Chelonian Conservation And Biology

Vol. 17 No.2 (2022) | https://www.acgpublishing.com/ | ISSN - 1071-8443

DOI:doi.org/10.18011/2022.04(1) 2301.2309

INVESTIGATING THE IMPORTANCE OF ARTIFICIAL INTELLIGENCE (AI) IN COVID-19 PANDEMIC- A REVIEW

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ABSTRACT

In recent years, Internet of Things (IoT), Big Data, Artificial Intelligence (AI), and Machine Learning are some of the new technologies that healthcare delivery needs to embrace in order to combat and anticipate emerging diseases. Reviewing AI's function as a cutting-edge tool for analysis, avoidance and the fight contrary to COVID-19 (the coronavirus) and further pandemics is our goal. The COVID-19 pandemic has placed the whole globe in an unparalleled and challenging condition, causing a complete cessation of living activities and resulting in the loss of thousands of human beings. COVID-19 is currently present in 212 nations and territories, resulting in a total of May 22, 2020, there were 5,212,172 infected cases and 334,915 deaths. This poses a significant threat to the public health system. Approaches: A comprehensive literature review was conducted utilizing the Google Scholar, Scopus, and PubMed databases, focusing on the keywords The Coronavirus (COVID-19) with Artificial Intelligence (AI). Gathered the most recent data on AI concerning COVID-19 and subsequently investigated it to find possible uses for this condition.

KEYWORDS- Big data, machine learning, IOT, artificial intelligence, bioinformation etc.

The “SARS-CoV-2” virus is the source of the communicable disease COVID-19, that significantly changed the lifestyle of the global community. Most people who catch a viral infection will experience a mild to severe respiratory illness, but they will improve without the necessity for specialized medical care. Additionally, some people had serious illness and require medical attention. Severe illness is more likely to strike older people or those with pre-existing conditions like diabetes, heart disease, cancer, or chronic lung disease. Any age can be affected by COVID-19, which can cause serious sickness or even death. Respiratory droplets continuously released from the lips or nose of an infected person when they cough, sneeze, speak, sing, breathe, or cough might spread the virus. These particles come in a range of sizes, from small aerosols to bigger droplets that evaporate. It's important to practice respiratory etiquette.

For example, coughing into the bend of your elbow can stop the virus from spreading. Additionally, if you start feeling poorly, it is advisable to remain at home and isolate yourself until you have fully recovered. As of January 21, 2021, the global COVID-19 pandemic has impacted 219 countries, resulting in 97,422,123 confirmed instances and 2,086,159 deaths worldwide (source: worldometers.info). COVID-19, also known as a novel coronavirus illness, is an infectious illness brought on by the severe respiratory syndrome coronavirus (“SARS-CoV-2”) coronavirus according to (Awasthi et al, 2020; de Almeida et al., 2020; Manganoan et al., 2020). The predominant symptoms observed in individuals infected with COVID-19 include a fever, gradual loss of taste and smell, dry and continuous cough, exhaustion, and respiratory issues such as shortage of their breath (Ibrahim, 2020) (Caliber and colleague, 2020).

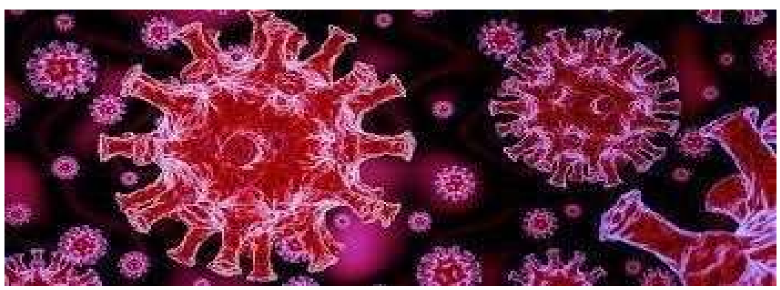

Fig.1 Coronavirus

A cross-sectional view of “SARS-CoV-2” is shown in Figure 2, that includes a “hemagglutinin-esterase dimer, spike protein (S), and nucleocapsid protein (N)”. The membrane glycoprotein (G), matrix protein (M), envelope protein (E), and non-segmented, encapsulated single-strand RNA make up the virus.

