4bf58dd8d48988d163941735',
        'name': 'Park',
        'pluralName': 'Parks',
        'shortName': 'Park',
        'icon': { 'prefix':
'https://ss3.4sqi.net/img/categories_v2/parks_outdoors/park_',
        'suffix': '.png'},
        'primary': True}],
    'photos': { 'count': 0, 'groups': [] },
    'referralId': 'e-0-4b3e6419f964a520669c25e3-33'},
    {'reasons': { 'count': 0,
        'items': [{ 'summary': 'This spot is popular',
            'type': 'general',
            'reasonName': 'globalInteractionReason' } ] },
        'venue': { 'id': '4e56abb162e123a76493b886',
            'name': 'MTA Bus - Bay St & Nick Laporte Pl
(S42/S46/S48/S51/S52/S61/S62/S66/S74/S76/S78/S86/S91/S92/S96/S98)',
            'location': { 'address': 'Bay St',
                'lat': 40.64167021628304,
                'lng': -74.07577872276306,
                'labeledLatLngs': [{ 'label': 'display',
                    'lat': 40.64167021628304,
                    'lng': -74.07577872276306 } ] },
                'distance': 476,
                'cc': 'US',
                'city': 'Staten Island',
                'state': 'NY',
                'country': 'United States',
                'formattedAddress': ['Bay St', 'Staten Island, NY', 'United States'] },
            'categories': [{ 'id': '52f2ab2ebcbc57f1066b8b4f',
                'name': 'Bus Stop',
                'pluralName': 'Bus Stops',
                'shortName': 'Bus Stop',
                'icon': { 'prefix':
'https://ss3.4sqi.net/img/categories_v2/travel/busstation_',
                'suffix': '.png'},
                'primary': True } ] },
            'photos': { 'count': 0, 'groups': [] },
            'referralId': 'e-0-4e56abb162e123a76493b886-34'},
            {'reasons': { 'count': 0,
                'items': [{ 'summary': 'This spot is popular',
                    'type': 'general',
                    'reasonName': 'globalInteractionReason' } ] },

```

```

'venue': {'id': '515af2b6e4b08549aebb78f0',
'name': 'Staten Island Visitor Information Booth',
'location': {'lat': 40.64463918117021,
'lng': -74.07364558712177,
'labeledLatLngs': [{'label': 'display',
'lat': 40.64463918117021,
'lng': -74.07364558712177}]},
'distance': 483,
'cc': 'US',
'city': 'Staten Island',
'state': 'NY',
'country': 'United States',
'formattedAddress': ['Staten Island, NY', 'United States']},
'categories': [{'id': '4f4530164b9074f6e4fb00ff',
'name': 'Tourist Information Center',
'pluralName': 'Tourist Information Centers',
'shortName': 'Tourist Information',
'icon': {'prefix':
'https://ss3.4sqi.net/img/categories_v2/travel/touristinformation_',
'suffix': '.png'},
'primary': True}],
'photos': {'count': 0, 'groups': []},
'referralId': 'e-0-515af2b6e4b08549aebb78f0-35'},
'reasons': {'count': 0,
'items': [{'summary': 'This spot is popular',
'type': 'general',
'reasonName': 'globalInteractionReason'}]},
'venue': {'id': '56f05339498eb6c326c20ee2',
'name': 'Ferris Wheel Juice Bar',
'location': {'address': 'Bay St',
'crossStreet': 'Hyatt Pl',
'lat': 40.642509,
'lng': -74.074488,
'labeledLatLngs': [{'label': 'display',
'lat': 40.642509,
'lng': -74.074488}]},
'distance': 494,
'postalCode': '10305',
'cc': 'US',
'city': 'Staten Island',
'state': 'NY',
'country': 'United States',
'formattedAddress': ['Bay St (Hyatt Pl)',
'Staten Island, NY 10305',
'United States']},
'categories': [{'id': '4bf58dd8d48988d112941735',
'name': 'Juice Bar',

```

```

        'pluralName': 'Juice Bars',
        'shortName': 'Juice Bar',
        'icon': {'prefix':
'https://ss3.4sqi.net/img/categories_v2/food/juicebar_',
        'suffix': '.png'},
        'primary': True}],
        'photos': {'count': 0, 'groups': []}},
        'referralId': 'e-0-56f05339498eb6c326c20ee2-36'}}]]]]}

```

[19]: *# 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']

```

[20]: *from pandas.io.json import json_normalize*

```

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()

```

/home/jupyterlab/conda/envs/python/lib/python3.6/site-packages/ipykernel_launcher.py:4: FutureWarning: pandas.io.json.json_normalize is deprecated, use pandas.json_normalize instead
after removing the cwd from sys.path.

```

[20]:
0          name      categories      lat \
      Beso    Tapas Restaurant  40.643306

```

1	A&S Pizzeria	Pizza Place	40.643940
2	Staten Island September 11 Memorial	Monument / Landmark	40.646767
3	Richmond County Bank Ballpark	Baseball Stadium	40.645056
4	Shake Shack	Burger Joint	40.643660

```

lng
0 -74.076508
1 -74.077626
2 -74.076510
3 -74.076864
4 -74.075891

```

```
[21]: print('{} venues were returned by Foursquare.'.format(nearby_venues.shape[0]))
```

37 venues were returned by Foursquare.

```
[22]: def getNearbyVenues(names, latitudes, longitudes, radius=500):

    venues_list=[]
    for name, lat, lng in zip(names, latitudes, longitudes):
        print(name)

        # 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"]

        # return only relevant information for each nearby venue
        venues_list.append([
            name,
            lat,
            lng,
            v['venue']['name'],
            v['venue']['location']['lat'],
            v['venue']['location']['lng'],
            v['venue']['categories'][0]['name']) for v in results])
```

```

nearby_venues = pd.DataFrame([item for venue_list in venues_list for item_
↪in venue_list])
nearby_venues.columns = ['Neighborhood',
                        'Neighborhood Latitude',
                        'Neighborhood Longitude',
                        'Venue',
                        'Venue Latitude',
                        'Venue Longitude',
                        'Venue Category']

return(nearby_venues)

```

```

[23]: StatenIsland_venues = getNearbyVenues(names=Staten_Island['Neighborhood'],
                                           latitudes=Staten_Island['Latitude'],
                                           longitudes=Staten_Island['Longitude']
                                           )

