

COVID-19 Data Analysis and Mapping

Muddassir Shaikh

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1. Introduction

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The disease was first identified in December 2019 in Wuhan, the capital of China's Hubei province, and has since spread globally, resulting in the ongoing 2019–20 coronavirus pandemic. Common symptoms include fever, cough and shortness of breath. Other symptoms may include fatigue, muscle pain, diarrhea, sore throat, loss of smell and abdominal pain. The time from exposure to onset of symptoms is typically around five days, but may range from two to 14 days. While the majority of cases result in mild symptoms, some progress to viral pneumonia and multi-organ failure. As of 9 April 2020, more than 1.5 million cases have been reported in more than 200 countries and territories, resulting in more than 90,000 deaths. More than 340,000 people have recovered.

The virus is mainly spread between people during close contact,[a] often via small droplets produced during cough,[b] sneeze, or talk. While these droplets are produced when breathing out, they usually fall to the ground or surfaces rather than being infectious in the air over large distances. People may also become infected by touching a contaminated surface and then their face. The virus can survive on surfaces for up to 72 hours. Coronavirus is most contagious during the first three days after onset of symptoms, although spread may be possible before symptoms appear and in later stages of the disease.

The standard method of diagnosis is by real-time reverse transcription polymerase chain reaction (rRT-PCR) from a nasopharyngeal swab. The infection can also be diagnosed from a combination of symptoms, risk factors and a chest CT scan showing features of pneumonia.

Recommended measures to prevent infection include frequent hand washing, social distancing (maintaining physical distance from others, especially from those with symptoms), covering coughs and sneezes with a tissue or inner elbow and keeping unwashed hands away from the face. The use of masks is recommended for those who suspect they have the virus and their caregivers. Recommendations for mask use by the general public vary, with some authorities recommending against their use, some recommending their use and others

requiring their use. Currently, there is no vaccine or specific antiviral treatment for COVID-19. Management involves treatment of symptoms, supportive care, isolation and experimental measures.

The World Health Organization (WHO) declared the 2019–20 coronavirus outbreak a Public Health Emergency of International Concern (PHEIC) on 30 January 2020 and a pandemic on 11 March 2020. Local transmission of the disease has been recorded in many countries across all six WHO regions.

2. Problem Statement

It is important to track the cases of virus and prevent it from spreading. If you want to stay on top of the coronavirus, one great way to do so is to plot its progression over time and around the world. We're going to do just that using Python and we'll even animate the progress, as shown here. This is a great way to get involved and keep an eye on this developing story.

So it can help WHO and govt. to keep a track of the cases and take steps to prevent it in those areas with maximum infection.

The Dataset we are using is of WHO and provided by John Hopkins University. The link for the dataset is given below:

https://github.com/Muddassir98/Coursera_Capstone/blob/master/covid_19_data.csv

3. Dataframe and Analysis

After loading the data set in Jupyter notebook we can see the dataframe as given below:

	SNo	ObservationDate	Province/State	Country/Region	Last Update	Confirmed	Deaths	Recovered
12991	12992	2020-04-08	No_Province	Maldives	2020-04-08 22:59:00	19.0	0.0	13.0
12990	12991	2020-04-08	No_Province	Malaysia	2020-04-08 22:59:00	4119.0	65.0	1487.0
12989	12990	2020-04-08	No_Province	Malawi	2020-04-08 22:59:00	8.0	1.0	0.0
13047	13048	2020-04-08	No_Province	Switzerland	2020-04-08 22:59:00	23280.0	895.0	9800.0
13208	13209	2020-04-08	Zhejiang	Mainland China	2020-04-08 22:59:00	1266.0	1.0	1232.0

To plot it on a map we need to get the latitude and longitude of the location.

We use openstreetmap API to get latitude and longitude of each country.

