heatmap_covid-19

September 3, 2020

[46]:
```
import pandas as pd
import numpy as np

import folium
from folium import plugins
```

[47]:
```
df = pd.read_csv('caso_covid.csv')
```

[48]:
```
df.head()
```

[48]:

	date	state	city	place_type	confirmed	deaths	order_for_place	is_last	estimated_population_2019	city_ibge_code	confirmed_per_100k_inhabitants	death_rate
0	2020-09-02	AP	NaN	state	43800	668	166	True	845731.0	16.0	5178.95170	0.0153
1	2020-09-01	AP	NaN	state	43514	663	165	False	845731.0	16.0	5145.13480	0.0152
2	2020-08-31	AP	NaN	state	43193	661	164	False	845731.0	16.0	5107.17947	0.0153
3	2020-08-30	AP	NaN	state	42892	660	163	False	845731.0	16.0	5071.58896	0.0154
4	2020-08-29	AP	NaN	state	42771	659	162	False	845731.0	16.0	5057.28181	0.0154

[49]:
```
## IBGE LATITUDE E LONGITUDE
```

[50]:
```
cidades = pd.read_csv('cidades_brasil.csv')
```

[51]:
```
cidades = cidades.set_index('codigo_ibge')
```

[52]:
```
cidades.head()
```

[52]:

codigo_ibge	nome	latitude	longitude	capital	codigo_uf
5200050	Abadia de Goiás	-16.75730	-49.4412	0	52
3100104	Abadia dos Dourados	-18.48310	-47.3916	0	31
5200100	Abadiânia	-16.19700	-48.7057	0	52
3100203	Abaeté	-19.15510	-45.4444	0	31
1500107	Abaetetuba	-1.72183	-48.8788	0	15

[53]:
```
## Data preprocessing
```

[54]:
```
cities = df.loc[df.place_type == 'city']
```

[55]:
```
cities.place_type.unique()
```

[55]:
```
array(['city'], dtype=object)
```

[56]:
```
len(cities)
```

[56]:
```
614193
```

[57]:
```
cities = cities.join( cidades, on='city_ibge_code')
```

[58]:
```
cities
```

[58]:

	date	state	city	place_type	confirmed	deaths	\
166	2020-09-02	AP	Amapá	city	510	4	
167	2020-09-01	AP	Amapá	city	506	4	
168	2020-08-31	AP	Amapá	city	504	4	
169	2020-08-30	AP	Amapá	city	489	4	
170	2020-08-29	AP	Amapá	city	484	4	
…	…	…	…	…	…	…	
618808	2020-06-23	SP	Óleo	city	1	0	
618809	2020-06-22	SP	Óleo	city	1	0	
618810	2020-06-21	SP	Óleo	city	1	0	
618811	2020-06-20	SP	Óleo	city	1	0	
618812	2020-06-19	SP	Óleo	city	1	0	

	order_for_place	is_last	estimated_population_2019	city_ibge_code	\
166	127	True	9109.0	1600105.0	
167	126	False	9109.0	1600105.0	
168	125	False	9109.0	1600105.0	
169	124	False	9109.0	1600105.0	
170	123	False	9109.0	1600105.0	
…	…	…	…	…	
618808	5	False	2496.0	3533809.0	

```
618809                4    False                    2496.0       3533809.0
618810                3    False                    2496.0       3533809.0
618811                2    False                    2496.0       3533809.0
618812                1    False                    2496.0       3533809.0

        confirmed_per_100k_inhabitants  death_rate   nome  latitude  \
166                          5598.85827      0.0078  Amapá   2.05267
167                          5554.94566      0.0079  Amapá   2.05267
168                          5532.98935      0.0079  Amapá   2.05267
169                          5368.31705      0.0082  Amapá   2.05267
170                          5313.42628      0.0083  Amapá   2.05267
…                                   …           …    …       …
618808                         40.06410      0.0000   Óleo -22.94350
618809                         40.06410      0.0000   Óleo -22.94350
618810                         40.06410      0.0000   Óleo -22.94350
618811                         40.06410      0.0000   Óleo -22.94350
618812                         40.06410      0.0000   Óleo -22.94350

        longitude  capital  codigo_uf
166      -50.7957      0.0       16.0
167      -50.7957      0.0       16.0
168      -50.7957      0.0       16.0
169      -50.7957      0.0       16.0
170      -50.7957      0.0       16.0
…           …      …         …
618808   -49.3419      0.0       35.0
618809   -49.3419      0.0       35.0
618810   -49.3419      0.0       35.0
618811   -49.3419      0.0       35.0
618812   -49.3419      0.0       35.0

[614193 rows x 17 columns]
```

[59]:
```
cidades
```

[59]:
```
                           nome  latitude  longitude  capital  codigo_uf
codigo_ibge
5200050          Abadia de Goiás -16.75730   -49.4412        0         52
3100104      Abadia dos Dourados -18.48310   -47.3916        0         31
5200100                Abadiânia -16.19700   -48.7057        0         52
3100203                   Abaeté -19.15510   -45.4444        0         31
1500107               Abaetetuba  -1.72183   -48.8788        0         15
…                            …       …         …      …        …
2933604              Xique-Xique -10.82300   -42.7245        0         29
2517407                   Zabelê  -8.07901   -37.1057        0         25
3557154                 Zacarias -21.05060   -50.0552        0         35
2114007                  Zé Doca  -3.27014   -45.6553        0         21
```

```
4219853                  Zortéa -27.45210   -51.5520        0         42

[5570 rows x 5 columns]
```