```

St. George
 New Brighton
 Stapleton
 Rosebank
 West Brighton
 Grymes Hill
 Todt Hill
 South Beach
 Port Richmond
 Mariner's Harbor
 Port Ivory
 Castleton Corners
 New Springville
 Travis
 New Dorp
 Oakwood
 Great Kills
 Eltingville
 Annadale
 Woodrow
 Tottenville
 Tompkinsville
 Silver Lake
 Sunnyside
 Park Hill
 Westerleigh
 Graniteville
 Arlington
 Arrochar
 Grasmere

Old Town
 Dongan Hills
 Midland Beach
 Grant City
 New Dorp Beach
 Bay Terrace
 Huguenot
 Pleasant Plains
 Butler Manor
 Charleston
 Rossville
 Arden Heights
 Greenridge
 Heartland Village
 Chelsea
 Bloomfield
 Bulls Head
 Richmond Town
 Shore Acres
 Clifton
 Concord
 Emerson Hill
 Randall Manor
 Howland Hook
 Elm Park
 Manor Heights
 Willowbrook
 Sandy Ground
 Egbertville
 Prince's Bay
 Lighthouse Hill
 Richmond Valley
 Fox Hills

```
[24]: print(StatenIsland_venues.shape)
      StatenIsland_venues.head()
```

```
(833, 7)
```

```
[24]:
```

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	\
0	St. George	40.644982	-74.079353	
1	St. George	40.644982	-74.079353	
2	St. George	40.644982	-74.079353	
3	St. George	40.644982	-74.079353	
4	St. George	40.644982	-74.079353	

	Venue	Venue Latitude	Venue Longitude	\
--	-------	----------------	-----------------	---

0	Beso	40.643306	-74.076508
1	A&S Pizzeria	40.643940	-74.077626
2	Staten Island September 11 Memorial	40.646767	-74.076510
3	Richmond County Bank Ballpark	40.645056	-74.076864
4	Shake Shack	40.643660	-74.075891

	Venue Category
0	Tapas Restaurant
1	Pizza Place
2	Monument / Landmark
3	Baseball Stadium
4	Burger Joint

```
[25]: StatenIsland_venues.groupby('Neighborhood').count()
```

```
[25]:
```

	Neighborhood	Latitude	Neighborhood	Longitude	Venue	\
	Neighborhood					
	Annadale	10		10	10	
	Arden Heights	7		7	7	
	Arlington	5		5	5	
	Arrochar	23		23	23	
	Bay Terrace	10		10	10	
	
	Travis	15		15	15	
	West Brighton	38		38	38	
	Westerleigh	3		3	3	
	Willowbrook	5		5	5	
	Woodrow	19		19	19	

	Venue	Latitude	Venue	Longitude	Venue	Category
	Neighborhood					
	Annadale	10		10	10	
	Arden Heights	7		7	7	
	Arlington	5		5	5	
	Arrochar	23		23	23	
	Bay Terrace	10		10	10	
	
	Travis	15		15	15	
	West Brighton	38		38	38	
	Westerleigh	3		3	3	
	Willowbrook	5		5	5	
	Woodrow	19		19	19	

[63 rows x 6 columns]

```
[26]: print('There are {} unique categories.'.format(len(StatenIsland_venues['Venue_
→Category'].unique())))
```


There are 180 unique categories.

3. Analyze Each Neighborhood of Staten Island.

```
[27]: # one hot encoding
staten_island_onehot = pd.get_dummies(StatenIsland_venues[['Venue Category']],
    ↪ prefix="", prefix_sep="")

# add neighborhood column back to dataframe
staten_island_onehot['Neighborhood'] = StatenIsland_venues['Neighborhood']

# move neighborhood column to the first column
fixed_columns = [staten_island_onehot.columns[-1]] + list(staten_island_onehot.
    ↪ columns[:-1])
staten_island_onehot = staten_island_onehot[fixed_columns]

staten_island_onehot.head()
```

```
[27]: Neighborhood  Accessories Store  African Restaurant  American Restaurant  \
0    St. George           0              0              0
1    St. George           0              0              0
2    St. George           0              0              0
3    St. George           0              0              0
4    St. George           0              0              0

    Arcade  Art Gallery  Art Museum  Arts & Crafts Store  Asian Restaurant  \
0         0           0           0                   0              0
1         0           0           0                   0              0
2         0           0           0                   0              0
3         0           0           0                   0              0
4         0           0           0                   0              0

    Athletics & Sports  ...  Tourist Information Center  Toy / Game Store  \
0                   0  ...                   0              0
1                   0  ...                   0              0
2                   0  ...                   0              0
3                   0  ...                   0              0
4                   0  ...                   0              0

    Trail  Train Station  Vegetarian / Vegan Restaurant  Video Game Store  \
0         0           0                   0              0
1         0           0                   0              0
2         0           0                   0              0
3         0           0                   0              0
4         0           0                   0              0

    Video Store  Vietnamese Restaurant  Wings Joint  Yoga Studio
0              0                   0              0              0
```

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

[5 rows x 181 columns]

```
[28]: statenisland_onehot.shape
```

```
[28]: (833, 181)
```

```
[29]: statenisland_grouped = statenisland_onehot.groupby('Neighborhood').mean().
      ↪reset_index()
      statenisland_grouped
```

```
[29]:
```

	Neighborhood	Accessories Store	African Restaurant	American Restaurant \
0	Annadale	0.0	0.0	0.100000
1	Arden Heights	0.0	0.0	0.000000
2	Arlington	0.0	0.0	0.000000
3	Arrochar	0.0	0.0	0.000000
4	Bay Terrace	0.0	0.0	0.000000
..
58	Travis	0.0	0.0	0.000000
59	West Brighton	0.0	0.0	0.026316
60	Westerleigh	0.0	0.0	0.000000
61	Willowbrook	0.0	0.0	0.000000
62	Woodrow	0.0	0.0	0.000000

	Arcade	Art Gallery	Art Museum	Arts & Crafts Store	Asian Restaurant \
0	0.000000	0.0	0.0	0.0	0.0
1	0.000000	0.0	0.0	0.0	0.0
2	0.000000	0.0	0.0	0.0	0.0
3	0.000000	0.0	0.0	0.0	0.0
4	0.000000	0.0	0.0	0.0	0.0
..
58	0.000000	0.0	0.0	0.0	0.0
59	0.000000	0.0	0.0	0.0	0.0
60	0.333333	0.0	0.0	0.0	0.0
61	0.000000	0.0	0.0	0.0	0.0
62	0.000000	0.0	0.0	0.0	0.0

