The Battle of Covid19

March 30, 2020

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1 The Battle

1.1 Introduction

Coronavirus sickness (COVID-19) is an irresistible infection brought about by another infection.

The infection causes respiratory ailment (like this season's flu virus) with manifestations, for example, a hack, fever, and in progressively extreme cases, trouble relaxing. You can secure yourself by washing your hands as often as possible, abstaining from contacting your face, and maintaining a strategic distance from close contact (1 meter or 3 feet) with individuals who are unwell.

1.2 Problem Statement

This Virus has spread all through the world, which caused a significant misfortune in human life and financial everyday practice. Besides, The Virus has affected in excess of 7 lacs individuals all through the world with recuperation pace of 2% and 34000+ Deaths all through the world. The Major Countries Such as China , Itlay , US , Germany and so on have huge measure of paitents who are affected with Covid19.

As, this Virus has caused pandamic debacle all through the world. India has least number of cases on the planet till now as India has played it safe to forestall this pandamic.

We will try to figure out The most effected states in India with more population and least number number of center.With the Most effected states we will find most effected citites in that paticular states.

As of Now we have least number of cases compared to rest of the countries. But talking about the stats we have mass number of population and very limited amount of reasources.Taking the worst case Senrio we need to expand the resources with limited number of doctors who will be treating the paitents.

1.3 Goal

Lets Assume, we have 800 beds accessible in the fundamental center.In Case if beds are completly full we need a seclusion place yet alloting an isloation community would help paitents however we have 10 principle specialists who are treating critcal just as expected paitents.

Imagine a scenario where we discover the closest medical clinics or a seclusion community inside 1.5 to 3 km of range to such an extent that in time of crisis or for normal exam they can without much of a stretch travel inside 3 km range to numerous focuses.

1.This Will assist with decreasing the quantity of passings and help paitents to fix quick.

2.By breaking down versertile paitents, there would be more possibilty for their examination group to handily discover arrangement and get ready immunization.

What We will Do With information driven technique

1.We will Optimize the and find conceivable isloation habitats which are closest to our test place in the event that we unexpectedly have ascend in symotmatic paitents. We can designate them to that place through which an indvdiual specialists can assume responsibility for the paitents by utilizing Foursqure API.

2.By Using Machine Learning we will amass the basic paitents and typical paitents closest to the test place inside 1.5 km of range.

```
In [1]: import requests
        from bs4 import BeautifulSoup
        import csv
        import json
        import xml
        import pandas as pd
        import numpy as np

        !conda install -c conda-forge folium=0.5.0 --yes
        import folium
        from folium import plugins

        import json
        from pprint import pprint

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

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

        # Matplotlib and associated plotting modules
        import matplotlib.cm as cm
        import matplotlib.colors as colors
        import matplotlib.pyplot as plt
        %matplotlib inline

        # import k-means from clustering stage
        from sklearn.cluster import KMeans

        import pandas as pd # library for data analsysis
        pd.set_option('display.max_columns', None)
        pd.set_option('display.max_rows', None)

        import json # library to handle JSON files
        import requests # library to handle requests
        from pandas.io.json import json_normalize # tranform JSON file into a pandas dataframe
```

```
Solving environment: done

# All requested packages already installed.

Solving environment: done

# All requested packages already installed.
```

