Role of Artificial Intelligence Techniques in COVID-19 Pandemic

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Abstract- The most flexible branch of computer science is artificial intelligence (AI). It contributes to the development of intelligent machines capable of executing activities that would normally need human intelligence. The medical sector is looking for innovative tools to monitor and control the spread of the COVID-19 (Coronavirus) pandemic in this global health disaster. AI offers numerous technologies or systems that aid in tracking the transmission of this virus, identifying high-risk patients, and controlling this infection in real time. AI can also forecast mortality risk by gathering and evaluating past data from patients. These AI-based solutions can assist us in fighting this illness by scanning the population, providing medical assistance, notifying us, and making infection-control recommendations.

Keywords-Machine Learning; COVID-19; Deep Convolutional Neural Network; Classifier;

I. INTRODUCTION

Artificial intelligence (AI) refers to the simulation of human intelligence in machines. These machines are programmed to think like humans and mimic their behaviors [3, 12, 14]. AI-based programming focuses on three cognitive skills. They are learning, reasoning and self-correction. In the learning phase, AI programming mainly aims at gathering data and making rules [3, 4, 5]. AI has been converted into meaningful and actionable information with help of these analysed data. In the reasoning phase, AI programming aims at selecting appropriate algorithms to reach the expected output. AI programming is used to fine-tune algorithms in self-correction processes. It helps to obtain the exact results. AI programming has two parts: weak or strong AI programming. Weak AI [3, 4] system is designed and trained to complete a specific task. It is known as narrow AI. Strong AI [3, 4] is called artificial general intelligence (AGI). It helps to replicate the cognitive abilities of the human brain.

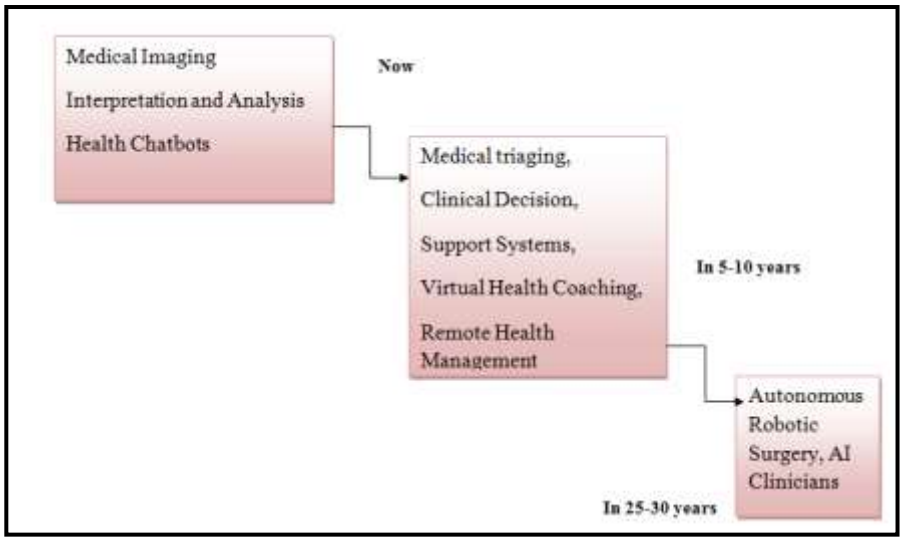

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Fig. 1: Maturity levels of application of Artificial Intelligence (AI) in healthcare delivery

Artificial Intelligence (AI) has done massive improvements with the development of deep neural networks, natural language processing, computer vision and robotics in recent times. These techniques have been successfully applied in healthcare systems [1, 12, 15]. AI has brought several opportunities for health service activities that are very much helpful for doctors, clinicians and administrators. However, there has also been exceptional hype about the abilities of AI with a mistaken notion that AI will soon replace human clinicians. These perspectives are not accurate, and if a balanced perspective of the limitations and promise of AI is taken, one can determine which portions of the health system AI can be integrated to make a meaningful impact [2, 13, 14]. AI have the most influence mainly in four areas. These areas are patient administration, clinical decision support, patient monitoring and healthcare interventions. In the health system, AI plays a crucial role could be termed an AI-augmented health system [1, 2]. This study discusses how artificial intelligence (AI) plays a critical role in the contemporary global health crises. AI-based technologies, as a medical aid based on evidence. This tool has the potential to improve the COVID-19 patient's treatment strategy and reported outcomes. AI can detect severely infected patients. It is useful for real-time infection control. It has aided in determining the mortality risk by examining the patients' past data. AI can assist us in combating this virus through population screening, medical assistance, notification, and infection control recommendations [1, 2]. Section II describes different AI-based methods that are used to battle the COVID-19 pandemic. Section III described the future work and conclusions have been included in Section IV.