	Athletics & Sports	...	Tourist Information Center	Toy / Game Store \
0	0.000000	...	0.0	0.0
1	0.000000	...	0.0	0.0
2	0.000000	...	0.0	0.0
3	0.043478	...	0.0	0.0
4	0.000000	...	0.0	0.0

```

..          ... ..
58          0.000000 ...          0.0          0.0
59          0.000000 ...          0.0          0.0
60          0.000000 ...          0.0          0.0
61          0.000000 ...          0.0          0.0
62          0.000000 ...          0.0          0.0

Trail  Train Station  Vegetarian / Vegan Restaurant  Video Game Store \
0      0.0          0.1          0.0          0.0
1      0.0          0.0          0.0          0.0
2      0.0          0.0          0.0          0.0
3      0.0          0.0          0.0          0.0
4      0.0          0.1          0.0          0.0
..      ...          ...          ...          ...
58      0.0          0.0          0.0          0.0
59      0.0          0.0          0.0          0.0
60      0.0          0.0          0.0          0.0
61      0.0          0.0          0.0          0.0
62      0.0          0.0          0.0          0.0

Video Store  Vietnamese Restaurant  Wings Joint  Yoga Studio
0            0.0          0.0          0.000000          0.0
1            0.0          0.0          0.000000          0.0
2            0.0          0.0          0.000000          0.0
3            0.0          0.0          0.000000          0.0
4            0.0          0.0          0.000000          0.0
..            ...          ...          ...          ...
58           0.0          0.0          0.000000          0.0
59           0.0          0.0          0.026316          0.0
60           0.0          0.0          0.000000          0.0
61           0.0          0.0          0.000000          0.0
62           0.0          0.0          0.000000          0.0

```

[63 rows x 181 columns]

```
[30]: statenisland_grouped.shape
```

```
[30]: (63, 181)
```

```
[31]: num_top_venues = 5

for hood in statenisland_grouped['Neighborhood']:
    print("-----"+hood+"-----")
    temp = statenisland_grouped[statenisland_grouped['Neighborhood'] == hood].T.
    ↪reset_index()
    temp.columns = ['venue', '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')

```

----Annadale----

	venue	freq
0	Pizza Place	0.2
1	Restaurant	0.1
2	Train Station	0.1
3	Pharmacy	0.1
4	Food	0.1

----Arden Heights----

	venue	freq
0	Lawyer	0.14
1	Deli / Bodega	0.14
2	Bus Stop	0.14
3	Business Service	0.14
4	Pharmacy	0.14

----Arlington----

	venue	freq
0	Deli / Bodega	0.2
1	Boat or Ferry	0.2
2	Bus Stop	0.2
3	Construction & Landscaping	0.2
4	Coffee Shop	0.2

----Arrochar----

	venue	freq
0	Bus Stop	0.17
1	Deli / Bodega	0.09
2	Liquor Store	0.09
3	Italian Restaurant	0.09
4	Outdoors & Recreation	0.04

----Bay Terrace----

	venue	freq
0	Supermarket	0.2
1	Donut Shop	0.1
2	Sushi Restaurant	0.1

3	Liquor Store	0.1
4	Italian Restaurant	0.1

----Bloomfield----

	venue	freq
0	Theme Park	0.25
1	Recreation Center	0.25
2	Burger Joint	0.25
3	Bus Stop	0.25
4	Accessories Store	0.00

----Bulls Head----

	venue	freq
0	Bus Stop	0.08
1	Pizza Place	0.06
2	Café	0.04
3	Gift Shop	0.04
4	Pharmacy	0.04

----Butler Manor----

	venue	freq
0	Pool	0.4
1	Baseball Field	0.4
2	Convenience Store	0.2
3	Accessories Store	0.0
4	Pizza Place	0.0

----Castleton Corners----

	venue	freq
0	Pizza Place	0.19
1	Bank	0.19
2	Bagel Shop	0.06
3	Tattoo Parlor	0.06
4	Go Kart Track	0.06

----Charleston----

	venue	freq
0	Coffee Shop	0.07
1	Cosmetics Shop	0.07
2	Big Box Store	0.07
3	Diner	0.03
4	Music Venue	0.03

----Chelsea----

	venue	freq
0	Steakhouse	0.2
1	Park	0.2
2	Bus Stop	0.2
3	Sandwich Place	0.2
4	Spanish Restaurant	0.2

----Clifton----

	venue	freq
0	Train Station	0.12
1	Grocery Store	0.12
2	Storage Facility	0.06
3	Museum	0.06
4	Deli / Bodega	0.06

----Concord----

	venue	freq
0	Deli / Bodega	0.18
1	Bus Stop	0.09
2	Park	0.09
3	Grocery Store	0.09
4	Sandwich Place	0.09

----Dongan Hills----

	venue	freq
0	Pizza Place	0.12
1	Chinese Restaurant	0.08
2	Italian Restaurant	0.08
3	Jewelry Store	0.04
4	Ice Cream Shop	0.04

----Egbertville----

	venue	freq
0	Italian Restaurant	0.25
1	Cosmetics Shop	0.25
2	Bagel Shop	0.25
3	Clothing Store	0.25
4	Accessories Store	0.00

----Elm Park----

	venue	freq
--	-------	------

0	Deli / Bodega	0.29
1	American Restaurant	0.14
2	Italian Restaurant	0.14
3	Bus Stop	0.14
4	Ice Cream Shop	0.14

----Eltingville----

	venue	freq
0	Sushi Restaurant	0.11
1	Pizza Place	0.11
2	Fast Food Restaurant	0.05
3	Sandwich Place	0.05
4	Pharmacy	0.05

----Emerson Hill----

	venue	freq
0	Historic Site	0.25
1	Construction & Landscaping	0.25
2	Sculpture Garden	0.25
3	Food	0.25
4	Accessories Store	0.00

----Fox Hills----

	venue	freq
0	African Restaurant	0.2
1	Deli / Bodega	0.2
2	Bus Stop	0.2
3	Sandwich Place	0.2
4	Grocery Store	0.2