1.4 Working with Test Center Data Set

```
In [2]: url= 'https://docs.google.com/spreadsheets/d/1vvhdhxNPlEqIZxfQiSGmYCnNf6WB37vhXo3P5W08CQ
```

```
In [3]: data = 'https://docs.google.com/spreadsheets/d/e/2PACX-1vTowbPbWhuIRQgVzJR0mVcFv4nG59m5J
```

```
In [4]: import pandas as pd
        file = pd.read_csv(data,sep=",") # use sep="," for coma separation.
        file.describe()
```

```
Out[4]:         Latitude  Longitude
        count  62.000000  62.000000
        mean   21.574865  80.200249
        std     7.136525   6.287965
        min     8.485500  72.114700
        25%    14.966342  76.176767
        50%    23.139585  77.640610
        75%    26.839086  82.076485
        max    34.141700  94.908370
```

```
In [5]: file = file.drop(file.index[0])
```

```
In [52]: file.head()
```

```
Out[52]:             State                                       TestCenter  \
         1  ANDHRA PRADESH  Sri Venkateswara Institute of Medical Sciences
         2  ANDHRA PRADESH                          Andhra Medical College
         3  ANDHRA PRADESH                                             GMC
         4  ANDHRA PRADESH                       Sidhartha Medical College
         5  ANDHRA PRADESH                       Rangaraya Medical College

                     City   Latitude  Longitude
         1       Tirupati  22.467370  88.378590
         2  Visakhapatnam  15.821800  78.038840
         3      Anantapur  14.681190  77.596700
         4     Vijayawada  16.491640  80.690150
         5       Kakinada  20.474449  85.888367
```

```
In [7]: file.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 62 entries, 1 to 62
Data columns (total 5 columns):
State         62 non-null object
TestCenter    62 non-null object
City          62 non-null object
Latitude      62 non-null float64
Longitude     62 non-null float64
dtypes: float64(2), object(3)
memory usage: 2.9+ KB
```

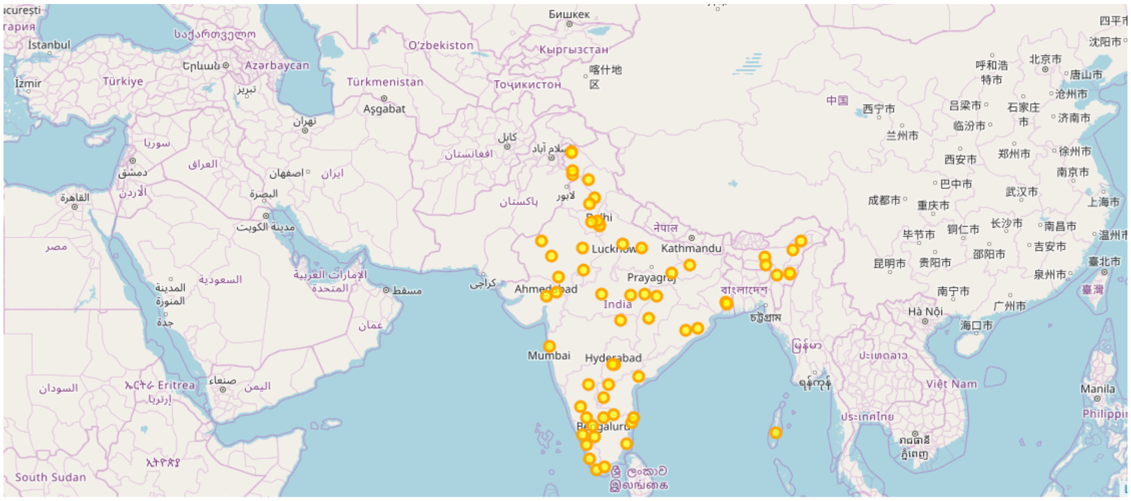
1.5 Ploting Test Center Using Geolocator and Folium

```
In [8]: address = 'India'
        geolocator = Nominatim(user_agent="my_app")
        location = geolocator.geocode(address)
        latitude = location.latitude
        longitude = location.longitude
        print('The geograpical coordinate are {}, {}.'.format(latitude, longitude))
```

```
The geograpical coordinate are 22.3511148, 78.6677428.
```

```
In [53]: map_test_center = folium.Map(location=[latitude, longitude], zoom_start=4)

         # add markers to map
         for lat, lng, label in zip(file['Latitude'], file['Longitude'], file['TestCenter']):
             label = folium.Popup(label, parse_html=True)
             folium.CircleMarker(
                 [lat, lng],
                 radius=5,
                 popup=label,
                 color='orange',
                 fill=True,
                 fill_color='yellow',
                 fill_opacity=0.7,
                 parse_html=False).add_to(map_test_center)

         map_test_center.save("map_test_center.png")
```

```
In [54]: map_test_center
```



