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Artificial intelligence: An immense hope to confront COVID-19 and post-COVID-19 crisis

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Abstract---Like all other fields, healthcare is also fully blessed with Artificial Intelligence (AI) in current era. From managing records and other data, AI has impacted various facets of COVID-19 epidemic in addition to post COVID-19 crisis in positive way. During the scary period of COVID-19, AI has emerged out as blessing for all the patients, healthcare professionals and even for whole world as it aided

in rapid diagnosis, treatment, paradoxically in the post COVID-19 crisis too. The AI has emoted a very noteworthy part in early detection of COVID, prediction of morbidity and mortality as well as detection of deterioration of patients in emergency. In nutshell, the current review is an assemblage of the role of AI in COVID-19 along with post COVID-19 in all ways from forecasting of COVID cases to the burial facility in case of any mortality.

Keywords---artificial intelligence, COVID-19, Post COVID-19, diagnosis.

Introduction

The new coronavirus (SARS-CoV-2) has now become a serious concern for health for almost all countries of the world. (1)(2) Artificial intelligence (AI) is a core technology in the area of algorithm or finding-based applications that enables to unravel acquaintance hitches and continuously enhance performance to perform specific tasks by applying inputted data. In the current ages. AI has resulted in momentous advancement, exclusively in medical care for prophetic machine learning models. The object of Artificial intelligence and machine learning is to enhance the eminence of health care, diminish potential mistakes, accelerate diagnostic accuracy and predicting outcomes by vast amount of data which were collected by patient's experience. AI has been extensively used in this pandemic, inserting in diagnosis, social control, operation of clinical services, for developing vaccine, clinical decision-making, effective therapy and managing patients by the pandemic of COVID -19.

Serious issues regarding care systems' capability have arisen because of the unparalleled demand for health services, particularly regarding deprived states. During this situation, methodologies ready to speed up diagnostic procedures, enhance observance and tracking competences, envisage the biological process phases of the contagion also as its effects on society, and simulate the results of a containment strategy, a medical protocol or a brand-new molecule, will represent a world-shattering milestone within the progress of the planet in facing these histrionic events. Persuasive aids to the drive against pandemic models have been made available by the investigators and hence novel COVID-19 allied AI models are promptly increasing these days. AI represented early detection of speculative risk in patients and characterize the risk of COVID-19, and model infection transmission by trained statistics. In order to curve this pandemic, swift diagnosis, precise estimate, effective treatment, heightened monitoring are significant dealings to manage the spread of the pandemic(3).

Outbreak of Coronavirus disease 2019 (COVID-19) has been reported worldwide in year 2020 and considering this outbreak, on 11th March 2020, the world Health Organization (WHO) declared COVID-19 as the worldwide epidemic. Over 16.562 million individuals reported to get infected with COVID-19 worldwide in July 2020, among these more than 654,000 deaths were reported and over 10.147 million were recovered, the particular range of contagions might surpass the sum of confirmed cases (4,5). COVID-19 is instigated by a severe acute

respiratory syndrome virus 2 (SARS-CO-V-2) and was first perceived in December 2019, and distributed speedily to utmost countries and cities all over the world. The responsible virus for COVID-19 pandemic primarily proliferates via respiratory droplets. The ailment may result into trifling signs of upper respiratory tract contagion, extremely septicaemia severe infection. In 16th March 2021, COVID -19 has affected above 200 nations and directed to great losses, leading to more than 120 million positive cases and 2.6 million documented demises. For actual diagnosis, treatment and scrutiny of COVID-19 efficacious tools are essential to merge the analysis, treatment and scrutiny of pandemic. Recent studies have revealed that AI is an effectual technology for attaining better inflate, accelerated processing influence and even outpace human in peculiar health errands (3).