----Graniteville----

	venue	freq
0	Boat or Ferry	0.5
1	Grocery Store	0.5
2	Accessories Store	0.0
3	Optical Shop	0.0
4	Outdoors & Recreation	0.0

----Grant City----

	venue	freq
0	Fast Food Restaurant	0.10
1	Food & Drink Shop	0.10
2	Eastern European Restaurant	0.05

3	Bar	0.05
4	Bus Stop	0.05

----Grasmere----

	venue	freq
0	Bus Stop	0.20
1	Bagel Shop	0.08
2	Bakery	0.08
3	Bank	0.08
4	Restaurant	0.04

----Great Kills----

	venue	freq
0	Bar	0.13
1	Pizza Place	0.09
2	Italian Restaurant	0.09
3	Deli / Bodega	0.04
4	Dessert Shop	0.04

----Greenridge----

	venue	freq
0	Lawyer	0.14
1	Diner	0.14
2	Construction & Landscaping	0.14
3	Pet Store	0.14
4	Shipping Store	0.14

----Grymes Hill----

	venue	freq
0	Deli / Bodega	0.5
1	Dog Run	0.5
2	Playground	0.0
3	Outlet Mall	0.0
4	Park	0.0

----Heartland Village----

	venue	freq
0	Coffee Shop	0.18
1	Accessories Store	0.09
2	Food	0.09
3	Restaurant	0.09
4	Optical Shop	0.09

----Howland Hook----

	venue	freq
0	Boat or Ferry	1.0
1	Accessories Store	0.0
2	Pizza Place	0.0
3	Outdoors & Recreation	0.0
4	Outlet Mall	0.0

----Huguenot----

	venue	freq
0	Deli / Bodega	0.12
1	Italian Restaurant	0.12
2	Donut Shop	0.12
3	Train Station	0.12
4	Sandwich Place	0.12

----Lighthouse Hill----

	venue	freq
0	Italian Restaurant	0.2
1	Art Museum	0.2
2	Trail	0.2
3	Café	0.2
4	Spa	0.2

----Manor Heights----

	venue	freq
0	Donut Shop	0.15
1	Liquor Store	0.15
2	Deli / Bodega	0.15
3	Chinese Restaurant	0.08
4	American Restaurant	0.08

----Mariner's Harbor----

	venue	freq
0	Deli / Bodega	0.22
1	Italian Restaurant	0.22
2	Bus Stop	0.22
3	Other Repair Shop	0.11
4	Pizza Place	0.11

----Midland Beach----

	venue	freq
--	-------	------

0	Beach	0.22
1	Liquor Store	0.11
2	Chinese Restaurant	0.11
3	Bookstore	0.11
4	Bus Stop	0.11

----New Brighton----

	venue	freq
0	Deli / Bodega	0.25
1	Bus Stop	0.25
2	Park	0.17
3	Flower Shop	0.08
4	Playground	0.08

----New Dorp----

	venue	freq
0	Italian Restaurant	0.12
1	Pizza Place	0.08
2	Yoga Studio	0.04
3	Taco Place	0.04
4	Mexican Restaurant	0.04

----New Dorp Beach----

	venue	freq
0	Italian Restaurant	0.21
1	Food	0.14
2	Deli / Bodega	0.14
3	Restaurant	0.07
4	Diner	0.07

----New Springville----

	venue	freq
0	Bagel Shop	0.08
1	Chinese Restaurant	0.08
2	Coffee Shop	0.08
3	Mobile Phone Shop	0.08
4	Accessories Store	0.04

----Oakwood----

	venue	freq
0	Lawyer	0.50
1	Nightlife Spot	0.25
2	Bar	0.25

3	Playground	0.00
4	Outlet Mall	0.00

----Old Town----

	venue	freq
0	Italian Restaurant	0.24
1	Restaurant	0.06
2	Bakery	0.06
3	Mattress Store	0.06
4	Grocery Store	0.06

----Park Hill----

	venue	freq
0	Bus Stop	0.29
1	Park	0.14
2	Gym / Fitness Center	0.14
3	Athletics & Sports	0.14
4	Coffee Shop	0.14

----Pleasant Plains----

	venue	freq
0	Donut Shop	0.14
1	Yoga Studio	0.07
2	Toll Plaza	0.07
3	Liquor Store	0.07
4	Salon / Barbershop	0.07

----Port Ivory----

	venue	freq
0	Business Service	1.0
1	Accessories Store	0.0
2	Other Repair Shop	0.0
3	Outlet Mall	0.0
4	Park	0.0

----Port Richmond----

	venue	freq
0	Rental Car Location	0.25
1	Martial Arts Dojo	0.25
2	Donut Shop	0.25
3	Pizza Place	0.25
4	Playground	0.00

----Prince's Bay----

	venue	freq
0	Pizza Place	0.2
1	Chinese Restaurant	0.1
2	Liquor Store	0.1
3	Sushi Restaurant	0.1
4	Ice Cream Shop	0.1

----Randall Manor----

	venue	freq
0	Home Service	0.2
1	Park	0.2
2	Bus Stop	0.2
3	Business Service	0.2
4	Bagel Shop	0.2

----Richmond Town----

	venue	freq
0	Italian Restaurant	0.25
1	Café	0.25
2	Spa	0.25
3	Bagel Shop	0.25
4	Accessories Store	0.00

----Richmond Valley----

	venue	freq
0	Bank	0.17
1	Fast Food Restaurant	0.17
2	Mexican Restaurant	0.08
3	Construction & Landscaping	0.08
4	Smoothie Shop	0.08

----Rosebank----

	venue	freq
0	Pharmacy	0.08
1	Grocery Store	0.08
2	Italian Restaurant	0.08
3	Sandwich Place	0.04
4	Beach	0.04

----Rossville----

	venue	freq
--	-------	------

0	Pizza Place	0.27
1	Bagel Shop	0.20
2	Convenience Store	0.07
3	American Restaurant	0.07
4	Moving Target	0.07

----Sandy Ground----

	venue	freq
0	Playground	0.14
1	Bus Stop	0.14
2	Art Gallery	0.14
3	Racetrack	0.14
4	Intersection	0.14

----Shore Acres----

	venue	freq
0	Italian Restaurant	0.12
1	Bus Stop	0.12
2	Deli / Bodega	0.08
3	Intersection	0.08
4	Bar	0.08

