



A DEVELOPING DATA SCIENCE FOR INFORMING THE RESPONSE TO EMERGING PATHOGENS

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Abstract

Transmissible and infectious diseases denote a major challenge for health systems worldwide. More recently, with the increase in cases related to these problems, combined with the recent global pandemic of COVID-19, the need to study strategies to treat these health disrupts, is even more. So by taking the recent global pandemic in concern, in this research paper I have described some significant ways in which Data Science plays a vital role during these pandemics. We incorporate essential questions like what is Data science, how it helps improve similar situations and what measures should be taken during a pandemic.

Keywords: Severe acute respiratory syndrome (SARS); Center for Disease Control and Prevention (CDC); Host/healthy cells; Data science; Artificial intelligence; Pathogens.

Introduction

A pandemic occurs when a disease spreads, which people are not immune to. Similarly this new virus which has boomed into our lives and has become a global crises causing immense suffering. Yes the coronavirus. What is Coronavirus? Coronaviruses are a troop of viruses that can cause illness in humans as well as animals. Severe acute respiratory syndrome (SARS), and the common cold are examples of coronaviruses. SARS spread rapidly in 2002–2003 but recently In December 2019, scientists identified a coronavirus outbreak in Wuhan, China. Specialists named the newly identified virus severe acute respiratory syndromecoronavirus 2 (SARS-CoV-2) and the illness that it causes coronavirus disease 19 (COVID-19).The virus has spread to all the continents worldwide.

China took the first few cases lightly and assumed it's a normal spread of some disease until it realized the disruption it caused. China delayed in informing the world health organization about this new virus spread. When the whole world realized the immense destruction the virus caused finally on 11 March, 2020 the World Health Organization declared COVID-19 as a pandemic. Anytime you have the emergence of a novel disease, in this case it's a novel virus, it's important to understand the structure of the virus, how is it spreading, who all are getting infected and what are the symptoms. These are the questions we have to keep in mind while analyzing a pandemic.



Theory

Analyzing each and every problem is important and easy in today's generation, as we have technology with us. Speaking of analyzing we cannot miss the key term, Data Science. Data science is the study of pandemics and such outbreaks, it keeps collecting minute data and information about the outbreaks. They continuously research till they find effective solutions. Thankfully, data collection today is much easier than it was 15-20 years ago. Before people would have to hand distribute survey papers to individuals, who would then give it back for data to be collected. So the reason this outbreak seems to be moving so quickly is not just that it is infectious, but because of how interconnected we are digitally. We are kept up to date and aware on the current state of the pandemic. So if we keep the searching, analyzing, and testing going we will be able to respond much more quickly, because we know how many people are being affected and how.

Literature

The number of people infected changes daily. One of the organizations that collect this information, are the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC), they are gathering information and continuously learning more about this outbreak.

How Does Coronavirus Attack Your Body?

The virus first enters the body by transmission. Once inside, the coronavirus hijacks host cells and takes control. It then starts multiplying itself, creating more and more copies. Eventually, it kills some of the host cells.

How Does Coronavirus Move Through Your Body?

Once inside, the virus moves through our respiratory track the Trachea, which goes through our mouth, eyes, nose and lungs. If your immune system is good it might stay there for about 3-5 days without causing much damage to your body. But if it infects the lungs there is threat to your body. Our immune system may respond with symptoms like:

Fever, cough, Shortness of breath or trouble breathing, Fatigue, Chills, Body aches, Headaches, A sore throat, Congestion or Runny nose, Loss of taste, Loss of smell, Nausea or Vomiting, Diarrhea.

Our lower airways have more of ACE2 receptors than rest of the respiratory tract. Hence the virus is most likely to go deeper than the normal cold. Our lungs might become inflamed, making it tough for us to breathe. If a doctor does a CT scan of the chest, they'll find patchy area which indicates the virus has started damaging our cells. The patchy areas are known as "ground-glass opacity". For most us, the symptoms might end with just a normal cough and a fever. But for some, the infection gets more critical. After 5 to 8 days of the symptoms, they can have shortness of breath which is known as (dyspnea).