1.6 Finding out which state has most population Population

```
In [10]: url_list = requests.get('https://en.wikipedia.org/wiki/List_of_states_and_union_territo
```

```
In [57]: soup = BeautifulSoup(url_list, 'lxml')
```

```
In [12]: wiki_extract = soup.find("table", class_ = 'wikitable sortable')
         wiki_table_rows = wiki_extract.find_all('tr')
```

```
In [13]: information = []
         for row in wiki_table_rows:
             info = row.text.split('\n')[1:-1]
             information.append(info)

         state_df = pd.DataFrame(information[0:])

         state_df = state_df.drop(state_df.columns[[0, 17, 18]], axis=1)
```

```
In [14]: state_df.columns = state_df.iloc[0]
         state_df = state_df.reindex(state_df.index.drop(0)).reset_index(drop=True)
         state_df.columns.name = None
```

```
In [58]: state_df.head(10)
```

```
Out[58]:     State or union territory           Population(%)    \
         0              Uttar Pradesh      199,812,341(16.51%)
         1                Maharashtra       112,374,333(9.28%)
         2                      Bihar        104,099,452(8.6%)
         3                West Bengal        91,276,115(7.54%)
         4             Madhya Pradesh           72,626,809(6%)
         5                 Tamil Nadu        72,147,030(5.96%)
         6                  Rajasthan        68,548,437(5.66%)
         7                  Karnataka        61,095,297(5.05%)
         8                    Gujarat        60,439,692(4.99%)
```

```
9             Andhra Pradesh    49,577,103[b]  (4.08%)

  Decadal growth(2001-2011)       Rural population(%)   Urban population(%)    \
0                     20.2%       155,317,278(77.73%)    44,495,063(22.27%)
1                     20.0%        61,556,074(54.78%)    50,818,259(45.22%)
2                        25  .4%                         92,341,436(88.71%)
3                     13.8%        62,183,113(68.13%)    29,093,002(31.87%)
4                     16.3%        52,557,404(72.37%)    20,069,405(27.63%)
5                     15.6%         37,229,590(51.6%)     34,917,440(48.4%)
6                     21.3%        51,500,352(75.13%)    17,048,085(24.87%)
7                     15.6%        37,469,335(61.33%)    23,625,962(38.67%)
8                     19.3%         34,694,609(57.4%)     25,745,083(42.6%)
9                     11.0%        34,966,693(70.53%)    14,610,410(29.47%)

                      Area[16]                   Density[a]    \
0   240,928 km2 (93,023 sq mi)        828/km2 (2,140/sq mi)
1  307,713 km2 (118,809 sq mi)          365/km2 (950/sq mi)
2           11,758,016(11.29%)    94,163 km2 (36,357 sq mi)
3    88,752 km2 (34,267 sq mi)      1,029/km2 (2,670/sq mi)
4  308,245 km2 (119,014 sq mi)          236/km2 (610/sq mi)
5   130,058 km2 (50,216 sq mi)        555/km2 (1,440/sq mi)
6  342,239 km2 (132,139 sq mi)          201/km2 (520/sq mi)
7   191,791 km2 (74,051 sq mi)          319/km2 (830/sq mi)
8   196,024 km2 (75,685 sq mi)          308/km2 (800/sq mi)
9   162,968 km2 (62,922 sq mi)          303/km2 (780/sq mi)

                 Sex ratio
0                      912
1                      929
2  1,102/km2 (2,850/sq mi)
3                      953
4                      931
5                      996
6                      928
7                      973
8                      919
9                      993
```

UP, Maharastra and Bihar are the three states with most population.