----Silver Lake----

	venue	freq
0	Golf Course	0.25
1	Gym	0.25
2	Burger Joint	0.25
3	American Restaurant	0.25
4	Recreation Center	0.00

----South Beach----

	venue	freq
0	Beach	0.33
1	Pier	0.33
2	Deli / Bodega	0.17
3	Athletics & Sports	0.17
4	Playground	0.00

----St. George----

	venue	freq
0	Clothing Store	0.16
1	Sporting Goods Shop	0.05
2	Park	0.05

3	Pizza Place	0.05
4	Bar	0.05

----Stapleton----

	venue	freq
0	Discount Store	0.09
1	Pizza Place	0.09
2	Sandwich Place	0.06
3	Bank	0.06
4	Skate Park	0.03

----Sunnyside----

	venue	freq
0	American Restaurant	0.2
1	Market	0.2
2	Grocery Store	0.2
3	Gym	0.2
4	Spa	0.2

----Todt Hill----

	venue	freq
0	Park	1.0
1	Accessories Store	0.0
2	Optical Shop	0.0
3	Outdoors & Recreation	0.0
4	Outlet Mall	0.0

----Tompkinsville----

	venue	freq
0	Pizza Place	0.11
1	Bus Stop	0.11
2	Park	0.07
3	Brewery	0.07
4	Rental Car Location	0.04

----Tottenville----

	venue	freq
0	Bus Stop	0.12
1	Lawyer	0.12
2	Italian Restaurant	0.12
3	Deli / Bodega	0.12
4	Cosmetics Shop	0.12

----Travis----

	venue	freq
0	Hotel	0.20
1	Bowling Alley	0.13
2	Deli / Bodega	0.13
3	Gym	0.13
4	Sports Club	0.07

----West Brighton----

	venue	freq
0	Coffee Shop	0.08
1	Pharmacy	0.05
2	Breakfast Spot	0.05
3	Music Store	0.05
4	Bar	0.05

----Westerleigh----

	venue	freq
0	Sushi Restaurant	0.33
1	Arcade	0.33
2	Convenience Store	0.33
3	Accessories Store	0.00
4	Playground	0.00

----Willowbrook----

	venue	freq
0	Chinese Restaurant	0.4
1	Deli / Bodega	0.2
2	Bus Stop	0.2
3	Spa	0.2
4	Plaza	0.0

----Woodrow----

	venue	freq
0	Pharmacy	0.11
1	Bakery	0.05
2	Grocery Store	0.05
3	Pizza Place	0.05
4	Chinese Restaurant	0.05

```
[32]: 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]

[33]: num_top_venues = 10

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

# create columns according to number of top venues
columns = ['Neighborhood']
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
neighborhoods_venues_sorted = pd.DataFrame(columns=columns)
neighborhoods_venues_sorted['Neighborhood'] =
    ↪ statenisland_grouped['Neighborhood']

for ind in np.arange(statenisland_grouped.shape[0]):
    neighborhoods_venues_sorted.iloc[ind, 1:] =
    ↪ return_most_common_venues(statenisland_grouped.iloc[ind, :], num_top_venues)

neighborhoods_venues_sorted.head()
```

```
[33]:
```

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	\
0	Annadale	Pizza Place	Train Station	
1	Arden Heights	Deli / Bodega	Lawyer	
2	Arlington	Deli / Bodega	Boat or Ferry	
3	Arrochar	Bus Stop	Liquor Store	
4	Bay Terrace	Supermarket	Insurance Office	

		3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	\
0		Food	Pharmacy	Diner	
1		Bus Stop	Business Service	Coffee Shop	
2	Construction & Landscaping		Coffee Shop	Bus Stop	
3	Italian Restaurant		Deli / Bodega	Polish Restaurant	
4	Italian Restaurant		Train Station	Sushi Restaurant	

		6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	\
0		Restaurant	Dance Studio	Deli / Bodega	
1		Pizza Place	Pharmacy	Fast Food Restaurant	
2	Filipino Restaurant	Furniture / Home Store		French Restaurant	

3	Outdoors & Recreation	Supermarket	Middle Eastern Restaurant
4	Liquor Store	Salon / Barbershop	Donut Shop

	9th Most Common Venue	10th Most Common Venue
0	American Restaurant	Fast Food Restaurant
1	Food Truck	Food & Drink Shop
2	Food Truck	Food & Drink Shop
3	Mediterranean Restaurant	Sandwich Place
4	Shipping Store	Fast Food Restaurant

4. Cluster Neighborhoods

Run k-means to cluster the neighborhood into 5 clusters.

```
[34]: #import k-means from clustering stage
from sklearn.cluster import KMeans

# set number of clusters
kclusters = 5

staten_island_grouped_clustering = staten_island_grouped.drop('Neighborhood', 1)

# run k-means clustering
kmeans = KMeans(n_clusters=kclusters, random_state=0).
    ↪ fit(staten_island_grouped_clustering)

# check cluster labels generated for each row in the dataframe
kmeans.labels_[0:10]
```

```
[34]: array([2, 0, 0, 2, 2, 2, 2, 2, 2, 2], dtype=int32)
```

```
[35]: # add clustering labels
neighborhoods_venues_sorted.insert(0, 'Cluster Labels', kmeans.labels_)

Staten_Island_merged = Staten_Island

# merge toronto_grouped with toronto_data to add latitude/longitude for each
    ↪ neighborhood
Staten_Island_merged = Staten_Island_merged.join(neighborhoods_venues_sorted.
    ↪ set_index('Neighborhood'), on='Neighborhood')

Staten_Island_merged.head() # check the last columns!
```

```
[35]:
```

	Borough	Neighborhood	Latitude	Longitude	Cluster Labels \
0	Staten Island	St. George	40.644982	-74.079353	2
1	Staten Island	New Brighton	40.640615	-74.087017	0
2	Staten Island	Stapleton	40.626928	-74.077902	2
3	Staten Island	Rosebank	40.615305	-74.069805	2

4 Staten Island West Brighton 40.631879 -74.107182 2

	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	\
0	Clothing Store	Sporting Goods Shop	Italian Restaurant	
1	Deli / Bodega	Bus Stop	Park	
2	Pizza Place	Discount Store	Sandwich Place	
3	Pharmacy	Italian Restaurant	Grocery Store	
4	Coffee Shop	Pharmacy	Bank	