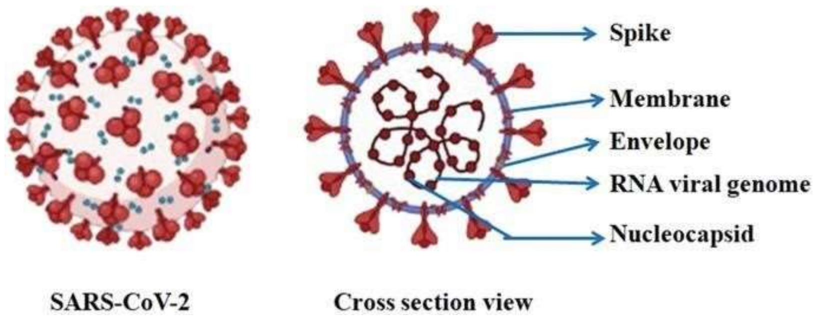

Fig. 2: A cross-sectional view of SARS-CoV-2.

From our perspective, the current situation is clear: the pandemic has directly influenced scientific research, leading to the utilization of AI techniques in COVID-19 associated scenarios. Additionally, associations between nations have been reinforced due to the shared objective of developing operative strategies to mitigate the crisis across various domains. Chen et al. (2020) provides an excellent literature assessment of artificial intelligence (AI) approaches used during the COVID-19 epidemic.

This spike of interest demonstrates the importance of employing creative approaches to accelerate the advancement of information and solutions for the current medical and socioeconomic problems. Nonetheless, there are still unanswered questions about the part of AI in a pandemic. Studies investigated has AI proved readiness for such a scenario? Furthermore, identified what is the true value of data, specifically the rank of data collection and excellence in the application of AI technologies to real-world problems? Finally, has AI been effectively used in real-world COVID-19 scenarios, and what benefits has it offered in these cases?

The COVID-19 virus was discovered in 2019 in Wuhan, China, and significantly spread fast over the world, resulting during the 2019-2020 coronavirus pandemic. Predominant manifestations of COVID-19 encompass coughing,

Symptoms include pyrexia and dyspnea. Additional symptoms may encompass diarrhea, myalgia, pharyngitis, expectoration, abdominal discomfort, and anosmia and ageusia. COVID-19 is primarily transmitted by close contact and respiratory droplets generated by sneezing or coughing. Respiratory droplets can be generated when breathing, although they are not considered to be airborne. It can also be transmitted through fomites. For instance, if one were to come into contact with a fomite (a surface contaminated with pathogens) and subsequently touch the mucous membranes of the body, such as the mouth, nose, or eyes, there is a possibility that the pathogen may enter the body. Effective strategies to mitigate the risk of infection encompass regular hand hygiene, practicing social distancing (maintaining a physical distance from others, particularly individuals displaying symptoms), employing a tissue or inner elbow to conceal coughs and sneezes, and refraining from touching the face with dirty hands. Some national health authorities advocate the use of masks for those who fear they have the virus and for their caretakers. However, they do not recommend masks for the general public, although those who wish to do so may use basic cotton masks. This paper investigates the significant role of AI technology in combatting the Covid-19 epidemic. Various applications are used to analyze, identify, and prevent the condition.

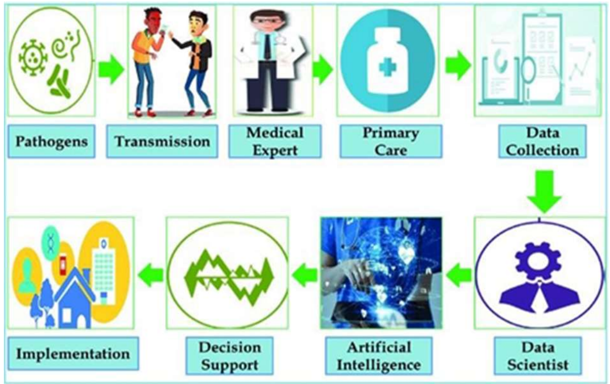

Fig. 3: Prevention of infectious disease.

The progress in artificial intelligence is anticipated to serve as a viable approach to tackle these difficulties. This is due to the substantial volume of information that is now accessible through the use of AI. With the widespread adoption of information technology and ever-increasing computational capabilities, artificial intelligence has showed exceptional proficiency in addressing the majority of the aforementioned concerns.

Above. Undoubtedly, the ability to extract patterns and relationships from data has made this field of research more appealing in positions that require the representation of complex information and dynamics. In a wide range of fields, such as "image recognition and segmentation, time series forecasting, sentiment analysis, system control, and dynamics simulation, the literature clearly shows how well Deep Learning (DL) (Shorten et al. 2021) and Machine Learning (ML)" (Nayak et al. 2021) approaches can be applied. Furthermore, there is proof that robotic self-operating systems work well for restricting social interactions.

