Fighting Coronavirus through AI, Data Science and Technology

Shaveta Bhatia, Amandeep Singh, Amit, Anurag

Abstract: The coronavirus which started in 2019 and later named as COVID-19 is tackled with Artificial Intelligence (AI) and Data Science technologies. Researchers all over the globe have been working together on scientific breakthroughs and researches to develop and test potential vaccines, to predict hotspots of the disease spread, and to endorse strategies and planning with the WHO to find its cure and prevent its spread.Coronavirus has created panic everywhere around the world. People are wearing mask and staying at their home all day to avoid getting infected with the virus.Economists confirmed that the outbreak will negatively impact global economy and disrupt supply chain all around the world. Recession is likely to be registered in post-pandemic world . How can technology help us recognize the path of virus spread, How Artificial Intelligence can help fight Coronavirus, Can Big Data play a vital role in minimizing coronavirus outbreak, How Top Tech firms are helping in curbing the virus spread and many more. The answers to these questions posed are addressed in variety of sources. This researcharticle briefs about how china and other affected countries are taking advantage of technology to fight coronavirus.

Keywords: corona virus outbreak, WHO.

I.INTRODUCTION

On December 31, 2019, the WHO office located in Chinagot informed about the first report of an unknown virus causinglung inflammation in Wuhan city, which is located in Eastern China where about 11 million people reside.Sincethen ,the virus has infected more than 81,470 people in China and killed over 3,304.While china almost containedthe virus, the outbreak had already gained pace around the world, especially in European countries and North America. Outside of China, there have been over a two million cases and counting. Over 330000 deaths has be recorded worldwide, [Ref.7] .Data is accumulated from national and international health departments around the globe to forecastits impact. According to the reports ,more than 180 countries have reported cases of coronavirus across the globe. Most of the developed nations like USA, France ,UK, Spain,Germany ,China, South Korea and Italy have witnessed the worst phase of this virus. In the USA alone, there have been over 1500000 confirmed cases and over 95000 deaths as on 21st May, 2020.

II. ROBOTS TO THE RESCUE

Robots are now being used to minimize the outbreak of COVID-19, around the world. Robots are being used for cleaning and food preparation jobs that are observed as risky for humans. Also drones are used to spray disinfectants in coronavirus affected areas in many countries.

Fig. 1. Robot being used to take temperature reading of a person in China. [Ref.3]

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Many tech companies in China have developed such technologies to carry out contactless delivery of food and other basic necessities, spraying of sanitizers and performing basic diagnostic tests of COVID-19 as in Fig. 1, to limit the physical contact with customers and people. Pudu Technology a company based in Shenzhen, which manufactures robots for the hotel industry, is reported to have deployed its robots in more than 60 hospitals all over the China to help medical staff and to prolong

implementation of no-contact policy. Micro Multi Copter which is also in Shenzhen, is deploying drones to carry medical samples and conduct thermal imaging on a large radius to check for potential COVID-19 infected people.

III.AI AS A HELPING HAND

Advanced AI has been used to identify patterns in coronavirus-related research and helping with the diagnose of the disease and accelerate the development and deployment of a vaccine.