	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	\
0	Park	Bar	Pizza Place	
1	Discount Store	Playground	Flower Shop	
2	Bank	Restaurant	Spanish Restaurant	
3	Breakfast Spot	Beach	Pizza Place	
4	Italian Restaurant	Music Store	Breakfast Spot	

	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	\
0	Outlet Mall	Baseball Stadium	Bus Stop	
1	Bowling Alley	Filipino Restaurant	French Restaurant	
2	Fast Food Restaurant	Skate Park	New American Restaurant	
3	Deli / Bodega	Cosmetics Shop	Ice Cream Shop	
4	Bar	Bus Stop	Café	

	10th Most Common Venue
0	Bus Station
1	Food Truck
2	Optical Shop
3	Eastern European Restaurant
4	Sandwich Place

```
[ ]: import matplotlib.cm as cm
import matplotlib.colors as colors

# create map
map_clusters = folium.Map(location=[latitude, longitude], zoom_start=11)

# 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 lat, lon, poi, cluster in zip(Staten_Island_merged['Latitude'],
    ↳Staten_Island_merged['Longitude'], Staten_Island_merged['Neighborhood'],
    ↳Staten_Island_merged['Cluster Labels']):
```

```
label = folium.Popup(str(poi) + ' Cluster ' + str(cluster), parse_html=True)
folium.CircleMarker(
    [lat, lon],
    radius=5,
    popup=label,
    color=rainbow[cluster-1],
    fill=True,
    fill_color=rainbow[cluster-1],
    fill_opacity=0.7).add_to(map_clusters)
```

map_clusters

5. Examining the Clusters

[37]: #CLUSTER-1

```
Staten_Island_merged.loc[Staten_Island_merged['Cluster Labels'] == 0,
↳Staten_Island_merged.columns[[1] + list(range(5, Staten_Island_merged.
↳shape[1]))]]
```

[37]:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	\
1	New Brighton	Deli / Bodega	Bus Stop	
5	Grymes Hill	Deli / Bodega	Dog Run	
9	Mariner's Harbor	Italian Restaurant	Bus Stop	
27	Arlington	Deli / Bodega	Boat or Ferry	
41	Arden Heights	Deli / Bodega	Lawyer	
50	Concord	Deli / Bodega	Gym / Fitness Center	
54	Elm Park	Deli / Bodega	Italian Restaurant	
56	Willowbrook	Chinese Restaurant	Bus Stop	
62	Fox Hills	Deli / Bodega	African Restaurant	

	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	\
1	Park	Discount Store	Playground	
5	Fast Food Restaurant	Furniture / Home Store	French Restaurant	
9	Deli / Bodega	Supermarket	Other Repair Shop	
27	Construction & Landscaping	Coffee Shop	Bus Stop	
41	Bus Stop	Business Service	Coffee Shop	
50	Bus Stop	Train Station	Park	
54	American Restaurant	Ice Cream Shop	Bus Stop	
56	Spa	Deli / Bodega	Yoga Studio	
62	Bus Stop	Sandwich Place	Grocery Store	

	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	\
1	Flower Shop	Bowling Alley	Filipino Restaurant	
5	Food Truck	Food & Drink Shop	Food	
9	Pizza Place	Dim Sum Restaurant	Fish & Chips Shop	
27	Filipino Restaurant	Furniture / Home Store	French Restaurant	

41	Pizza Place	Pharmacy	Fast Food Restaurant
50	Coffee Shop	Sandwich Place	Peruvian Restaurant
54	Pizza Place	Farmers Market	Food Truck
56	Filipino Restaurant	French Restaurant	Food Truck
62	Fast Food Restaurant	French Restaurant	Food Truck

	9th Most Common Venue	10th Most Common Venue
1	French Restaurant	Food Truck
5	Flower Shop	Fish & Chips Shop
9	French Restaurant	Food Truck
27	Food Truck	Food & Drink Shop
41	Food Truck	Food & Drink Shop
50	Bagel Shop	Grocery Store
54	Food & Drink Shop	Food
56	Food & Drink Shop	Food
62	Food & Drink Shop	Food

[38]: #CLUSTER-2

```
Staten_Island_merged.loc[Staten_Island_merged['Cluster Labels'] == 1,
↳Staten_Island_merged.columns[[1] + list(range(5, Staten_Island_merged.
↳shape[1]))]]
```

[38]:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue \
26	Graniteville	Boat or Ferry	Grocery Store
53	Howland Hook	Boat or Ferry	German Restaurant

	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue \
26	Filipino Restaurant	Gas Station	Furniture / Home Store
53	Gas Station	Furniture / Home Store	French Restaurant

	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue \
26	French Restaurant	Food Truck	Food & Drink Shop
53	Food Truck	Food & Drink Shop	Food

	9th Most Common Venue	10th Most Common Venue
26	Food	Flower Shop
53	Flower Shop	Fish & Chips Shop

[39]: #CLUSTER-3

```
Staten_Island_merged.loc[Staten_Island_merged['Cluster Labels'] == 2,
↳Staten_Island_merged.columns[[1] + list(range(5, Staten_Island_merged.
↳shape[1]))]]
```

[39]:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue \
0	St. George	Clothing Store	Sporting Goods Shop