Utilizations of Artificial Intelligence in the healthcare and bioscience fields

Investigation

- Gathering and consolidating information.
- Data mining is used to identify molecular interactions and drugs.
- Clarification of the mechanism behind the sickness. Drug candidate generation and selection.

Identification

- Data analysis and early warning for both communicable and non-communicable diseases.
- Medical conditions can be diagnosed by utilizing pattern recognition techniques that analyze symptom data and medical pictures.

Prevention

- Forecasting involves computing an individual's likelihood of contracting an infection.
- Surveillance is used to actively observe and trace the movement of infectious agents in real-time.
- Analyzing tailored news and regulating content to combat misinformation by deciphering relevant information.

Medical advancement

- Trial design.
- Site selection for conducting trials. Optimizing the recruitment process.
- Toxicity prediction and risk monitoring. Surveillance of medication compliance.

Reply

- Support in transportation (Using robots for high-risk duties in hospitals and drones to deliver commodities).
- Automating services through the implementation of virtual assistants and chatbots.

Recovery

- Monitoring entails using satellites, GPS, and social media to track the development of economic recovery.
- AI-powered tools also help to identify individuals who are more vulnerable based on their specific "genetic, physiological, and biochemical" profiles. The preceding sections describe applications of AI-based technology that could be critical components in combating the Covid-19 outbreak.

The junction of Covid-19 and artificial intelligence (AI).

AI techniques are being utilized to diagnose Covid-19. Some AI algorithms have proven to be able to accurately assess the level of severity of Covid-19 by the analysis of radiologic images, including CT and X-rays. An expanding number of supervised learning algorithms are being utilised to diagnose Covid-19, including "convolutional neural networks (CNN), logistic regression, random forests, support vector machines, linear discriminant analysis, Naive Bayes, and decision trees". Utilising diverse datasets, these algorithms classify pictures into several groupings, aiding in the evaluation of sickness severity and distinguishing Covid-19 from other illnesses exhibiting like symptoms and pneumonia. The values fall into the range of 41 to 45.

Artificial intelligence in the field of disease diagnostics

Chest CT scans are the most efficient tool for clinically diagnosing Covid-19 in supposed patients, despite with certain specific limitations. In a recent study, Covid-19 and community-acquired pneumonia were distinguished individually using a deep learning system. There is an

18–20 range. In the absence of point-of-care diagnostics, AI-powered technologies can help us understand the dynamics of SARS-CoV-2 transmission among various demographic groups and the threat of disease spread. Presently, is believed that the dynamic learning process in AI gadgets enhances trust in decision-making. The number 23 is enclosed in square brackets. Therefore, it is necessary to establish standardized guidelines for the creation of AI-based technologies that can be utilized during such catastrophic events. When diagnosing Covid-19 positive cases, the deep learning methods benefit from the use of “chest CT and X-ray images”. The following is the order: [7, 20, 28]. Recent research indicates that individuals with Covid-19 had radiographic characteristics on their chest CT scans, including “ground-glass opacities, multifocal patchy consolidation”, and/or interstitial alterations with a peripheral distribution. The user's text is "[8]". A technique utilizing Convolutional Neural Networks (CNN) successfully differentiated between pneumonic lungs infected with influenza A and Covid-19, achieving an overall accuracy of 86.7%. The number 15 is enclosed in square brackets. A transfer learning algorithm was used to create a Convolutional Neural Network (CNN) model for detecting disease using chest anterior-posterior radiographs. The model exhibited great sensitivity and specificity and achieved an impressive accuracy of 96.3%. Incredibly accurate predictions were established in a meta-analysis of previously published research that used distinct databases on CT scans and other types of imaging for identifying Covid-19.

Much more sensitive than radiological illness diagnosis are AI-based algorithms that integrate results from chest CT scans with lab tests, clinical symptoms, and environmental history. The user's text reads "[20]". Several research have used artificial intelligence (AI) in combination with radiological image analysis to distinguish between infected and uninfected individuals. A different study used advanced 2D and 3D deep learning algorithms to automatically identify and track patients. A study of CT images using deep learning algorithms was conducted on 157 patients from all over the world. The findings revealed an extremely accurate prediction of sickness development, with a precision rate of 98.2%.