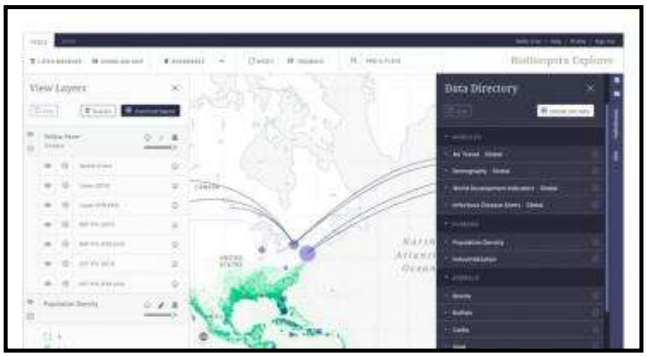
II. Different AI methods

Some noticeable examples of AI methods that are used to battle the COVID-19 pandemic are discussed as follows.

A. BlueDot

BlueDot is a Toronto-based startup. It has been used to track and predict the outbreak and spread of infectious diseases by a platform built with the help of artificial intelligence tools. It had alerted its private sector and government clients about a cluster of “unusual pneumonia” cases happening around a market in Wuhan, China. BlueDot is a proprietary software-as-a-service model. It has been designed to locate, track and predict infectious disease spread. This model has gathered data on over 150 diseases and syndromes around the world searching every 15 minutes a day. This includes official data from organizations like the Centre for Disease Control. But, the system also counts on less structured information [6].

The BlueDot system flagged articles in Chinese. It reported 27 pneumonia cases associated with a market in Wuhan. The market had seafood and live animals. In addition to the alert, BlueDot correctly identified the cities that were highly connected to Wuhan using global airline ticketing data. It has been helped to track where the infected might be travelling. The overseas locations with the highest volume of Wuhan visitors anticipated by BlueDot were Bangkok, Hong Kong, Tokyo, Taipei, Phuket, Seoul, and Singapore. In the end, 11 of the top cities on their list were the first to see COVID-19 cases [6].

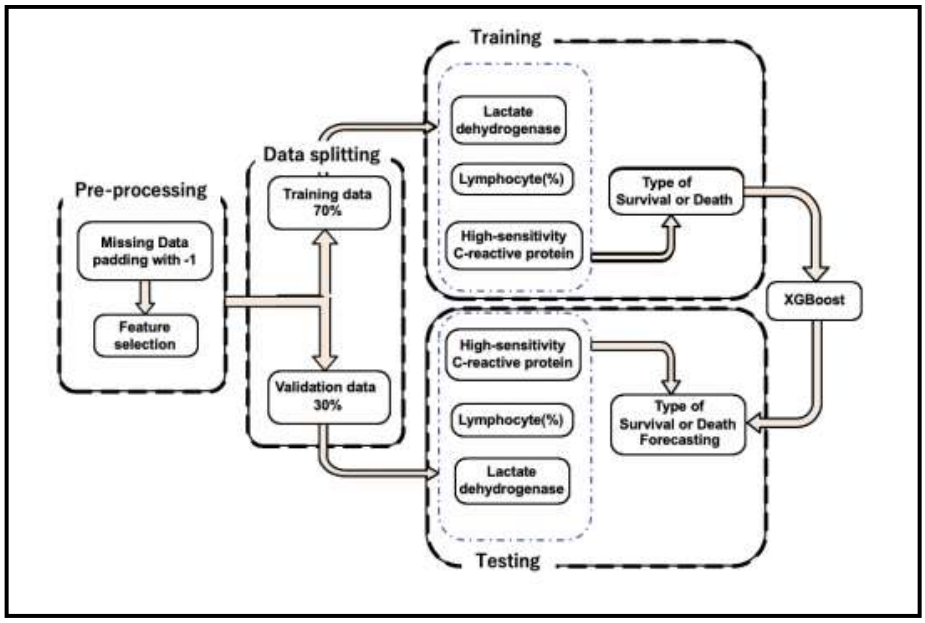


[6]

Fig. 2: Bluedot Explorer

B. XG Boost machine learning based prognostic model

XGBoost [8] machine learning algorithm is a prognostic prediction model. The model is completely based on Machine Learning (ML) strategy. The model has been tested on 29 patients (including 3 patients from another hospital) who were cleared after 19th February. As a result, the mean age of the 375 patients was 58.83 years old with 58.7% of males. Fever was the most common initial symptom (49.9%), followed by cough (13.9%), fatigue (3.7%), and dyspnea (2.1%). This model has been identified three key clinical features. They are lactic dehydrogenase (LDH), lymphocyte and High-sensitivity C-reactive protein (hs-CRP), from a pool of more than 300 features. The clinical route is simple to check and quickly assess the risk of death. Therefore, it plays a great role in medical domains [8].