[60]:
```
geo_last = cities.loc[cities.
 ↪is_last==True,['city','latitude','longitude','state','confirmed','deaths']]
```

[61]:
```
geo_last
```

[61]:

	city	latitude	longitude	state	confirmed	deaths
166	Amapá	2.052670	-50.7957	AP	510	4
293	Calçoene	2.504750	-50.9512	AP	1131	5
415	Cutias	0.970761	-50.8005	AP	583	2
533	Ferreira Gomes	0.857256	-51.1795	AP	540	3
654	Itaubal	0.602185	-50.6996	AP	286	0
…	…	…	…	…	…	…
618253	Águas de São Pedro	-22.597700	-47.8734	SP	37	0
618398	Álvares Florence	-20.320300	-49.9141	SP	50	2
618494	Álvares Machado	-22.076400	-51.4722	SP	172	5
618621	Álvaro de Carvalho	-22.084100	-49.7190	SP	12	3
618738	Óleo	-22.943500	-49.3419	SP	4	0

[5561 rows x 6 columns]

[62]:
```
len(geo_last)
```

[62]:
```
5561
```

[63]:
```
geo_last.confirmed.sum()
```

[63]:
```
3949396
```

[68]:
```
geo_last.state.unique()
```

[68]:
```
array(['AP', 'AC', 'AM', 'AL', 'DF', 'CE', 'ES', 'GO', 'BA', 'MS', 'MA',
       'MT', 'MG', 'PA', 'PB', 'PE', 'PI', 'PR', 'RR', 'RO', 'RJ', 'RN',
       'SE', 'SC', 'TO', 'RS', 'SP'], dtype=object)
```

[69]:
```
len(geo_last.state.unique())
```

[69]:
```
27
```

[76]:
```
coordenadas = geo_last[['latitude','longitude','confirmed']]
```

[78]:
```
coordenadas = coordenadas.dropna()
```

[79]:
```
coordenadas
```

[79]:
```
          latitude  longitude  confirmed
166       2.052670   -50.7957        510
293       2.504750   -50.9512       1131
415       0.970761   -50.8005        583
533       0.857256   -51.1795        540
654       0.602185   -50.6996        286
…              …          …          …
618253  -22.597700   -47.8734         37
618398  -20.320300   -49.9141         50
618494  -22.076400   -51.4722        172
618621  -22.084100   -49.7190         12
618738  -22.943500   -49.3419          4

[5542 rows x 3 columns]
```

[80]:
```
baseMap = folium.Map(
    width="100%",
    height="100%",
    location=[-15.788497, -47.879873],
    zoom_start=4
)
```

[81]:
```
baseMap
```

[81]:
```
<folium.folium.Map at 0x7f7799f5f0a0>
```

[83]:
```
# Adicionar camada
baseMap = baseMap.add_child(plugins.HeatMap(coordenadas))
```

[84]:
```
baseMap
```

[84]:
```
<folium.folium.Map at 0x7f7799f5f0a0>
```

[85]:
```
geo_last = geo_last.dropna()
geo_last
```

[85]:
```
                      city   latitude  longitude state  confirmed  deaths
166                  Amapá   2.052670   -50.7957    AP        510       4
293               Calçoene   2.504750   -50.9512    AP       1131       5
415                 Cutias   0.970761   -50.8005    AP        583       2
533         Ferreira Gomes   0.857256   -51.1795    AP        540       3
654                Itaubal   0.602185   -50.6996    AP        286       0
…                        …          …          …   …          …       …
618253  Águas de São Pedro -22.597700   -47.8734    SP         37       0
618398    Álvares Florence -20.320300   -49.9141    SP         50       2
618494     Álvares Machado -22.076400   -51.4722    SP        172       5
618621  Álvaro de Carvalho -22.084100   -49.7190    SP         12       3
```

```
618738                Óleo -22.943500   -49.3419     SP          4       0

[5542 rows x 6 columns]
```

[87]:
```
geo_last.iloc[0]['latitude']
```

[87]:
```
2.05267
```

[100]:
```
for i in range(0, len(geo_last)):
    folium.Circle(
        location = [geo_last.iloc[i]['latitude'],geo_last.iloc[i]['longitude']],
        color = '#00FF69',
        fill = '#00A1B3',
        tooltip = '<li><bold>CIDADE : '+str(geo_last.iloc[i]['city'])+'</bold></
↪li>'+
        '<li><bold>ESTADO : '+str(geo_last.iloc[i]['state'])+'</bold></li>'+
        '<li><bold>CASOS : '+str(geo_last.iloc[i]['confirmed'])+'</bold></li>'+
        '<li><bold>MORTES : '+str(geo_last.iloc[i]['deaths'])+'</bold></li>',
        radius = (geo_last.iloc[i]['confirmed']**1.1)
    ).add_to(baseMap)
```

[101]:
```
baseMap
```

[101]:
```
<folium.folium.Map at 0x7f7799f5f0a0>
```

[ ]:
```

```