The test has 92.2% of sensitivity and specificity values. Furthermore, it has been demonstrated that by adding AI-based image analysis, a speedy and highly accurate Covid-19 diagnosis can be achieved. A CRISPR-based nucleic acid identification tool for “SARS-CoV-2” and other symptomatic disorders was developed using an extensive machine learning technique. There may be uses for this method in surveillance and diagnosis. Square brackets encircle the number 19. A lateral-flow assay was used in an experimental assessment of the “CRISPR-Cas13” detection system to show how quickly and sensitively it could detect synthetic targets. The number 19 is enclosed in square brackets. Hence, the integration of AI methodologies with current molecular diagnostic techniques should aid in the identification of diseases and facilitate early containment of their transmission. AI-powered technology can accelerate healthcare operations during the Covid pandemic crisis by leveraging AI/ML algorithms that have been thoroughly tested and proven in various disease outbreaks.

Artificial intelligence in the prediction of Covid-19 outcome

Current research aims to enhance clinical proficiency in the detection and advancement of Covid-19. The number 13 is enclosed in square brackets. A predictive analytics-enabled AI framework was created and used to analyze clinical data, hence assisting in clinical decision making. Utilising past medical records from Covid-19 patients, algorithms for prediction can assess the likelihood that a patient would experience serious signs and symptoms, including acute breathing distress syndrome, or need intensive care unit treatment. Raised haemoglobin levels, physical discomfort, and elevated alanine aminotransferases were the most notable clinical signs. The prediction models were able to predict severe cases with a maximum accuracy of 80%. Recurrent neural networks were employed in a recent study to forecast the effects of the Covid-19 pandemic. Openly accessible information from Johns Hopkins University and the World Health Organisation (WHO) were used in the study. The results demonstrated that there were few differences between the validated and projected data in contrast to the actual matching patterns. The study determined that the Covid-19 epidemic curve is predicted to have multiple peaks because to its propagating source. With around 90% accuracy, a prognostic system based on clinical data from Tongji Hospital in Wuhan, China, and machine learning forecasted the survival of critically ill Covid-19 patients. Three distinct factors served as the foundation for this model: lymphocyte count, high-sensitivity C-reactive protein, and lactic dehydrogenase. These factors were chosen from a set of approximately 300 clinical and laboratory characteristics. The number 29 is enclosed by square brackets. The usage of artificial intelligence () in predicting and regulating the spread of Covid-19. Tackling global viral epidemics is commonly regarded as a matter of both national and global significance. Enhanced data sharing is an essential requirement for gaining a deeper understanding of pandemics and creating highly effective AI-based model systems. A recent study conducted an analysis of Google trends (GT) to specifically examine the often-searched terms related to Covid-19.

The epidemic among the Taiwanese populace [13]. The findings indicate that GT has the potential to accurately forecast the timing of public response in relation to risk communication. A study conducted in six Taiwanese cities studied the relationship between Google relative search volumes and Covid-19 cases, and found a significant association ranging from high to moderate. The conclusions derived from Google operations preceded a rise in Covid-19 cases. The number 13 is enclosed in square brackets. Implementing an appropriate risk communication strategy will effectively mitigate the risks associated with infodemics and fraudulent phone calls. Covid-19, with a R0 surpassing 2.0, is highly infectious to a population that has not been previously exposed to it. The number 18 is enclosed in square brackets. Early phase risk communication is crucial for effectively limiting the global spread. This could make it easier to disseminate information on the events surrounding the outbreak's epicenter to public health officials and experts, as well as the general public. The use of decision-making AI algorithms in literature can make it easier to find scientists, researchers, and medical practitioners who can use these platforms for support in attending circumstances. 64 ML-based algorithms can improve the identification of infected cases using mobile phone-based web surveys, hence reducing the spread among susceptible groups.

Starting in Wuhan, China, a worldwide travel pattern study was conducted to forecast the disease's spread to many other nations. The Infectious Disease Vulnerability Index (IDVI), which takes into account factors including as disease dynamics, demographics, public health, politics (domestic and international), healthcare, and economics, was used to evaluate nations that receive a significant volume of travellers from Wuhan. IDVI scores are allocated to countries on a 0–1 scale, where higher scores correspond to a stronger capacity to contain a disease epidemic. The study discovered that "Wuhan (China), Hong Kong, Bangkok (Thailand), Taipei (Taiwan), Dubai (UAE), Sydney (Australia), and Victoria (Canada)" had high values of IDVI scores among the countries that received a large number of passengers from "Tokyo (Japan)". In addition, a parallel study analyzed African nations' vulnerability and readiness (using IDVI) for Covid 19.