2	Stapleton	Pizza Place	Discount Store
3	Rosebank	Pharmacy	Italian Restaurant
4	West Brighton	Coffee Shop	Pharmacy
7	South Beach	Pier	Beach
8	Port Richmond	Rental Car Location	Martial Arts Dojo
11	Castleton Corners	Bank	Pizza Place
12	New Springville	Chinese Restaurant	Coffee Shop
13	Travis	Hotel	Bowling Alley
14	New Dorp	Italian Restaurant	Pizza Place
15	Oakwood	Lawyer	Nightlife Spot
16	Great Kills	Bar	Italian Restaurant
17	Eltingville	Pizza Place	Sushi Restaurant
18	Annadale	Pizza Place	Train Station
19	Woodrow	Pharmacy	Bakery
20	Tottenville	Italian Restaurant	Thrift / Vintage Store
21	Tompkinsville	Pizza Place	Bus Stop
22	Silver Lake	Burger Joint	American Restaurant
23	Sunnyside	American Restaurant	Spa
24	Park Hill	Bus Stop	Park
25	Westerleigh	Convenience Store	Arcade
28	Arrochar	Bus Stop	Liquor Store
29	Grasmere	Bus Stop	Bagel Shop
30	Old Town	Italian Restaurant	Donut Shop
31	Dongan Hills	Pizza Place	Italian Restaurant
32	Midland Beach	Beach	Deli / Bodega
33	Grant City	Food & Drink Shop	Fast Food Restaurant
34	New Dorp Beach	Italian Restaurant	Deli / Bodega
35	Bay Terrace	Supermarket	Insurance Office
36	Huguenot	Italian Restaurant	Train Station
37	Pleasant Plains	Donut Shop	Yoga Studio
38	Butler Manor	Pool	Baseball Field
39	Charleston	Coffee Shop	Cosmetics Shop
40	Rossville	Pizza Place	Bagel Shop
42	Greenridge	Shipping Store	Pet Store
43	Heartland Village	Coffee Shop	Accessories Store
44	Chelsea	Steakhouse	Spanish Restaurant
45	Bloomfield	Recreation Center	Bus Stop
46	Bulls Head	Bus Stop	Pizza Place
47	Richmond Town	Italian Restaurant	Spa
48	Shore Acres	Italian Restaurant	Bus Stop
49	Clifton	Train Station	Grocery Store
51	Emerson Hill	Construction & Landscaping	Food
52	Randall Manor	Bus Stop	Business Service
55	Manor Heights	Deli / Bodega	Liquor Store
57	Sandy Ground	Intersection	Food Truck
58	Egbertville	Italian Restaurant	Clothing Store
59	Prince's Bay	Pizza Place	Pharmacy

60	Lighthouse Hill	Italian Restaurant	Art Museum
61	Richmond Valley	Fast Food Restaurant	Bank
	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue \
0	Italian Restaurant	Park	Bar
2	Sandwich Place	Bank	Restaurant
3	Grocery Store	Breakfast Spot	Beach
4	Bank	Italian Restaurant	Music Store
7	Athletics & Sports	Deli / Bodega	Diner
8	Donut Shop	Pizza Place	Dim Sum Restaurant
11	Japanese Restaurant	Sandwich Place	Go Kart Track
12	Mobile Phone Shop	Bagel Shop	Accessories Store
13	Gym	Deli / Bodega	Sports Club
14	Yoga Studio	Bank	Hobby Shop
15	Bar	Filipino Restaurant	Gas Station
16	Pizza Place	Japanese Restaurant	Basketball Court
17	Pharmacy	Sandwich Place	Gourmet Shop
18	Food	Pharmacy	Diner
19	Grocery Store	Sushi Restaurant	Chinese Restaurant
20	Cosmetics Shop	Construction & Landscaping	Bus Stop
21	Brewery	Park	Ice Cream Shop
22	Golf Course	Gym	Yoga Studio
23	Market	Grocery Store	Gym
24	Hotel	Coffee Shop	Athletics & Sports
25	Sushi Restaurant	Yoga Studio	Fast Food Restaurant
28	Italian Restaurant	Deli / Bodega	Polish Restaurant
29	Bakery	Bank	Japanese Restaurant
30	Playground	Mattress Store	Pharmacy
31	Chinese Restaurant	Bar	Bagel Shop
32	Pet Store	Bookstore	Bus Stop
33	Bar	Health & Beauty Service	Dessert Shop
34	Food	Scenic Lookout	Other Repair Shop
35	Italian Restaurant	Train Station	Sushi Restaurant
36	Deli / Bodega	Bank	Donut Shop
37	Discount Store	Bus Stop	Fast Food Restaurant
38	Convenience Store	Yoga Studio	Fast Food Restaurant
39	Big Box Store	Gym / Fitness Center	Music Venue
40	Deli / Bodega	American Restaurant	Ice Cream Shop
42	Diner	Construction & Landscaping	Lawyer
43	Optical Shop	Food	Restaurant
44	Bus Stop	Sandwich Place	Park
45	Burger Joint	Theme Park	Dim Sum Restaurant
46	Pharmacy	Ice Cream Shop	Sandwich Place
47	Bagel Shop	Café	Yoga Studio
48	Intersection	Deli / Bodega	Bar
49	Museum	Martial Arts Dojo	Discount Store
51	Sculpture Garden	Historic Site	Yoga Studio

52	Park	Home Service	Bagel Shop
55	Donut Shop	Pharmacy	American Restaurant
57	Playground	Fish & Chips Shop	Bus Stop
58	Bagel Shop	Cosmetics Shop	Dim Sum Restaurant
59	Ice Cream Shop	Sushi Restaurant	Liquor Store
60	Trail	Spa	Café
61	Deli / Bodega	Construction & Landscaping	Food

6th Most Common Venue	7th Most Common Venue \
0 Pizza Place	Outlet Mall
2 Spanish Restaurant	Fast Food Restaurant
3 Pizza Place	Deli / Bodega
4 Breakfast Spot	Bar
7 Discount Store	Furniture / Home Store
8 Fast Food Restaurant	French Restaurant
11 Grocery Store	Mini Golf
12 Donut Shop	Sandwich Place
13 Comedy Club	Spanish Restaurant
14 Mexican Restaurant	Gas Station
15 Furniture / Home Store	French Restaurant
16 Liquor Store	Mexican Restaurant
17 Fast Food Restaurant	Bank
18 Restaurant	Dance Studio
19 Mexican Restaurant	Diner
20 Mexican Restaurant	Deli / Bodega
21 Sandwich Place	Supermarket
22 Filipino Restaurant	French Restaurant
23 Yoga Studio	Filipino Restaurant
24 Gym / Fitness Center	Yoga Studio
25 Furniture / Home Store	French Restaurant
28 Outdoors & Recreation	Supermarket
29 Basketball Court	Italian Restaurant
30 Bakery	Pizza Place
31 Smoke Shop	Flower Shop
32 Restaurant	Liquor Store
33 Grocery Store	Miscellaneous Shop
34 Beach	Skating Rink
35 Liquor Store	Salon / Barbershop
36 Sandwich Place	Nail Salon
37 Salon / Barbershop	Toll Plaza
38 French Restaurant	Food Truck
39 Burger Joint	Furniture / Home Store
40 Convenience Store	Liquor Store
42 Pizza Place	Bagel Shop
43 Spa	Donut Shop
44 Fast Food Restaurant	Food Truck
45 Diner	French Restaurant

