International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 09 Issue 12 ǁ 2021 ǁ PP. 22-25

Machine learning and artificial intelligence in the war against Covid-19

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Abstract
Since the outbreak of the novel corona virus (SARS-CoV-2), researchers, scientists, the vaccine development industry and drug manufacturers around the world are increasingly searching for alternative methods of screening and prediction. Contact tracing, forecasting and vaccine development or drugs with more accurate and reliable handling to fight pandemics are the urgent need of the hour. Machine learning and artificial intelligence are such promising methods employed by various healthcare providers. This review paper aims to address recent studies that use advanced technology as well as artificial intelligence and machine learning to assist medical specialists in real-world problems and problems when using such algorithms. This review shows that AI and ML combined with the use of modern technology incredibly improve screening, prediction, contact tracing, prognosis and drug/vaccine development with extreme reliability.

Keywords
Corona virus, Deep Learning, Neural Networks, Covid-19, Machine learning, Artificial intelligence, Pandemic

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Date of Submission: 10-12-2021 Date of acceptance: 24-12-2021

I. Introduction

Outbreaks of several viral diseases like Chikungunya, Ebola, Zika, Nipah, H7N9 bird flu, H1N1, SARS and MERS have been witnessed over the past two decades. The world woke up in this decade with the outbreak of a new disease. The corona virus outbreak occurred in December 2019 in the city of Wuhan, Hubei province of China and subsequently spread to 213 countries and territories in a short period of time. As of 7 October 2021, there have been a total of 237,079,552 confirmed cases and 4,840,312 deaths globally. The worst outbreaks of COVID-19 have been reported in the United States, India, Brazil and Russia, where the number of cases has surpassed the confirmed cases in China. The WHO declared the current outbreak of COVID-19 a 'pandemic' on 11 March 2020.

Although severe acute respiratory syndrome corona virus 2 (SARS-CoV-2; 2.9%) has a much lower mortality rate than SARS-CoV (9.6%) and MERS-CoV (34.4%), SARS-CoV-2 has a higher infectivity. The rate compared to other viruses has become a matter of global concern. Mortality and vulnerability to COVID-19 were found to be higher in men than women, which can be attributed to other sexual practices such as smoking. The mortality rate of COVID-19 is also influenced by underlying co-morbidities such as diabetes, hypertension, cancer, heart disease and chronic respiratory disease. Mother-to-child transmission of COVID-19 infection was not observed. Children are vulnerable to COVID-19 but only show mild symptoms. [1-3]

COVID-19 spreads from human to human mainly through direct contact by respiratory droplets during coughing or sneezing, and indirect contact route by fomites and through regularly touching surfaces. SARS-CoV-2 can remain viable on various surfaces for several hours to several days [4]. Air-borne transmission is possible in a medical or hospital setting in procedures that generate aerosols. Although fecal-oral transmission of COVID-19 has not yet been reported, it is a possible route [5]

It is imperative to adopt control measures like case isolation, contact tracing, quarantine to limit human-to-human COVID-19 transmission. Personal hygiene measures such as frequent hand washing, respiratory hygiene, social distancing, use of face masks/shields and disinfecting surfaces can help reduce infection.

The role of AI

The unprecedented pace of efforts to address the situation of the COVID-19 pandemic has been harnessed by Big Data and Artificial Intelligence (AI). Various branches of AI have been used in the outbreak of many diseases in the past. AI can play an important role in the fight against COVID-19 [6].

"Artificial Intelligence" develops super-human learning capabilities and machines with the power to analyze large datasets are useful for everything from making suggestions to controlling traffic.

AI in identification of disease clusters, monitoring of cases, prediction of future outbreaks, mortality risk, diagnosis of COVID-19, disease management by resource allocation, facilitating training, record maintenance and pattern recognition to study disease trends is being used successfully. [7]. The many applications of AI which are very interesting and giving hope in the fight against COVID-19 are as follows-

AI in early detection of Covid-19

AI was used for the detection and quantification of COVID-19 cases from X-ray and CT scan images [8-9]. A deep learning model, called COVNet, is intended to differentiate between COVID-19 and pneumonia based on visual 2D and 3D images extracted from volumetric chest CT scans [10]. The COVIDResNet model was developed by improving the model of ResNet-50 which gives effective results in less time by 3-step technique. developed a system called COVID_MTNet by applying the Improved Inception Recurrent Residual Neural Network and NABLA-3 network model to detect and localize regions of interest from X-ray images and chest CT scans [11-13]. Another study used an AI-based classifier to predict the outcome of RT-PCR results of COVID-19 cases using 16 simple parameters derived from the complete blood profile [14].