Deep learningbased models likeMT-DTIis used to predict the firmness of bound between a specific molecule and a target protein. Atazanaviran antiretroviral medication used to treat and prevent HIV/AIDS is highly expected toblock and bind a key protein on the outside of SARS-CoV-2. Three other anti-viral has been detected by the model that can bind the virus. A company which discovers drugs for treating diseases through AI called BenevolentAIis has equipped its AI-powered data graph system to combat coronavirus.This technology can intake and analyse thousands of scientific publications and biomedical research to find links between genetic and biological properties of disease and the structure and function of drugs.
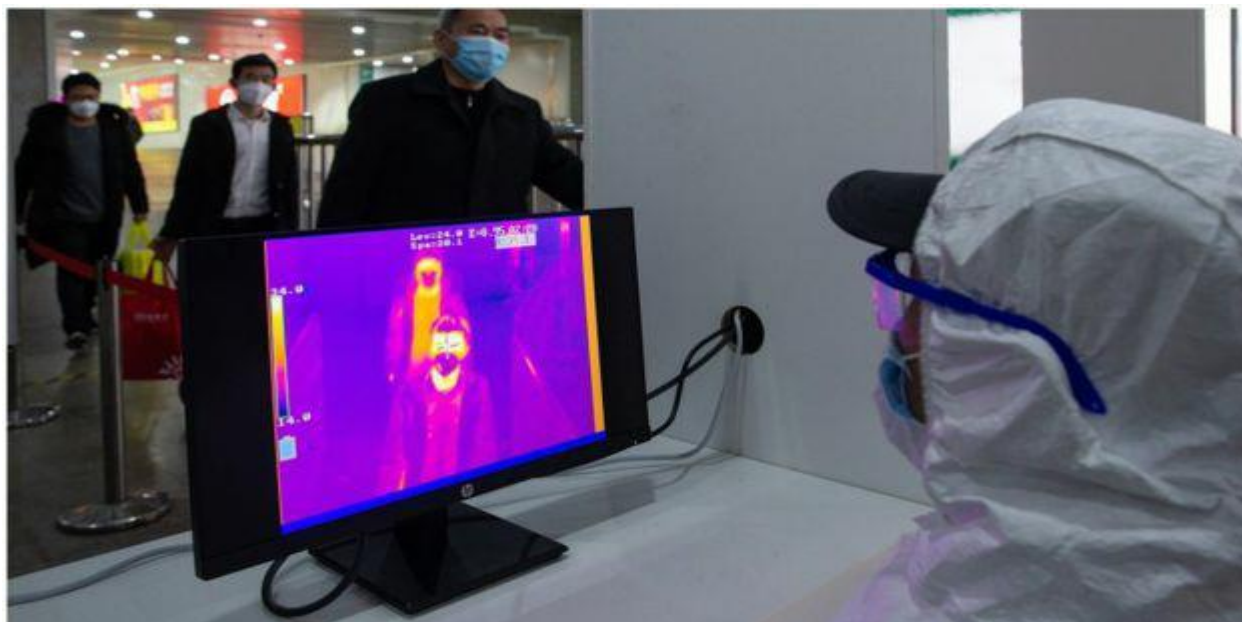

Fig. 2. Thermal Cameras being used to take temperature reading of people. [Ref.3]

One of the top e-commerce giant Alibaba, states that itsproclaimed that it's charitable foundation, will donate $2.15 latest AI-powered livescanningsystem can recognize Million towards the development of the vaccine.

Fig.3. A tweet reporting the use of high-tech smart helmets to detect potential coronavirus patient.
[**https://twitter.com/globaltimesnews/status/12348862552 77674503**]

Chengdu, a city in Sichuan Province of China, has equipped there outbreak control personnel's with a very high-tech and smart helmet as in Fig.3, that can automatically measures and

analyse passer-by's temperature, when they enter a 5-meter range. The helmet will raises an alert if anyone has a fever. This technology is proving out to be a good sensor for detecting the infected people.

DeepMind a Google's subsidiary is experimenting on certain properties of the novel coronavirus