1.7 Finding Out Which State is highly Infected

```
In [16]: covid_case = requests.get("https://www.mohfw.gov.in").text
```

```
In [59]: soup = BeautifulSoup(covid_case, 'lxml')
```

```
In [18]: wiki_covid = soup.find("div", id = 'cases')
         covid_table_rows = wiki_covid.find_all('tr')
```

```
In [20]: covid_information = []
         for row in covid_table_rows:
             info = row.text.split('\n')

             covid_information.append(info)

         covid_information
```

```
Out[20]: [['',
           'S. No.',
           'Name of State / UT',
           'Total Confirmed cases *',
           '',
           'Cured/Discharged/Migrated',
           'Death',
           ''],
          ['', '1', 'Andhra Pradesh', '19', '', '1', '0', ''],
          ['', '2', 'Andaman and Nicobar Islands', '9', '', '0', '0', ''],
          ['', '3', 'Bihar', '11', '', '0', '1', ''],
          ['', '4', 'Chandigarh', '8', '', '0', '0', ''],
          ['', '5', 'Chhattisgarh', '7', '', '0', '0', ''],
          ['', '6', 'Delhi', '53', '', '6', '2', ''],
          ['', '7', 'Goa', '5', '', '0', '0', ''],
          ['', '8', 'Gujarat', '58', '', '1', '5', ''],
          ['', '9', 'Haryana', '33', '', '17', '0', ''],
          ['', '10', 'Himachal Pradesh', '3', '', '0', '1', ''],
          ['', '11', 'Jammu and Kashmir', '31', '', '1', '2', ''],
          ['', '12', 'Karnataka', '80', '', '5', '3', ''],
          ['', '13', 'Kerala', '194', '', '19', '1', ''],
          ['', '14', 'Ladakh', '13', '', '3', '0', ''],
          ['', '15', 'Madhya Pradesh', '33', '', '0', '2', ''],
          ['', '16', 'Maharashtra', '193', '', '25', '8', ''],
          ['', '17', 'Manipur', '1', '', '0', '0', ''],
          ['', '18', 'Mizoram', '1', '', '0', '0', ''],
          ['', '19', 'Odisha', '3', '', '0', '0', ''],
          ['', '20', 'Puducherry', '1', '', '0', '0', ''],
          ['', '21', 'Punjab', '38', '', '1', '1', ''],
          ['', '22', 'Rajasthan', '57', '', '3', '0', ''],
          ['', '23', 'Tamil Nadu', '50', '', '4', '1', ''],
          ['', '24', 'Telengana', '69', '', '1', '1', ''],
          ['', '25', 'Uttarakhand', '7', '', '2', '0', ''],
          ['', '26', 'Uttar Pradesh', '75', '', '11', '0', ''],
          ['', '27', 'West Bengal', '19', '', '0', '1', ''],
          ['',
           'Total number of confirmed cases in India',
           '1071',
           '',
           '',
          '100',
          '',
          '',
          '29',
          '',
          '']]
```