AI in Contact Tracing

A range of smart devices such as watches, mobile phones, cameras and wearable devices can be employed for contact tracing and efficient surveillance in COVID-19. Applications such as AI4COVID-19 that rely on audio recording samples of cough can be used in telemedicine [15].

AI in monitoring COVID-19 cases

Based on data derived from vital data and clinical parameters, AI can provide critical information for resource allocation and decision-making by prioritizing the need for ventilators and respiratory support in the intensive care unit [16]. AI can also be used to predict the recovery or mortality rate in COVID-19 and provide daily updates, storage and trend analysis, and chart the course of treatment.

AI in Prediction and Tracking

AI can be used to predict the spread of the virus and develop early warning systems by extracting information from social media platforms, call and news sites and provide useful information about sensitive areas and predict morbidity and mortality. Bluedot identified a cluster of pneumonia cases and used machine learning to predict the COVID-19 outbreak and geographic location based on available data. HealthMap collects publicly available data on COVID-19 and makes it readily available to facilitate effective tracking of its spread. Recently, the role of AI in the identification and forecasting of COVID-19 outbreaks by employing multitudinal and multimodal data was emphasized [17].

AI in reducing the burden of medical practitioners and healthcare staff

AI-based triage systems can help reduce the workload of medical staff and healthcare workers by automating multiple processes such as providing training to clinicians, determining treatment modality and processing clinical data using pattern recognition approaches. Carrying out analysis, digitization of patient reports. And also by offering solutions that minimize their contact with patients [18]. AI can be used to classify patients on the basis of severity of symptoms, genetic disposition and clinical reports into different categories such as mild, moderate and severe, so that different approaches can be adopted to handle patients in the most effective manner . AI in telemedicine can also be used to eliminate the need for frequent and unnecessary hospital visits by remotely monitoring cases and recording patient data in patients with asymptomatic or mild symptoms. AI-based medical chatbots can also be used for consultations, thereby reducing hospital congestion as well as reducing the spread of infection thus preventing efficient operation of critical care services can go . Centers for Disease Control are providing much needed support to patients in remote settings with chatbots [19–20]. A prognostic prediction algorithm predicted patients' mortality risk using machine learning methods using features extracted from data from other patients as training datasets. A similar approach was used to estimate the likelihood of developing acute respiratory distress syndrome. Service robots and anthropomorphic robots with AI cores can be used for the delivery of essential services and routine tasks such as cleaning, disinfection and monitoring in hospital settings [21].

AI in the development of vaccines

Mankind has never seen a race like this before for the development of a vaccine against the pathogen. The speed of search can be accelerated manifold by harnessing the power of AI. Ong et al. Predicted potential vaccine candidates for COVID-19 using a vaccine reverse vaccinology-machine learning platform, relying on a supervised classification model [22].

AI in preventing the spread of misinformation

This pandemic has turned into an infodemic due to an avalanche of information. Understanding knowledge, awareness and practices towards COVID-19 by harnessing information from social media platforms such as Twitter, Facebook etc., devising a strategy to collect and disseminate timely and accurate information to reduce the impact of COVID-19 can help to. Machine learning techniques can be used to identify trends and analyze sentiment and provide information about the origins of false information and help reduce rumors and misinformation. AI techniques can be used to paint a clearer picture of recovery rates; access and availability of health care, and identify gaps. AI can provide the latest updates on emerging evidence in diagnosis, treatment, spectrum of symptoms and therapeutic outcomes in this highly dynamic situation, helping clinicians in real-world scenarios and helping the public overcome fear and panic [23].

AI in Genomics

Randhawa et al. devised a method for fast and accurate classification of available SARS-CoV-2 genomes by applying machine learning to the identified genomic signatures. Wang et al. used an oncology-based side effect prediction framework and artificial neural networks to evaluate the side effects of traditional Chinese medicine for the treatment of SARS-CoV-2 [24].

II. Conclusion

The current urgency of Covid-19 pandemic requires an improved model with high performance accuracy in screening and predicting SARS-CoV-2 with a different type of associated disease by analyzing clinical, mammographic and demographic information of suspects and infected patients. The results from various researches show that better deep learning algorithms and neural network algorithms are found to have greater potential for solving issues. It is clear that AI and ML can significantly improve treatment, drug, screening and prediction, prognosis, contact tracing and drug/vaccine development for the COVID-19 pandemic and reduce human intervention in medical practice. However, most models are still in their early stages as they have not had enough time to show their true form.

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