They are utilising data built on genomes(an organism's complete set of DNA and genes) to figure out the protein structure of the organism.They have deployed their Alpha Fold System to make predictions of many proteins that may be correlated with severe acute respiratory syndrome coronavirus 2 or simply SARS-CoV-2, the virus causing COVID-19.DeepMind claimed that it may guide researchers and scientists to understand how the coronavirus functions and penetrates human body ,which will eventually may be useful to develop vaccine or a cure.
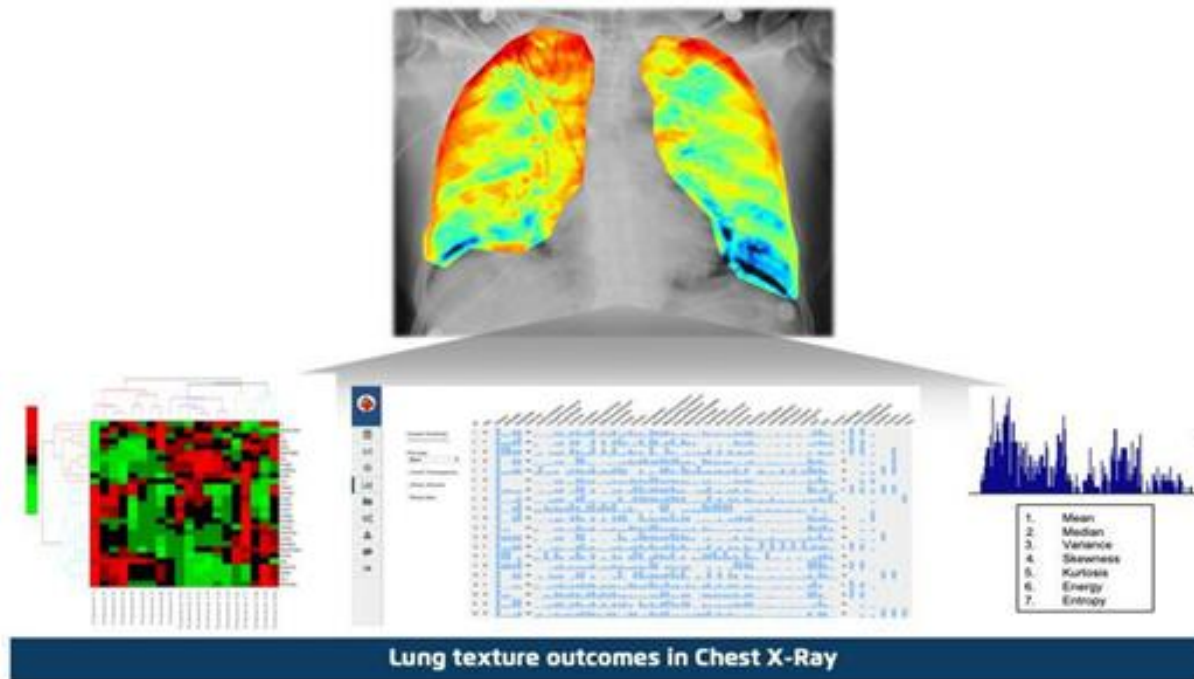
Fig. 4. Lung texture outcomes in Chest X-Ray to understand the mechanism and behaviour of the disease.[https://quibim.com/wp-content/uploads/2020/02/Lung-texture-outcomes-in-Chest-Xray.jpg]

AI algorithms and radionics features derived from Chest X-rays would be of huge help to undertake massive screening programs that could take place in any country with access to X-ray equipment and aid in the diagnosis of Covid-19 (Fig. 4.)

The main aspect of AI in terms of averting epidemics is its scale and speed. According to Polyamine, "AI can detect conditions instantly which makes it a great source of power when trying to prevent epidemics. AI technologies can accurately process and analyse thousands of scans within minutes or even seconds"

China is using robots and drones to extend its redefined surveillance system .Facial recognition cameras are customary across China. People are scanned constantly for fever and individuals are identified who are not wearing masks and gloves, through these enhanced technology .This is helping to keep a check on infected individuals and accomplish complete quarantines.Sense Time, an advancing AI firm, says its contactless temperature alert software has been deployed at universities, railway platforms, tourist hotspots and recreational centre's across China. The company also claimed that they have a equipment that can identify the facial structure of humans, even if they are masked or wearing cap, with a "high degree of accuracy".Smart phones are also playing a vital role in tracking the outbreak of the coronavirus and hotspots of corona infected areas.Alipay Health Code (an App) indicates each individual with yellow, green or red colour, based on whether they should be permitted into public spaces or isolated .It operates on big data to spot potential virus human transmitters, claimed by its builder Ant Financial. Now been deployed in more than 200 cities in China and now planned to be deployed across many other countries. Tencent, the company behind the trending social networking app WeChat, has started an alike QR-code-based tracking feature in its application.

IV.SURVEILLANCE

Several firms have developed such applications which can track the spread of Covid-19 Through live location access, Bluetooth and other wireless signals they can monitor the movement and path of infected covid-19 carriers and identify potential transmissions.

It also helps citizens know the exact location of residential societies where coronavirus cases have been found, so that they do not dare to go there and stay safe.