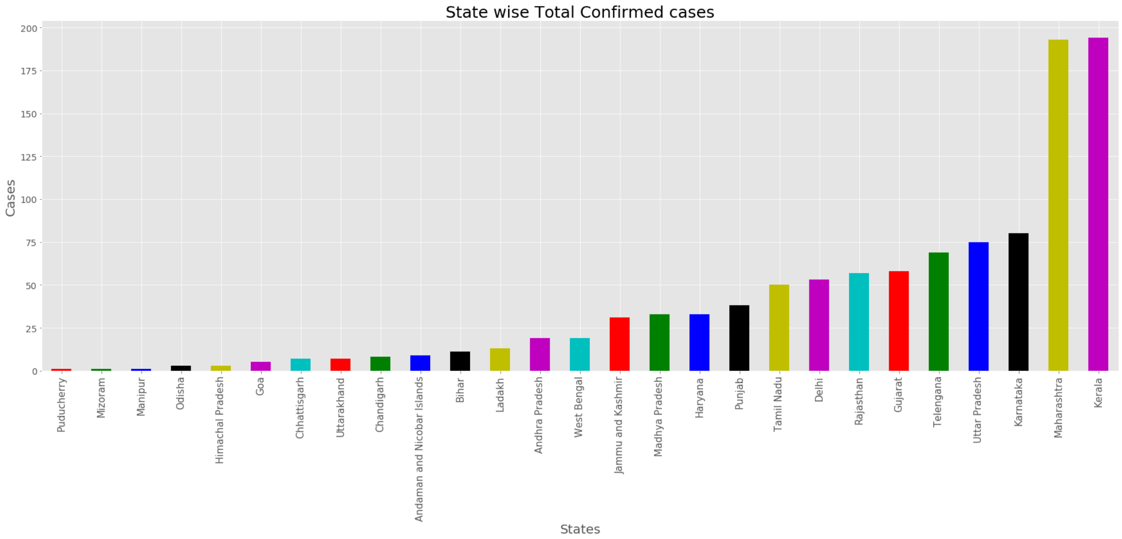
```
In [21]: covid_df = pd.DataFrame(covid_information)
         covid_df = covid_df.drop(covid_df.columns[[0, 7, 8,9,10]], axis=1)

         covid_df.columns = covid_df.iloc[0]
         covid_df = covid_df.reindex(covid_df.index.drop(0)).reset_index(drop=True)
         covid_df.columns.name = None

         covid_df = covid_df.drop(covid_df.index[27])
```

```
In [60]: covid_df['Total Confirmed cases *'] = covid_df['Total Confirmed cases *'].astype(int)
         covid_df.head(10)
```

```
Out[60]:   S. No.            Name of State / UT  Total Confirmed cases *    \
         0      1                Andhra Pradesh                       19
         1      2   Andaman and Nicobar Islands                        9
         2      3                         Bihar                       11
         3      4                    Chandigarh                        8
         4      5                  Chhattisgarh                        7
         5      6                         Delhi                       53
         6      7                           Goa                        5
         7      8                       Gujarat                       58
         8      9                       Haryana                       33
         9     10              Himachal Pradesh                        3

           Cured/Discharged/Migrated Death
         0                          1     0
         1                          0     0
         2                          0     1
         3                          0     0
         4                          0     0
         5                          6     2
         6                          0     0
         7                          1     5
         8                         17     0
         9                          0     1
```

```
In [56]: import matplotlib.pyplot as plt
         %matplotlib inline
         plt.style.use('ggplot')

         my_colors = 'rgbkymc'
```

```
covid_df2 = covid_df[['Name of State / UT', 'Total Confirmed cases *']].sort_values(by
index = covid_df2.set_index("Name of State / UT", inplace = True)
bar = covid_df2.plot(kind='bar',figsize=(20, 10) ,color=my_colors, legend = None)
bar
plt.yticks(fontsize = 14)
plt.xticks(index, fontsize=15, rotation=90)

plt.xlabel("States", fontsize = 20)
plt.ylabel("Cases", fontsize = 20)
plt.title("State wise Total Confirmed cases", fontsize=25)

bar.spines['top'].set_visible(False)
bar.spines['right'].set_visible(False)
bar.spines['bottom'].set_linewidth(0.5)
bar.spines['left'].set_visible(True)

plt.show()
plt.savefig('covid_read.png')
```



```
<Figure size 432x288 with 0 Axes>
```

Kerala and Maharashtra are two states which are highly effected with 190+ Cases. But We will choose Maharashtra because,