Measures taken by Artificial Intelligence for management of COVID -19

AI manages this pandemic by hastening research on uncluttered facts project and disseminated computing to find AI- driven solutions to the epidemic. Steps taken by Artificial intelligence to combat COVID- 19 are detection, prevention. Response and recovery. Early detection and diagnosing of the virus are necessary for predicting its evolution and assisting in prevention or slowing the virus spread through surveillance. By monitoring the recovery rate of patients and responding to the health crisis through significant learning and enhancing early warning tools. The diagnosis pattern recognition using medical imagery and patient symptom data, example CT- scans, X-rays (6). They give prevention by predicting probability of infection example EpiRisk. They also give personalised news and moderation to fight misinformation, example via social networks. AI technology and tools can help policy makes to under the pandemic by accelerating treatments by rapidly analysing large value of data research (7,8).

Contribution of AI in COVID -19 Pandemic

Artificial Intelligence (AI) has developed strategies that have vital prospective for identification and prediction of COVID-19 infections. Fast identification of COVID-19 and its severity in discrete patients is predicted to modify higher management of the malady separately and at-large. COVID-19 detection and management has been tremendously augmented by the exceptional attention by the scientific fraternity through the use of imaging biomarkers (9). Exploratory tools like AI-based models could facilitate make a case for the advanced living mechanisms and supply advanced considerate of the primary pathophysiological procedures. The current review emphases on AI-based COVID-19 studies as applies to chest x-ray (CXR) and X-radiation (CT) imaging modalities, and therefore the allied contests in the present review, we include the clinical characteristics, electronic medical records, medical images (CT-scans, X -rays, ultrasound images), in the COVID -19 diagnosis (10).

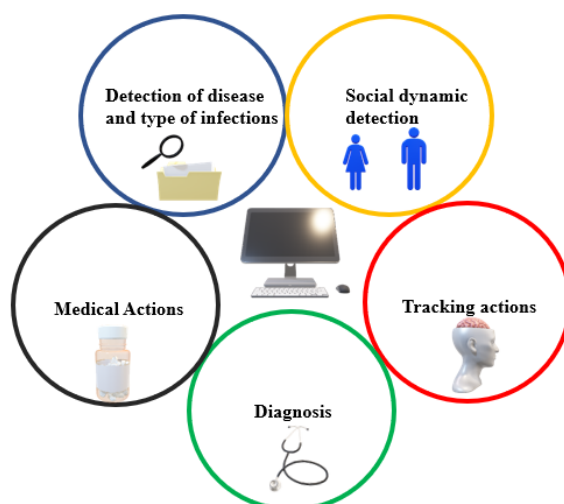


Figure 1. Roles performed by Artificial Intelligence

AI has emerged out several applications in following different parts of COVID-19:

Prevention & management

It is domineering to espouse management measures like case seclusion, monitoring individuals, confinement to restrict human-to-human COVID-19 communication. The proliferation can also be reduced by implementing individual sanitation actions for instance recurrent washing of hands, metabolic process sanitation, communal estrangement, use of face masks/shields and medical aid of surfaces (12).

Screening & identification

Univariate clinical choices such as dysomia (forfeiture of smell) and hypogeusia (damage to the taste senses) is sightseen as initial identification signs in telemedicine and mass screening. For manifestation of COVID-19, specimen samples collected from bodily cavity and cavity swabs or blood samples are considered as initial effective tools and solitary dependence on CT scans is deceiving owing to vague depictions with diverse viral infection (11). Molecular check reverse transcriptase-PCR (RT-PCR) is endorsed by World Health Organization (WHO) as an alternative for diagnosis of SARS-CoV-2 supermolecule for the purpose of identification of COVID-19. It is authoritative to use CT scan of the chest as an accompanying indicative mode to authenticate the detecting, because of high false-negative rate of RT-PCR,. Vigilant immunodiagnostic assays that perceive proteins from the COVID-19 virus or human antibodies engendered in contradiction of the virus in blood samples also are being employed consistently to augment molecular trials owing to cut-price and rapid outcomes. Though, these approaches abide from meagre sensitivity and are exclusively qualitative (14–16). These serologic approaches have presently acknowledged Emergency Use Authorization by the United States of America bureau.