In response to the COVID-19 outbreak, a firm in Seattle have invented a wristband that alerts when the person wearing it touches their face.
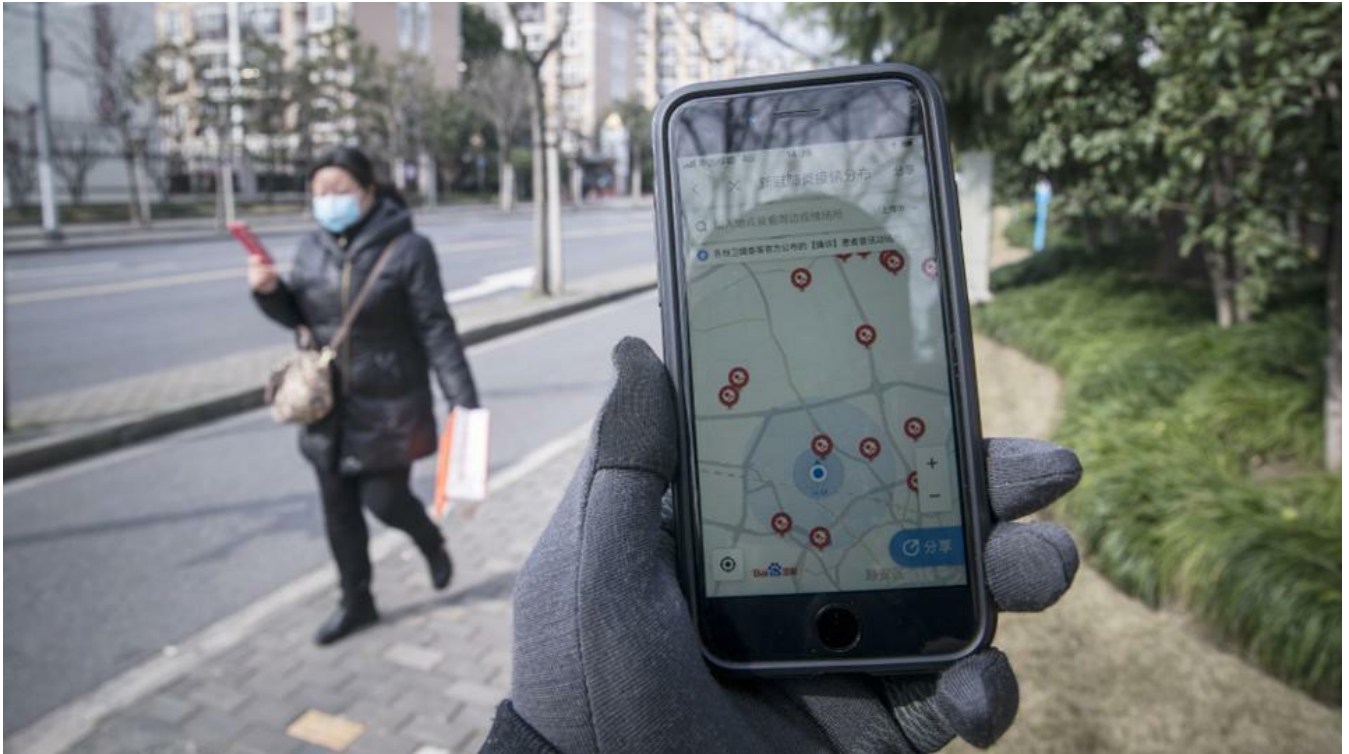
Fig. 5. The app shows the position on map where corona-positive people have visited recently goneto[https://specialsimages.forbesimg.com/imageserve/44299218/960x0.jpg?cropX1=0&cropX2=4000&cropY1=416&cropY2=2667]