[8]

Fig 3: Flowchart of XG Boost Machine Learning Algorithm

XGBoost classifier [8] is a supervised model that can be used as the predictor, due to its superb pattern characterization and feature selection ability. Figure 3 shows a procedure.

C. COVID-Net

COVID-Net, a deep convolutional neural network design, has been introduced [9]. It has been modified to detect COVID-19 instances in chest X-ray (CXR) images. It is an open-source model that is freely

available to the public. At the time of its original release, COVID-Net was one of the first open-source network architectures for COVID-19 identification from CXR pictures [9].

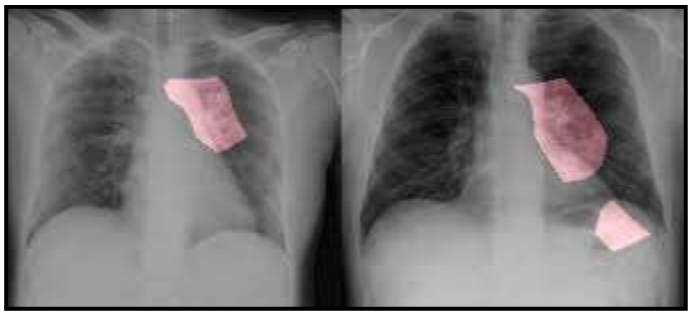
 [9]

Fig 4: GSInquire found crucial elements (highlighted in red) in chest radiography images of COVID-19 cases from two distinct patients.

D. Cloud Ginger

The Cloud Ginger model has been designed to engage with patients. This model has 34 actuators. It allows it to simulate in the same way humans move when they talk: flexible fingers, arms that gesticulate in conversation, and the ability to make eye contact. Its voice was carefully designed, too, according to Cui, and the team paid special attention to the robot's pitch, tone, speaking accent, and dialogue to approximate human speech patterns [10]. Coronavirus cases have spiked across the United States. There were 54,000 reported cases as of March 24 an increase of about 10,000 cases from the previous day, according to the CDC. Hospitals across the country are understaffed, under-supplied, and teetering on overcapacity. That combination leaves medical professionals dangerously vulnerable to contracting the virus [10, 11].

One solution to minimize the exposure of doctors and nurses to patients who have contracted the virus is to use robots for routine tasks like taking a patient's temperature or changing bed sheets. A hospital in China did exactly that. In February, robotics company CloudMinds donated 14 "humanoid" robots called Cloud Ginger to help the Wuchang field hospital in Hubei province—the same province as Wuhan, where the coronavirus originated [10, 11].

 [10]

Fig 5: Cloud Ginger

E. AI-based Voice Tool

AI-based voice tools can be used to identify whether a person could be infected or not. A pilot run has been conducted for a patented using artificial intelligence-based tool in a university of Rome. It has been developed by three biotechnology students and a professor from Mumbai. They claimed that COVID-19 can test by voice-based diagnosis with the help of a smartphone [7].


[7]

Fig 6: AI-based voice detector

III. FUTURE WORK

Future researchers will develop a number of sophisticated AI-based algorithms that can detect early coronavirus infections and aid in keeping track of the condition of infected patients. By creating effective algorithms, AI can dramatically enhance treatment uniformity and decision-making.

IV. CONCLUSION

The use of artificial intelligence is crucial for detecting early coronavirus infections. It is extremely important for keeping track of the infected patients' health. The medical staff benefited from it at this time. To deal with this infection, healthcare organizations urgently need decision-making technology. It offers advice on how to stop COVID-19 from spreading in real time. By creating some helpful algorithms, it can considerably enhance treatment uniformity and decision-making. The COVID-19 problem is being tracked by AI-based algorithms at several scales, including in medical, molecular, and epidemiological applications. The foundation of this research is a number of important AI strategies for the COVID-19 pandemic. These technologies have a significant impact on the ability to find the cluster of cases. On the basis of compiling and examining all available data, it has been anticipated which areas this virus would influence in the future. One of the best things artificial intelligence can do right now is assist researchers in searching through data to identify new therapies and provide suggestions for the creation of a COVID-19 vaccine.

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