Diagnosis by CT- scans and X-rays

Diagnosis results by different AI models exhibited following results, when CT-scan images and reports from two different hospitals in China were studied:

S. No.	Convolutional Neural Network (CNN) variant	ResNet – 101	Biomedical imaging like chest X- ray
1	Data of 495 patient's images	Data of 5800 patient's images	Data of 307 patient's images
2	76% precision	99.51 % accuracy	98.26% accuracy
3	81.9 % sensitivity	100% sensitivity	97.39 % sensitivity
4	61.5 % specificity	99.02 % specificity	98. 25 % specificity
5	81.9 % AUC	99.4% AUC	

The data record comprises of civic dataset of 5800 CT metaphors (where 4640 CT images, with 4656 drill samples and 1160 test sets). With these all records and dataset, the analysis of dataset shows a sensitivity of 94.74 % and a specificity of 87.37 % (16,17). Indications of pneumonia can be examined by biomedical imaging like chest X- ray, CT scans, and ultrasound images. The dataset analysis images of X-ray have high accuracy, sensitivity and specificity (96.78 %, 98.66% and 96.46% respectively). The whole sum of X-ray images which were collected by four categories was 307 i.e., COVID -19, normal, pneumonia bacteria and pneumonia virus. The X- rays, CT- scans, ultrasound images data has three civic datasets which were gained 98.26% accuracy, 98. 25 % specificity and 97.39 % sensitivity. The images of X-ray, CT – scans and database all records of COVID-19 were manage by artificial intelligence (18).

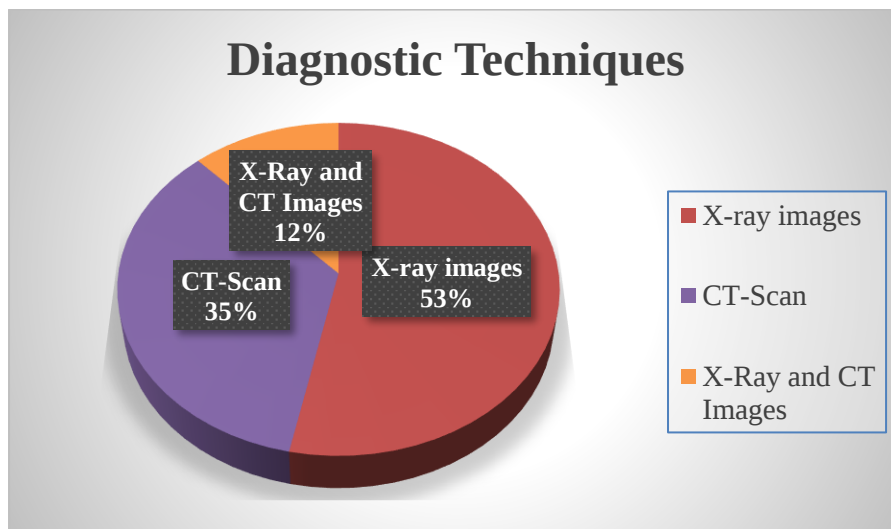


Figure 2. Percentage Distribution of Diagnostic techniques involved in COVID-19 detection

Regulation of false information dispersal associated to COVID-19 through AI

During the pandemic many information was circulated on social platforms like Facebook, WhatsApp, Instagram, twitter etc which were either false, fake or to misguide the public. The learning from the machine played a very crucial role in controlling the false information/misinformation and also analysed the source of the information. All the AI techniques were used to clear the concept that differentiates the true/original information and the fake one. AI worked in a positive way and provided the exact details about the emergence, the treatment criteria, types of symptoms and the therapeutic results with the help of all the study the picture was cleared for the scientists and the researchers and also controlled the mindset of the people in the positive way to combat the fear, anxiety related to COVID infection (19)(20).