In South Korea, many applications (Fig.5) have been built by independent software developers that help track corona positive patients and indicate where they have visited. Just by a click, we can check whether we are at a safe location or not. We can also check if there are any associated cases of the fast-spreading virus in our neighbourhood. A website in New Zealand is devoted to address the reports claimed by people about their neighbours for breaking coronavirus lockdown rules. In 2008, Google started a system that attempts to identify outbreaks of flu using people's search queries.Researchers and companies are utilizing AI to correctly foretell the spread of disease. BlueDot, a Canadian technology firm uses tons of data collected from health departments to forecast public health risks which helps to prepare strategies in advance before such outbreaks.
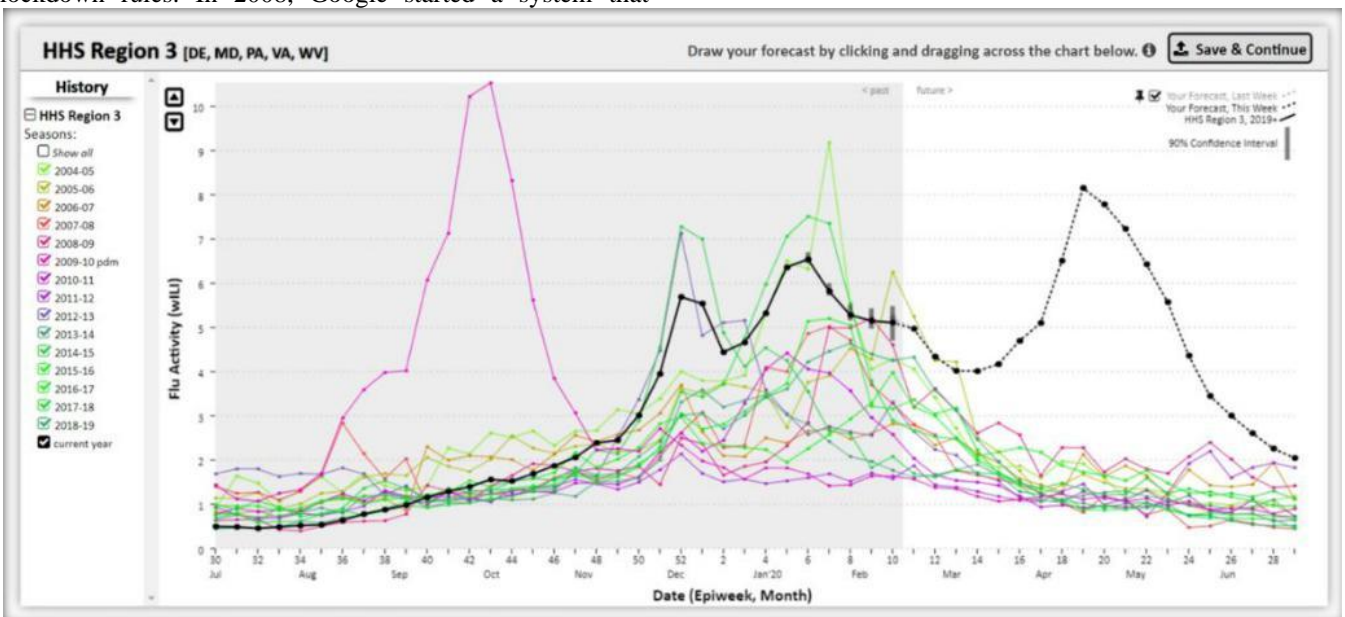
V.PREDICTION SYSTEM

Fig. 6. Forecast of a region in USA infected by coronavirus .Black line indicates peak level.
[https://www.vox.com/future-perfect/2020/3/19/21185686/ai-predicting-coronavirus-spread-forecasting-covid-19]

Through natural language processing and machine learning techniques BlueDot has invented a system that does data-mining of about 200,000 studies in 68 languages every day to extract new information related to over 150 infectious and contagious diseases. They were the first to inform their clients about the coronavirus outbreak and its potential impact in the near future. To predict the spread of disease, they use data such as passenger's route information, tweets, social media, news reports and published articles. Social media websites such as Twitter, Facebook and many other sites are playing a vital role in alerting and creating awareness about COVID-19. Other types of data that can be accumulated and analysed to examine the spread of diseases are local purchases, internet surfing history, and corona related keywords in posts and texts.

Many social media information miners and experts have teamed up to combat coronavirus. Machine learning is used for data scraping of social media posts, news reports and data accumulated from health channels. A program is developed which indicates posts including keywords related to respiratory diseases and symptoms of coronavirus. Unlike doctors who can identify corona infected people only by concrete symptoms, these technologies can pick up signs and patterns that are hidden and that a human would not be able to notice.

VI. AI SCAN READING AND DRUG DISCOVERY

Many bio pharmaceutical firms are adopting AI to escalate drug discovery procedure, bring down research and development cost, lessen failure proportion in clinical trials and ultimately create better drug. Due to access to vast data related to life science many firms have started to implement AI as their speciality.

Deep learning, the technology that enables facial recognition and autonomous driving, can help to diagnose infected people quicker. It usually takes few hours to get CT scan results by doctors, but through AI this process of medical imaging can be done much faster with much more efficiency. Although doctors still need to catch up with laboratory tests but saving time is critical when a virus spreads so quick. This proves how powerful AI is in disease detection and critically examine its symptoms.

Drug discovery, the technology which works through AI is very beneficial to find cure. With its help, the researchers are able determine the order of the four chemical building blocks - called "bases" of the coronavirus within weeks.

Exscientia Ltd. a company which combines power of AI and human creativity to make safer and more sophisticated drugs available to everyone acknowledged on producing drugs much quicker than before. While it took years to develop a vaccine in the medieval age, nowadays with the aid of algorithms it can be reduced to just 12–18 months. In pandemic such as coronavirus, it is of great help.