1. Maharastra has secound highest Population in the country

2. It has only two test Centers

1.8 Finding Out which city is most infected

```
In [24]: mh_data = requests.get('https://en.wikipedia.org/wiki/2020_coronavirus_pandemic_in_Maha
```

```
In [61]: soup = BeautifulSoup(mh_data, 'lxml')
```

```
In [26]: wiki_mh = soup.find("table", class_ = 'wikitable')
         mh_table_rows = wiki_mh.find_all('tr')

         mh_information = []
         for row in mh_table_rows:
             info = row.text.split('\n')

             mh_information.append(info)

         mh_information
```

```
Out[26]: [['', 'District', '', 'Total cases', '', 'Deaths', '', 'Notes', ''],
          ['', 'Mumbai City + Mumbai Suburban', '', '88', '', '6', '', '', ''],
          ['',
           'Thane',
           '',
           '18',
           '',
           '1',
           '',
           'Kalyan-Dombivli (7), Navi Mumbai (6), Thane (5), Ulhasnagar (1)',
           ''],
          ['', 'Palghar', '', '5', '', '0', '', ' Vasai-Virar (4), Palghar (1)', ''],
          ['', 'Raigad', '', '2', '', '0', '', 'Panvel (2)', ''],
          ['', 'Total in Mumbai Metropolitan Region', '', '113', '', '7', '', '', ''],
          ['', 'Pune', '', '42', '', '0', '', '', ''],
          ['', 'Sangli', '', '25', '', '0', '', '', ''],
          ['', 'Nagpur', '', '16', '', '0', '', '', ''],
          ['', 'Ahmednagar', '', '5', '', '0', '', '', ''],
          ['', 'Yavatmal', '', '4', '', '0', '', '', ''],
          ['', 'Kolhapur', '', '2', '', '0', '', '', ''],
          ['', 'Satara', '', '2', '', '0', '', '', ''],
          ['', 'Aurangabad', '', '1', '', '0', '', '', ''],
          ['', 'Buldhana', '', '1', '', '1', '', '', ''],
          ['', 'Gondia', '', '1', '', '0', '', '', ''],
          ['', 'Jalgaon', '', '1', '', '0', '', '', ''],
          ['', 'Nashik', '', '1', '', '0', '', '', ''],
          ['', 'Ratnagiri', '', '1', '', '0', '', '', ''],
          ['', 'Sindhudurg', '', '1', '', '0', '', '', ''],
          ['', 'Total (all districts)', '', '215', '', '8', '', '', ''],
          ['', 'As of 30 March 2020[70]', '']]
```

```
In [27]: mh_df = pd.DataFrame(mh_information[0:])
         mh_df.columns = mh_df.iloc[0]
```

```
        mh_df = mh_df.reindex(mh_df.index.drop(0)).reset_index(drop=True)
        mh_df.columns.name = None
```

```
In [62]: mh_df.head(10)
```

```
Out[62]:                                  District  Total cases  Deaths   \
         0        Mumbai City + Mumbai Suburban           88       6
         1                                Thane           18       1
         2                              Palghar            5       0
         3                               Raigad            2       0
         4   Total in Mumbai Metropolitan Region          113       7
         5                                 Pune           42       0
         6                               Sangli           25       0
         7                               Nagpur           16       0
         8                           Ahmednagar            5       0
         9                              Yavatmal            4       0

                                                Notes
         0
         1  Kalyan-Dombivli (7), Navi Mumbai (6), Thane (5...
         2                    Vasai-Virar (4), Palghar (1)
         3                                      Panvel (2)
         4
         5
         6
         7
         8
         9
```

As We know, Maharastra has second highest population and second highest Infected State in the Country with least number of Test Center. We will Pick up Mumbai(As we know Mumbai is very densly populated with highest number 0f cases) and we will try to impliment solutions.

1.9 Accessing Four Square API

```
In [29]: CLIENT_ID ='C1BB50HNQVJUNJBXQ2PDTEFSOX1SGJGLIEEJPYFFXADJH313' # portion hidden from vie
         CLIENT_SECRET = '30QKDGXPGJOCSKRETYN4G1CFQHVGZXBWNHSU3DSUTZ5QPAHL'# portion hidden from
         VERSION = '20180604'
         LIMIT = 50
         radius = 2000
         categoryId = "4bf58dd8d48988d196941735"
         print('Your credentails:')
         print('CLIENT_ID: ' + CLIENT_ID)
         print('CLIENT_SECRET:' + CLIENT_SECRET)
```

```
Your credentails:
CLIENT_ID: C1BB50HNQVJUNJBXQ2PDTEFSOX1SGJGLIEEJPYFFXADJH313
CLIENT_SECRET:30QKDGXPGJOCSKRETYN4G1CFQHVGZXBWNHSU3DSUTZ5QPAHL
```