Data extraction

The collection of surveys was preferably done by the AI that reported all the individual data of the specific region, place, state, country and later complied them for utilizing that data for further proceedings in future.

- The pandemic affected the whole world, The publicly sharing of data or the report of cases were completely strictly on controlled manner. The whatever data was shared was under the norms and the regulations.
- The report shows the number of countries affected is 212, the infected cases were increased with a very rapid speed i.e., 51.3 lakhs and the positive cases reported till today is 25.6 crore approximately (21,22).

Forecast of COVID- 19 Positive cases

The spreading of the virus as well as the spreading of the information was with the same speed. The data was analysed from the various regions and the geographical region they directly or indirectly play a vital role to conclude the mortality and the morbidity rate (23). The data was extracted by the machine learning and with the help of that focused on the geographically spreading of COVID-19 virus (24). Different types of modal data collected and studied. Healthcare experts are finding out the transmission rate of the epidemic by employing AI in combination with mathematical models:

Vulnerable, Infectious, and Recovered (VIR) Archetypal

This model is employed with AI to investigate and predict the virus's spread or containment. It's the foremost outstanding mathematical agent-based model using normal mathematical equations. The recovered people are aforementioned to be "Vulnerable-Infected-Recovered."

Global Epidemic and mobility (GLEaM)

The GLEaM model proposes the power to feign the emergence of COVID-19 worldwide. This easy program allows investigators to foster case studies, check and rationalize suppositions on the proliferation of the illness, and perceive the

apparent rampant variants. It additionally permits groups to check the effectiveness and consequences of various outburst ways, analyse intimidations through model eventualities, and prediction fresh budding communicable diseases.

Transportation Analysis and Simulation (TRANSIMS) system

TRANSIMS works with eccentric procedure and analytical methods to look at provincial conveyance systems and envisage the proliferation of COVID-19 supported people's travel conducts and native communications. It mimics the travel behaviour of every discrete for a whole round-the-clock amount supported the review information received, which has data on the sum of traffic and congestion, time-dependent suspensions for the complete road and transport system, and queues at junctures. These models will on paper envisage the quantity of confirmed cases and therefore the rate of spread. Once these models have created information, researchers will transfer that information into HealthMap, an internet info resource that assembles the overtly accessible COVID-19 information, creating it without delay accessible to ease the active pursuit of its transmission (25).

Newly, AI assisted to determine and estimate COVID-19 outbursts by using three-D information. Regularly, AI-driven tools square measure restricted to at least one information kind, which cannot cause a correct activity of the coronavirus's transmission. In such a case, the utilization of three-D information will facilitate managerial processes with advanced dependability. As an illustration, AI is getting employed with anomaly detection (AD), that recognizes irregular and unidentified outlines in an exceedingly therapeutic image (such as a chest X-ray). AD may be functional to either single-dimensional or three-D information. In absence of AI, AD-driven procedures would be dreary for physicians to investigate and supply treatment for patients. By employing the data generated by AD, AI are often used to determine the foremost susceptible provinces by chase the sum of positive cases and endorsing the required actions to restrain the proliferation.

Applications of AI in COVID-19 (26–29)

- Diagnosis
 - Pre-Diagnosis e.g.-Blue Dot technique
 - Diagnosis by assessing the symptoms or imaginary Technology. e.g., CT Scan
- Prevention
 - Prediction of cases
 - Contact tracing
 - Spreading of information
- Response
 - Delivery of materials in the hospital area or places.
 - Online assistance