The data frame now has latitude/longitude:

	SNo	ObservationDate	Province/State	Country/Region	Last Update	Confirmed	Deaths	Recovered	Longitude	Latitude
0	1	2020-01-22	Anhui	Mainland China	1/22/2020 17:00	1.0	0.0	0.0	72.833570	19.140625
21	22	2020-01-22	Ningxia	Mainland China	1/22/2020 17:00	1.0	0.0	0.0	72.833570	19.140625
22	23	2020-01-22	Qinghai	Mainland China	1/22/2020 17:00	0.0	0.0	0.0	72.833570	19.140625
23	24	2020-01-22	Shaanxi	Mainland China	1/22/2020 17:00	0.0	0.0	0.0	72.833570	19.140625
24	25	2020-01-22	Shandong	Mainland China	1/22/2020 17:00	2.0	0.0	0.0	72.833570	19.140625
25	26	2020-01-22	Shanghai	Mainland China	1/22/2020 17:00	9.0	0.0	0.0	72.833570	19.140625
26	27	2020-01-22	Shanxi	Mainland China	1/22/2020 17:00	1.0	0.0	0.0	72.833570	19.140625
27	28	2020-01-22	Sichuan	Mainland China	1/22/2020 17:00	5.0	0.0	0.0	72.833570	19.140625
20	21	2020-01-22	Macau	Macau	1/22/2020 17:00	1.0	0.0	0.0	113.551414	22.175760
28	29	2020-01-22	Taiwan	Taiwan	1/22/2020 17:00	1.0	0.0	0.0	120.982018	23.973937

The columns of this dataframe are now:

- SNo – used for assigning serial numbers
- ObservationDate- Observation of that particular date
- Province/State- Name of the State
- Country/Region- Name of the country or region
- Last Update- Update date and time
- Confirmed- No. of confirmed cases
- Deaths- No. of casualties or deaths
- Recovered- No. of patients recovered
- Longitude- Longitude of the location
- Latitude- Latitude of the location

4. Plotting on Map & Observing

Now we use Basemap to plot infection counts by country of map.

We have programmed in such a way that we can observe the daily cases on the map, as the days pass by we can observe the increase in the no. of cases.

We start with the date 22nd January 2020 and so on:

2020-01-22 Confirmed Covid-19 Cases: 555
(circles not to scale)



2020-01-23 Confirmed Covid-19 Cases: 653
(circles not to scale)



2020-01-24 Confirmed Covid-19 Cases: 941
(circles not to scale)



2020-01-25 Confirmed Covid-19 Cases: 1439
(circles not to scale)



2020-01-26 Confirmed Covid-19 Cases: 2119
(circles not to scale)



2020-01-27 Confirmed Covid-19 Cases: 2932
(circles not to scale)



2020-01-28 Confirmed Covid-19 Cases: 5584
(circles not to scale)



2020-01-29 Confirmed Covid-19 Cases: 6171
(circles not to scale)



2020-01-30 Confirmed Covid-19 Cases: 8241
(circles not to scale)



2020-01-31 Confirmed Covid-19 Cases: 9931
(circles not to scale)



2020-02-01 Confirmed Covid-19 Cases: 12055
(circles not to scale)



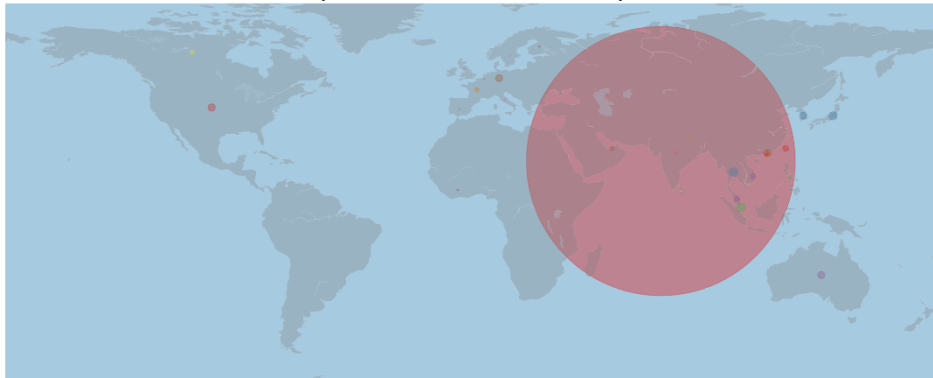
2020-02-02 Confirmed Covid-19 Cases: 16804
(circles not to scale)