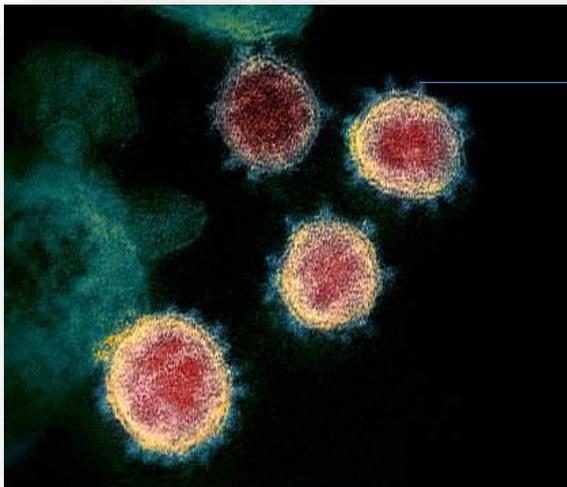
Who is most at risk for getting COVID-19?

- The people who have recently travelled to hotspot places. Where there is an active spread of the virus.

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- The person who has been in contact with a detected COVID patient. Close contact is well-defined as being within six feet of an infected person between a range of 15 mins or over 24 hours.
 - People over age 60 who have pre-existing medical illnesses or a weak immune system.
- What is the structure of the coronavirus like?

The virus is spherical in shape, covered in a protein coat called capsid. The genetic material inside the virus is (RNA). They have spikes all over the surface which bolt on to human cells. The spikes even helps it, to break through our cell membrane and fuse in.



Protein spikes

How many people are infected with COVID-19?

As of writing 05/11/2021, more than 159,000,000 people in the world have been infected. Over 3,300,000 people have died. Some 192 countries and territories, and all continents (except Antarctica) have reported cases of COVID-19. [1]

Country	People infected	Deaths
U.S.	32,000,000	580,000
India	23,000,000	250,000
Brazil	15,200,000	420,000
France	5,800,000	5,000,000
Russia and		
England	4,400,000	400,000
Italy	4,100,000	126,046
Spain and		
Germany	3,500,000	168,330
Argentina and		
Columbia	3,000,000	100,000
Poland and		



Iran	2,600,000	50,000
Mexico	2,300,000	75,000

This was all the detailed information on the virus, Data science uses the same technique to simplify outbreaks.

After the first case of coronavirus in Wuhan, China, it has spread to at least 100 other countries. As China initiated its response to the virus, it inclined on its strong technology sector along with Artificial Intelligence, Data Science, and Technology to track and fight the pandemic while tech leaders, have accelerated their company's healthcare initiatives. As a result, tech startups are closely involved with clinicians, academics, and government entities around the world to activate technology as the virus continues to spread too many other countries.

Here are some effective ways Artificial Intelligence, Data Science, and Technology are being used to manage and fight COVID-19.

1. AI to help diagnose the virus, track and forecast outbreaks.
2. Process healthcare claims
3. Drones deliver medical supplies
4. Robots sterilize, deliver food and supplies and perform other essential tasks.
5. Develop drugs.
 - All the scientist have come up with effective medicines as an tempory solution to the virus.
6. Avanced fabrics offer protection.
 - Scientists and companies have come up with clothing that offer protection along with protective sheilds to protect the front line workers from direct contact with the infected people.
7. AI to identify non-compliance or infected individuals.
8. Apps to share information.
 - We need people to be aware of the current situation and thus Data science and technology have come together to form apps that have all information related to covid, so they have just one place to look for.
Eg:- Aarogya setu app
9. Supercomputers working on coronavirus vaccine.

Discussion



The COVID-19 pandemic has led to a dramatic loss of human life worldwide and offers an exceptional challenge to public health, food sector and economic sector. The economic and social sectors are hit severely. Tens and millions of people are at risk of falling into extreme poverty, while the number of undernourished people is increasing day by day.

Millions of enterprises are facing an existential risk. Nearly half of the workforce of the world are at risk of losing their livelihood. Many of them lack social protection, access to good quality healthcare facilities along with food and security. During the lockdown they earned nearly less than half of the income and to them no money = no food.

Conclusion

The year 2020 will go down in history as the year that was drastically shaped by a virus, which as of late October had infected more than 40 million people worldwide. Scientists have compared what is happening today to the pandemic of 1918. But what's unlike today is how technology has allowed us to see, almost in real time. Where the virus is spreading, how is it transmitting and what effect is it causing on the economy. This detailed view of COVID-19 is made possible thanks, to a new generation of huge datasets, hundreds of genomes, millions of tweets along with advances in computing power and the analytical methods to study them. Data science and technology has made this pandemic going. Yes, the pandemic is getting worst but the major part of it is being handled by Data science which we fail to notice. They make us aware of things going on around the world at our leisure and space. [2]

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