46	Café	Chinese Restaurant
47	Fast Food Restaurant	French Restaurant
48	Baseball Field	Gastropub
49	Pizza Place	Eastern European Restaurant
51	Event Space	Food Truck
52	Yoga Studio	Filipino Restaurant
55	Food	Sushi Restaurant
57	Racetrack	Art Gallery
58	Filipino Restaurant	Furniture / Home Store
59	Chinese Restaurant	Bagel Shop
60	Yoga Studio	Fast Food Restaurant
61	Train Station	Coffee Shop

	8th Most Common Venue	9th Most Common Venue \
0	Baseball Stadium	Bus Stop
2	Skate Park	New American Restaurant
3	Cosmetics Shop	Ice Cream Shop
4	Bus Stop	Café
7	French Restaurant	Food Truck
8	Food Truck	Food & Drink Shop
11	Tattoo Parlor	Bagel Shop
12	Restaurant	Pizza Place
13	Park	Café
14	Dim Sum Restaurant	Dessert Shop
15	Food Truck	Food & Drink Shop
16	Grocery Store	Food & Drink Shop
17	Martial Arts Dojo	Smoke Shop
18	Deli / Bodega	American Restaurant
19	Coffee Shop	Martial Arts Dojo
20	Lawyer	Hotel
21	Café	Caribbean Restaurant
22	Food Truck	Food & Drink Shop
23	French Restaurant	Food Truck
24	Filipino Restaurant	Food Truck
25	Food Truck	Food & Drink Shop
28	Middle Eastern Restaurant	Mediterranean Restaurant
29	IT Services	Grocery Store
30	Liquor Store	Restaurant
31	Fast Food Restaurant	Sandwich Place
32	Chinese Restaurant	Food Truck
33	Tanning Salon	Mexican Restaurant
34	Sports Bar	Diner
35	Donut Shop	Shipping Store
36	Ice Cream Shop	Discount Store
37	Pizza Place	Brewery
38	Food & Drink Shop	Food
39	Sporting Goods Shop	Diner

40	Donut Shop	Moving Target
42	Food Truck	Food & Drink Shop
43	Pizza Place	Food Truck
44	Food & Drink Shop	Food
45	Food Truck	Department Store
46	Gift Shop	Food Truck
47	Food Truck	Food & Drink Shop
48	Music Store	Nail Salon
49	Chinese Restaurant	Cajun / Creole Restaurant
51	Food & Drink Shop	Flower Shop
52	French Restaurant	Food Truck
55	Home Service	Chinese Restaurant
57	Hotel	Food & Drink Shop
58	French Restaurant	Food Truck
59	Tanning Salon	Pet Store
60	French Restaurant	Food Truck
61	Smoothie Shop	Sandwich Place

	10th Most Common Venue
0	Bus Station
2	Optical Shop
3	Eastern European Restaurant
4	Sandwich Place
7	Food & Drink Shop
8	Food
11	Bar
12	Pharmacy
13	Baseball Field
14	Deli / Bodega
15	Food
16	Pharmacy
17	Bus Stop
18	Fast Food Restaurant
19	Bank
20	Event Space
21	Check Cashing Service
22	Food
23	Food & Drink Shop
24	Food & Drink Shop
25	Food
28	Sandwich Place
29	Nail Salon
30	Gas Station
31	Sushi Restaurant
32	Food & Drink Shop
33	Bus Stop
34	Restaurant

```

35         Fast Food Restaurant
36         Fish & Chips Shop
37         Cosmetics Shop
38         Flower Shop
39         Gift Shop
40         Grocery Store
42         Food
43         Pharmacy
44         Flower Shop
45         Food & Drink Shop
46         Deli / Bodega
47         Food
48         Furniture / Home Store
49         Park
51         Fish & Chips Shop
52         Food & Drink Shop
55         Campground
57         Ice Cream Shop
58         Food & Drink Shop
59         Farmers Market
60         Food & Drink Shop
61         Mexican Restaurant

```

[40]: #CLUSTER-4

```

Staten_Island_merged.loc[Staten_Island_merged['Cluster Labels'] == 3,
↳Staten_Island_merged.columns[[1] + list(range(5, Staten_Island_merged.
↳shape[1]))]]

```

[40]:

	Neighborhood	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
10	Port Ivory	Business Service	Yoga Studio								
10		Gastropub	Furniture / Home Store	French Restaurant							
10		Food Truck	Food & Drink Shop	Food							
10		Flower Shop	Fish & Chips Shop								

[41]: #CLUSTER-5

```

Staten_Island_merged.loc[Staten_Island_merged['Cluster Labels'] == 4,
↳Staten_Island_merged.columns[[1] + list(range(5, Staten_Island_merged.
↳shape[1]))]]

```

[41]: Neighborhood 1st Most Common Venue 2nd Most Common Venue \

6	Todt Hill	Park	Yoga Studio
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	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue \
6	Gas Station	French Restaurant	Food Truck

	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue \
6	Food & Drink Shop	Food	Flower Shop

	9th Most Common Venue	10th Most Common Venue
6	Fish & Chips Shop	Filipino Restaurant

Results and Discussion

The vision of this project is to help individuals/families who want to relocate to the safest borough in New York City, anyone can explore the neighborhoods to which they want to relocate based on the most common venues in it.

In the clusters formed after the data is explored a individual can look for a neighborhood with good public transportation, food places we can see that Clusters 2 has bus stops, restaurants as the most common venues. If a person is looking for a neighborhood with stores and restaurants in a close proximity then the neighborhoods in the cluster 3 is suitable for them. For a family looking for a neighborhood the Cluster 3 is more suitable as it shows parks, beach, grocery stores and Gyms.

Conclusion

This project helps an individual to get a better exposure to the neighborhoods in terms of the crimes occuring in the borough and the most common venues in that neighborhood. A project like this will be helpful to many people, it is always helpful to make use of technology and to understnad about the location online instead of being present there in the location itself or even before moving to the new place.

We have just taken safety as a primary concern of everyone and has shortlisted to the safest borough in New york city and then finding the most common places in the neighbourhods and presenting the different clusters to choose from according to once preferences.