Social supervision

Another way AI is being used to address the COVID-19 outbreak is through social control measures and methods. AI has been noted and cited as critical for pandemic management, including the use of thermal imaging applications to scan general and public spaces for sick individuals, as well as the implementation of social distance and lockdown measures (Rivas 2020). For example, as explained by Chun (2020), infrared cameras are used at Chinese airports and rail stations to monitor crowds for high temperatures. Occasionally, they are utilized in conjunction with a facial recognition system to accurately identify individuals with elevated body temperature and determine if they are wearing a surgical mask. According to reports, these cameras have the capability to scan 200 individuals every minute and can identify people whose physique matches certain criteria.

Over 37.3°C is the temperature (Dickson 2020). Thermal imaging has faced criticism for its inability to accurately detect a fever in those wearing glasses, as it cannot effectively scan the inner tear ducts from a distance. The most trustworthy signal) and because it is unable to determine if a person's fever is being caused by COVID-19 or another source (Carroll 2020).

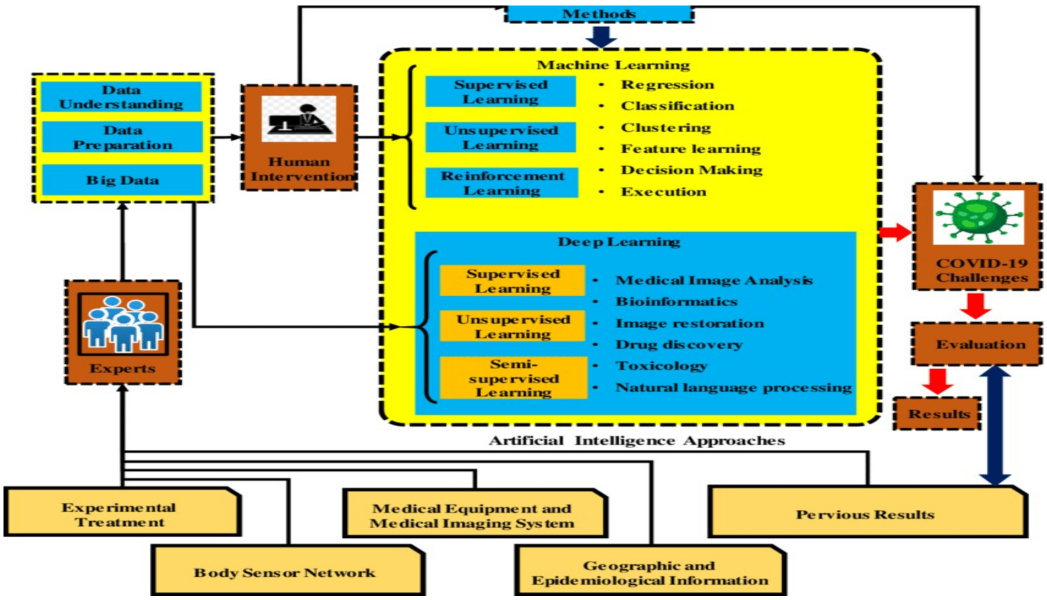

Fig. 4: The process of using AI-based methods to overcome issues related with COVID-19.

Treatments and vaccinations

AI has the ability to provide assistance in the battle against COVID-19 in three areas: the discovery of possible medicines and vaccinations. AI was praised for its ability to aid in the identification of novel drugs prior to the COVID-19 pandemic, as demonstrated by Koldewey (2019), Fleming (2018), Segler et al. (2018), and Smith (2018). Several research institutes and data centers have already stated their intention to use artificial intelligence (AI) in the hunt for COVID-19 treatments and vaccines. AI is expected to speed up the process of identifying new medications as well as repurposing existing ones. Several studies have previously identified drugs that can be repurposed. Using machine learning, Beck et al. (2020) concluded that atazanavir might be utilised to treat COVID-19. Baricitinib, a drug used to treat myelofibrosis and rheumatoid arthritis, was identified by Stebbing et al. (2020) as a potential COVID-19 treatment.