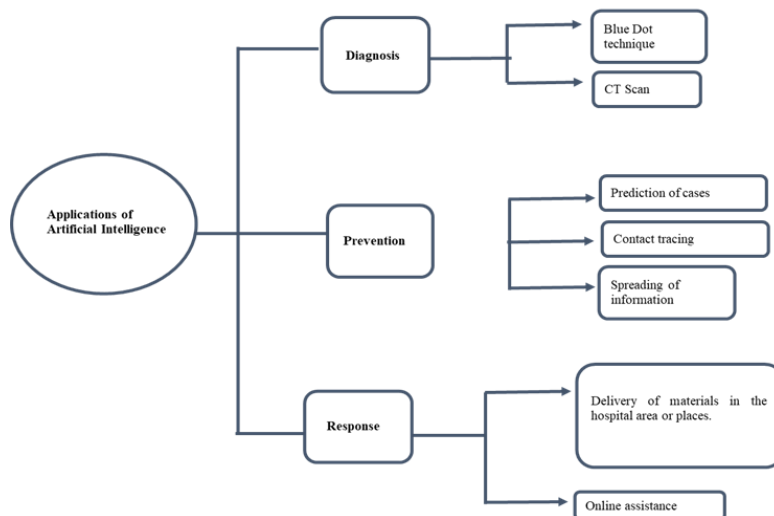


Figure 3. Applications of AI in COVID-19

Post COVID-19 Signs

Maximum patients experience gentle flu-like symptoms as well as temperature, cough, sickness, lethargy, mucus production and metabolism issues (30). Less common indications like headache, canal symptoms with diarrhoea and heavy signs like respiratory disease and respiratory disease were collectively discovered. Hitches like severe metabolism anguish disorder, acute internal organ damage, acute excretory organ damage and subordinate contagions were reportable in few patients. Different research lab constraints related to COVID-19 were low white blood cells and white corpuscle count, a rise in red blood cell rate, CRP (C-Reactive Protein), subverts and two-sided ground-glass opaqueness in respiratory organ CT scans. Due to the effect of the infection from virus undoubtedly the whole body and also many of the organs gets affected. Effect of the COVID-19 virus was observed as the long-term health issue (31). The term “Post COVID symptoms” termed because the health problems observed in the patients was already suffered from the COVID virus or either they are directly or indirectly coming in contact of the virus or the infected person. The problems were noticed and concluded that they stay in the body for approx. 4 months or more than that. The dangerous situation was tackled and the symptoms associated with COVID-19 was proven as very harmful and because of that the time taken for recovery was also long, due to which the impact stayed so long.

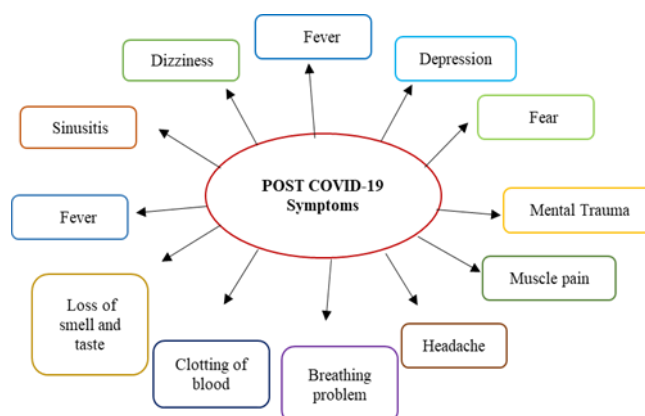


Figure 4. Post COVID-19 symptoms

AI reported the exact data with the relevancy, that data provided the tools to the researchers and developed techniques related to the control of post COVID symptoms. They developed models performed the study on them and forecasted the reports. AI is well known for their work and to solve the problems based on the machine learning, mathematically or statistically (32).

Conclusion

In this review, we have mainly focused on the tools, methods and the ways with the help of that the AI worked so efficiently during the tough times. The whole world was affected and suffered so badly and many of the people have lost their lives, their livelihood and the economy of the world was also affected. The above article summarizes the roles of the AI in combating the COVID and the Post COVID situation and also discussed about the development of the machine learning, software, all the report reading, collection of the surveys, and also the methods of diagnosis, prognosis, prevention, treatment and mitigation of the symptoms.

Conflict of interest

None

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