Fig.7. Medical workers are checking a patient's CT image with a moveable CT machine at Wuhan's makeshift hospital in China. [http://www.xinhuanet.com/english/2020-03/03/c_138839694.htm]

Most of the times mining scientific papers has proven to be useful. Through rigorous mining of such virus related scientific papers, the hope is that AI will accelerate insights into the coronavirus by looking for more exquisite connections across data. Nanox , an Israel based top MedTech company whose goal is to lead early detection preventive healthcare as a new standard of care has developed a portable automated X-ray technique that uses AI cloud-based software to recognise symptoms and help limit contagious outbreaks. It is also building such technology which will automatically scan and share tomographic images of the lungs to the database. worker in

Shanghai must report their body temperature, recent travel history and many other information, which is then sent to a big data platform that which extract relevant information and analysis the data to prepare statistics to better understand the outbreak.
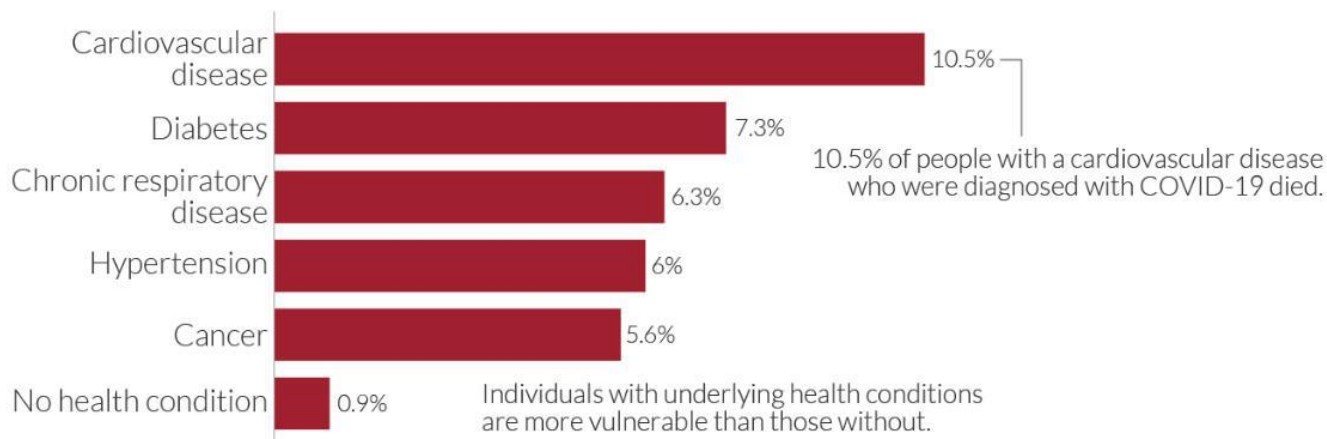
VII. SHARING DATA

Through Big Data many countries and firms are developing ways to identify outbreak before it spreads. Shanghai is also taking advantage of big data to minimize its outbreak. Every

Fig. 8. The chart here depicts the fatality rate for populations within China based on their health condition.
[https://ourworldindata.org/coronavirus]

Sharing data about the number of corona positive cases in each country, proportion of deaths and recovered cases, etc. will be critical to see whether measures taken by Govt. to slow the spread are working or not (Fig 8). Facebook engaged with researchers at established universities and research centres such as Harvard University's School of Public Health. It's sharing data about people's activity like their travel history, theirmovement, tourist hotspots and high-resolution images of densely populated areas, which could help them forecast the spread of the virus and advise Govt. to do the needful to prevent it."This could be especially useful in aged populations, where virus-related infections have advanced rates of morbidity and mortality", blogged chief executive SundarPichai.

VIII. CONCLUSION

In summary, there are many potentially impactful applications of machine learning to fighting the Covid-19, however, most are still in their early stages. Moreover, a lack of data sharing continues to inhibit overall progress in a variety of medical research problems. However, utilizing things like meta-learning, domain adaptation, and reinforcement learning, while loosening restrictions to healthcare data, can allow Machine Learning to play an important role in containing/responding to both Coronavirus and future pandemics. Unfortunately, applications which help in surveillance also require a huge percentage of a country's population to install them in their phones and always have their location services activated .Also sharing daily data of coronavirus has created panic among public.

Although Covid-19's rapid spread globally is scary, it gives us a ray of hope knowing the boundary-breaking inventions, jaw-dropping technologies, cross-collaboration of our healthcare institutions, governments, citizens and tech firms.

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