AI applications against COVID-19

Diagnostics and detection using remote access. The high transmissibility and fatality rate of COVID-19 presented a huge challenge to both the medical community and scientists. This challenge is based on the ever-changing effects of COVID-19. Pre-existing pulmonary disorders have a rapid effect on the evolution of COVID-19 problems. “Pulmonary atelectasis, hemorrhage, edema, and lung tissue neoplasia” are all conditions that can alter the diagnosis of COVID-19 and make it difficult for seasoned medical experts to recognize (Adly et al., 2020). The public health professionals define the standard diagnosis of COVID-19 as

Diagnostic radiography and nasopharyngeal PCR swabs are used in a two-step process. The PCR test analysis demonstrated a clear distinction in the differential diagnosis, with clinical sensitivity ranging from 60% to 71% (Adly et al., 2020). As a result, essential diagnostic information relevant to the patient's life can be captured quickly and accurately (Naude's, 2020). Bio surveillance was used by public health specialists to address a discrepancy in current molecular testing kits and provide the groundwork for distant COVID-19 identification and prevention (Bansal et al., 2020).

Contact tracing has been employed in public health epidemiology to combat global pandemics such as SARS, MERS, influenza, Ebola, and COVID-19 (Abadi et al., 2020; Lin and Hou, 2020). This process is evident in COVID-19 preventative approaches that allow for rigorous surveillance of infected patients over a 14-day period using cellular technologies such as global positioning systems, Bluetooth, social activity maps, and network credit card transactions. When properly deployed, contact tracing can be utilized to detect, identify, and prevent the development of severe COVID-19 outbreaks in real time (LaMantia et al., 2020). Therefore, by reducing the predicted number of casualties and increasing the efficiency of COVID-19 measures adopted by local authorities and governments, as proved in South Korea (Lin and Hou, 2020), The reverse of the beneficial function of contact tracing is revealed in potential. Data security breaches, invasions of autonomous privacy, and abuse of different data volumes are all major concerns (Laudanum et al., 2020).

Obstacles and potential opportunities that lie ahead

Artificial intelligence has received both praise and criticism from numerous scientific disciplines (Allam, 2020). AI agents have conducted a thorough examination of COVID-19 and the potential applications of AI. The majority of AI research organisations have emphasised the potential of supply chains, exports, and digital economies for the AI landscape of the future, especially in light of the COVID-19 pandemic (Nadu, 2020). According to additional research, developments in artificial intelligence after the COVID-19 pandemic are expected to lead to the creation of smart cities and the integration of robotics into human labour (Bragozzi et al., 2020; Naude, 2020). The difficulties and compromises involved in using AI to combat the COVID-19 pandemic are outlined.

CONCLUSION

AI-based algorithms can be used to epidemiologically model the current Covid-19 pandemic, as well as estimate future medical supply, infrastructure, and human resource requirements if the disease expands. This information can help public health organizations develop timely preventative and control plans. Nevertheless, the accuracy of AI-based projections is dependent on the input data and assumptions. It is critical to recognize that real-time circumstances may differ from projections. AI-based technologies and methodologies can help improve disease diagnosis, locate acceptable candidates for vaccine and treatment development, understand virus evolution, and identify viable medication candidates for repurposing against Covid-19. Artificial intelligence (AI) is critical for both healthcare and public health. This research examines the use of AI-based approaches in healthcare during the Covid-19 epidemic. AI-based technologies and methodologies were employed to model virus transmission and optimize resource allocation. The availability of a large volume of high-quality data, supplemented with information, can considerably aid AI-based approaches in efficiently studying complicated real-world health challenges, ultimately leading to better management. The researchers have achieved encouraging preliminary outcomes through the utilization of AI-based technology. However, the primary obstacle to its practical deployment lies in the regulations governing data interchange. Although AI-based techniques have made progress in addressing major concerns, they have not yet had a large impact on the global healthcare market. The potential of AI to tackle difficulties may position it as a pivotal force in determining the functioning of healthcare systems in the future. While virologists, epidemiologists, and physicians may not be completely replaced by AI-based tools in terms of observations, it is widely acknowledged that AI may provide considerable value and serve as a complimentary tool by alleviating the workload of each stakeholder. The determination Before focusing on final decision to control the impacts of an epidemic, decision-makers at all levels should consider a few proposed solutions provided by AI tools. These ideas can then be further investigated using human intelligence. During a disease epidemic, the employment of AI, either alone or in conjunction with other techniques, is dependent on a variety of parameters to ensure an efficient public health response. These elements include a thorough understanding of epidemiological features such as “incubation period, transmissibility, risk populations, reproduction ratio (R0), mortality rate, infection natural history, pathogen details, stability, virulence, and pathogenic potential”.

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