1.10 Getting Near by Hospltals within 2.5 km of range

```
In [30]: mum_lat = 18.98546
         mum_long = 72.83132

In [31]: url = 'https://api.foursquare.com/v2/venues/search?&client_id={}&client_secret={}&v={}&
             CLIENT_ID,
             CLIENT_SECRET,
             VERSION,
             categoryId,
             mum_lat,
             mum_long,
             radius,
             LIMIT)
         url

Out[31]: 'https://api.foursquare.com/v2/venues/search?&client_id=C1BB5OHNQVJUNJBXQ2PDTEFSOX1SGJG

In [32]: venues_list=[]

         results =  requests.get(url).json()["response"]['venues']

In [33]: venues_list.append([(
                     v['name'],
                     v['location']['lat'],
                     v['location']['lng'],
                     v['location']['distance']) for v in results])

In [34]: nearby_venues = pd.DataFrame([venues for venue_list in venues_list for venues in venue_
         nearby_venues.columns = ['Near by Hospitals',
                           'Latitude',
                          'Longitude','Distance']
         nearby_venues =  nearby_venues.dropna()
         nearby_venues =  nearby_venues.reset_index(drop=True)

In [63]: nearby_venues.head()

Out[63]:                           Near by Hospitals   Latitude  Longitude  Distance  \
         0                          Nirmala Hospital  18.984812  72.830059       151
         1                        kasturbha hospital  18.980616  72.829620       568
         2  Dr Babasaheb Ambedkar Memorial Hospital  18.979982  72.833486       651
         3                         Dr B A M Hospital  18.979415  72.834303       742
         4                    Wellspring, Lower Parel  18.977779  72.827191       959

            Cluster
         0        0
         1        0
         2        0
         3        0
         4        0
```

```
In [51]: print('There are {} hospitals within 2.5 km of range.'.format(len(nearby_venues['Near b
```

```
There are 22 hospitals within 2.5 km of range.
```

```
In [64]: nearby_venues = nearby_venues.sort_values(by ='Distance' , ascending=True)
         nearby_venues =  nearby_venues.reset_index(drop=True)
         nearby_venues.head(10)
```

```
Out[64]:                         Near by Hospitals   Latitude  Longitude  Distance  \
         0                        Nirmala Hospital  18.984812  72.830059       151
         1                      kasturbha hospital  18.980616  72.829620       568
         2  Dr Babasaheb Ambedkar Memorial Hospital  18.979982  72.833486       651
         3                      Dr B A M Hospital  18.979415  72.834303       742
         4                  Wellspring, Lower Parel  18.977779  72.827191       959
         5             King George Memorial Hospital  18.989853  72.823441       962
         6                          Niar hospital  18.976120  72.827176      1127
         7                  Masina Hospital, Byculla  18.974487  72.836080      1320
         8                 Maru Charitable Hospital  18.997197  72.836956      1434
         9                          Nair Hospital  18.973648  72.822754      1594

            Cluster
         0        0
         1        0
         2        0
         3        0
         4        0
         5        0
         6        0
         7        1
         8        1
         9        1
```

```
In [38]: nearby_venues['Distance'].mean()

         nearest_distance = np.array(nearby_venues['Distance']>=1489)

         mild_distance = np.array(nearby_venues['Distance']<= 1489)

         print('Nearest within 1.5 km to center:' ,nearest_distance.sum())

         print('Nearest between 1.5 to 2.5 km center:' ,mild_distance.sum())
```

```
Nearest within 1.5 km to center: 13
Nearest between 1.5 to 2.5 km center: 9
```

1.11 Using K means algorithum to group nearby places

```
In [39]: kclusters = 3
```

```
        nearby_venues_clustering = nearby_venues.drop('Near by Hospitals', 1)
        # run k-means clustering
        kmeans = KMeans(n_clusters=kclusters, random_state=1).fit(nearby_venues_clustering)

        # check cluster labels generated for each row in the dataframe
        print(kmeans.labels_)
        print(len(kmeans.labels_))
```

```
[0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2]
22
```