2020-02-03 Confirmed Covid-19 Cases: 19898
(circles not to scale)



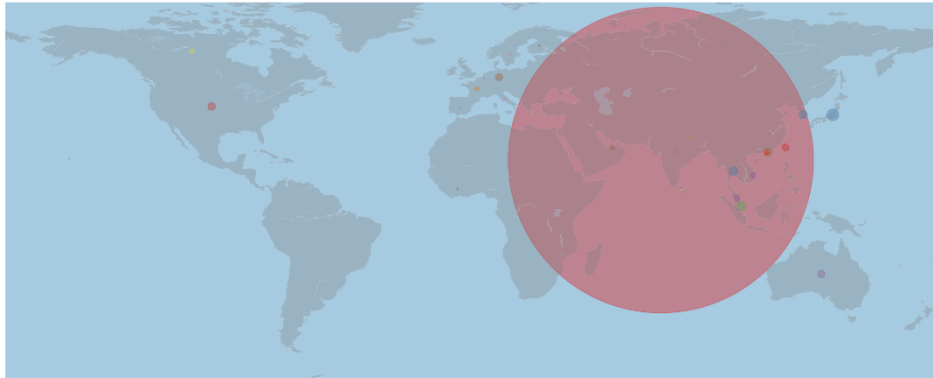
2020-02-04 Confirmed Covid-19 Cases: 23912
(circles not to scale)



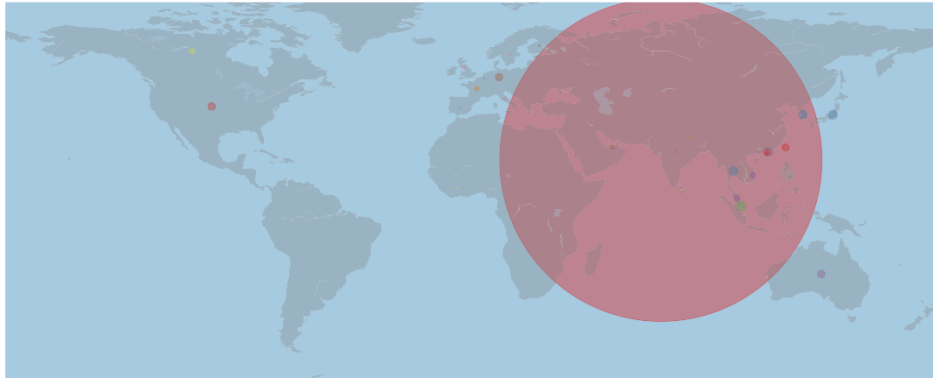
2020-02-05 Confirmed Covid-19 Cases: 27656
(circles not to scale)



2020-02-06 Confirmed Covid-19 Cases: 30838
(circles not to scale)



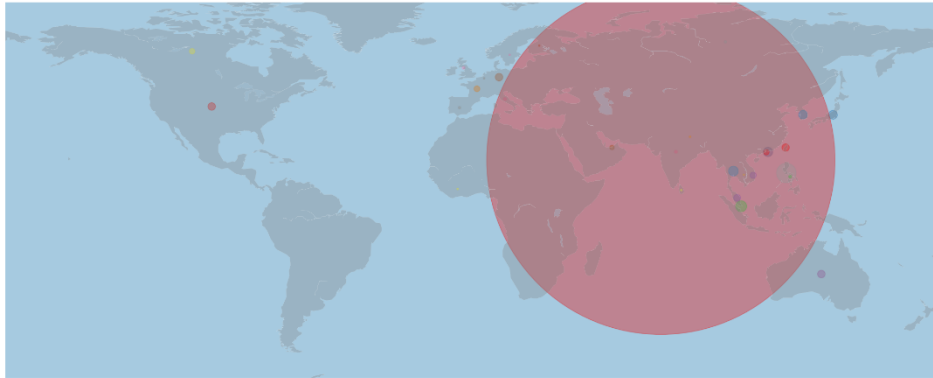
2020-02-07 Confirmed Covid-19 Cases: 34412
(circles not to scale)



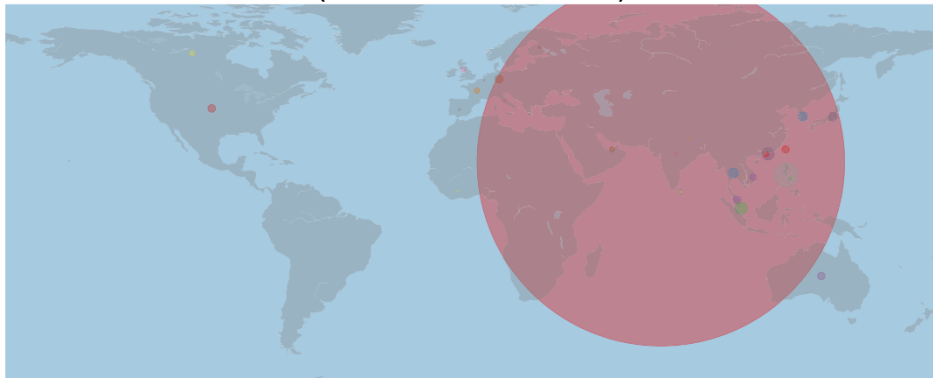
2020-02-08 Confirmed Covid-19 Cases: 37141
(circles not to scale)



2020-02-09 Confirmed Covid-19 Cases: 40232
(circles not to scale)



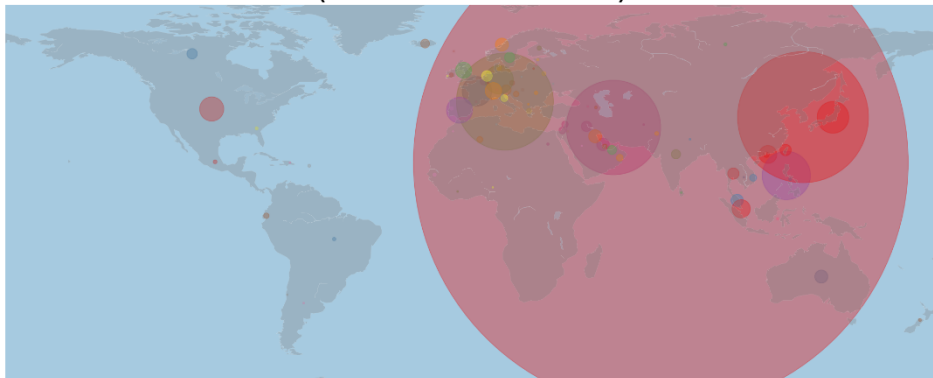
2020-02-11 Confirmed Covid-19 Cases: 44884
(circles not to scale)



5. Conclusion

Thus we can observe that as the date increases the radius of circle is increasing and also new smaller circles are emerging. This shows that the COVID-19 is spreading rapidly as day pass by. Let us now see the Map on the last date of our data frame.

2020-03-04 Confirmed Covid-19 Cases: 95244
(circles not to scale)



The total no. of cases of COVID-19 by 4th March, 2020 had reached 95,244.

We can observe that China, Italy, Middle East countries and America have developed their own smaller circles which show that they are hotspots of the corona virus and those countries should take more serious measures to stop the virus from spreading.