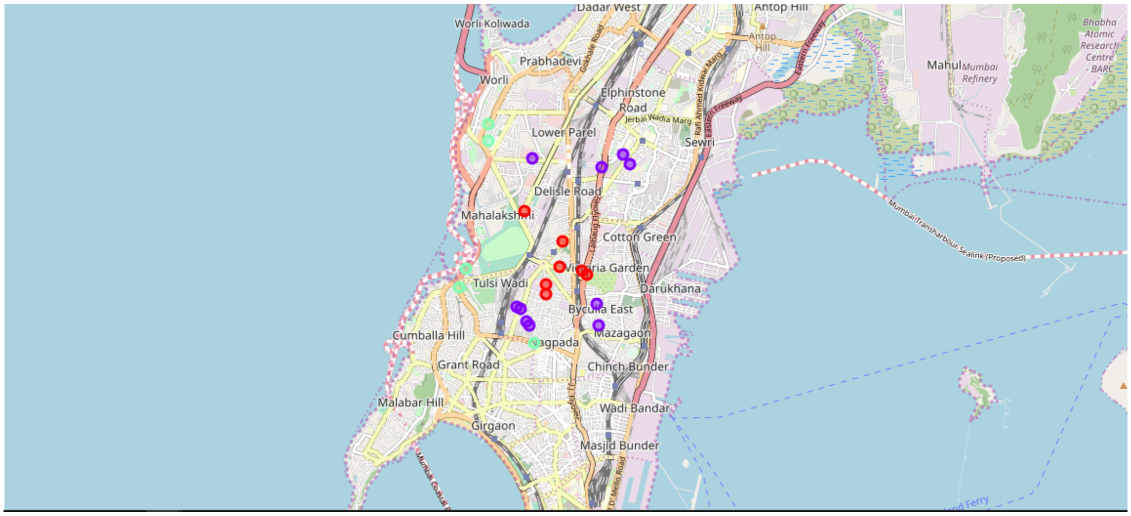
```
In [40]: nearby_venues_merge = nearby_venues

         nearby_venues['Cluster'] = kmeans.labels_
```

```
In [65]: nearby_venues.head()
```

```
Out[65]:                      Near by Hospitals   Latitude  Longitude  Distance  \
         0                    Nirmala Hospital  18.984812  72.830059       151
         1                   kasturbha hospital  18.980616  72.829620       568
         2  Dr Babasaheb Ambedkar Memorial Hospital  18.979982  72.833486       651
         3                     Dr B A M Hospital  18.979415  72.834303       742
         4               Wellspring, Lower Parel  18.977779  72.827191       959

            Cluster
         0        0
         1        0
         2        0
         3        0
         4        0
```

1.12 Plotting Map

```
In [66]: map_clusters = folium.Map(location=[mum_lat, mum_long], zoom_start=14)


         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]


         markers_colors = []

         for lat, lon, poi, cluster in zip(nearby_venues['Latitude'], nearby_venues['Longitude']
             label = folium.Popup(str(poi), parse_html=True)

             folium.CircleMarker(
                 [lat, lon],
                 radius=5,
                 popup=label,
                 color=rainbow[cluster-1],
                 fill=True,
                 fill_color=rainbow[cluster-1],
                 fill_opacity=0.5).add_to(map_clusters)
         map_clusters.save("map_clusters.png")
         map_clusters
```



1.13 Conclusion

We Found out 22 Hostpitals in the scope of 2.5 km.

Right off the bat, We sucessfully Optimized the nearby area using Clustering Algorithum.

1. For Cluster 0 we can say that these hosptials are close to the middle . So we can distribute that beds for critcal paitent.

2. Similary, For Cluster 1,2 we can designate gentle and typical symtom paitents.

Notwithstanding accomplish more accuary we can likewise use government schools, universities and shut zone places, for example, hotels, multi-corp. Structures for all the cities.