ISSN: 2582-8118 ***Volume 2, Issue 4; July 2022***

INTERNATIONAL JOURNAL OF RESEARCH AND ANALYSIS IN SCIENCE AND ENGINEERING

Web: https://www.iarj.in/index.php/ijrase/index

1. The Role of Machine Learning and Artificial Intelligence in Tackling COVID 19

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ABSTRACT

COVID-19, which is caused by SARS-CoV-2 (13), has become a public health crisis of unprecedented scale. In the aftermath of the recent global disaster, scientists, clinicians, and healthcare experts throughout the world are scrambling to find a new technology to tackle the Covid-19 outbreak. After a previous epidemic, researchers are encouraged by the evidence of the application of machine learning (ML) and AI (AI). Extracting information from social media, phone calls, and news websites can be used to create early warning systems that provide useful information about the most vulnerable areas and predict death rates. Using CT-Scans, X-ray imaging, sound analysis, and blood testing with machine learning, this viral disease may be thoroughly detected. COVID-19 vaccines and medicines could be developed using machine learning. Controlling epidemics was also a topic of discussion. T The study examines the relationship between technological advancements and epidemics, as well as the implications for health care that machine learning and natural language processing tools may have.

KEYWORDS:

Pandemic, COVID 19, AI, ML, Coronavirus.

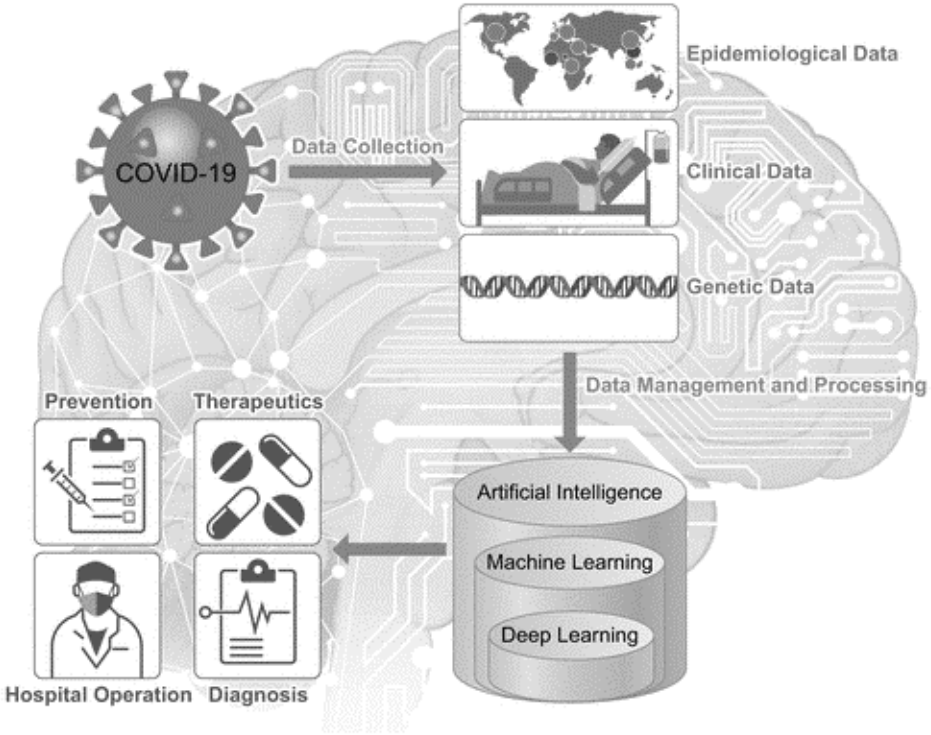
Introduction:

COVID-19 may be considered the first flu pandemic to spread in a hyper-connected world. Numerous facets of our culture have been affected by this rapid and widespread transmission. We are seeing as many as 116 million confirmed cases and more than 2 million deaths in 235 countries, as reported by the World Organization for Health (WHO) in February 2021, despite the implementation of many containment measures, such as the closing of borders and the introduction of lockdown periods. [1]

So, in order to keep the epidemic under control, numerous countries have overstretched their health care systems [2]. In addition, COVID-19 has been linked to a wide range of symptoms, from the flu to ARDS and fulminant pneumonia [3]. COVID-19 treatment and

preventative drugs and vaccinations are urgently needed. Because there are no proven treatments for Ebola, the majority of containment measures are based on social separation and quarantine measures [4]. The spread of COVID-19 has been slowed, but not halted, by these efforts. There is anxiety about a second illness wave once limitations are eased. For COVID-19's second outbreak, advanced containment methods like contact tracking and the detection of hotspots are required. This conflict relies heavily on science and technology. First, China used facial recognition cameras and robots to track sick persons with their activity histories and bring food and medication to them, as well. Robots disinfect public places and play sound signals to encourage people to stay at home [6]. COVID-19 had already been using artificial intelligence to identify new particles in motion. Artificial intelligence (AI) is widely used by researchers in the search for new therapeutics and pharmaceuticals. Software developers specialise in finding patients who are unable to treat using clinical imaging techniques like X-rays and computed tomography (CT).

The ACE2 gene polymorphism has been shown to influence virus binding activity (1) and shows that the general population may have a genetic predisposition to COVID-19 infection. A machine learning analysis of genetic variants from asymptomatic, mild, or severe COVID-19 patients can be used to classify and predict people based on their vulnerability or resistance to potential COVID-19 infection, and the machine learning model can also return those prioritised genetic variants, such as ACE2 polymorphisms, in their decision-making process as important features for functional and mechanistic studies. [7]



COVID-19 is illustrated in Figure 1 by AI and machine learning in the fight.

Management of COVID-19 Disease using Artificial Intelligence:

Artificial intelligence (AI) has been a success in the detection and monitoring of illness clusters as well as the prediction of future outbreaks as well as the risk of death from COVID-19, the diagnosis of COVID-19 and management of disease through resource allocation. [8]

- Prediction & tracking with AI
  Data from social media, phone conversations, and news websites may be used by AI to predict the spread of the virus, construct early warning systems, and provide useful information about vulnerable places and estimate mortality and morbidity rates.
- Contact tracing with AI
  An AI-enhanced phone health application in COVID-19 [9] uses smartwatches, mobile phones, cameras and other wearable devices to diagnosis, track contact information for patients and provide efficient monitoring.
- Monitoring of COVID-19 cases with the use of AI
  Patients in clinical settings are monitored and treatment plans are predicted using AI algorithms. Artificial Intelligence (AI) can help prioritise the use of ventilators and respiratory assistance in intensive care units based on data from vital statistics and clinical indicators [10].
- Early diagnosis with AI
  COVID-19 patients were identified and quantified using chest x-rays and CT scans [31–33]. Based on 2D and 3D visual data obtained from volumetric chest CT scans, researchers have developed a COVNet neural network to distinguish between COVID-19 and community-acquired pneumonia.
- By using AI, medical professionals and healthcare workers will have less work to do.
  AI-based triage systems that automate many processes, such as training practitioners, determining the best mode of treatment and care by analysing clinical data using pattern recognition approaches, digitising patient reports, and providing solutions that minimise their contact with patients, can help medical staff and healthcare workers. [11]
- AI in development of therapeutics
  Lead finding, virtual screening, and validation processes can be considerably sped up by artificial intelligence, which can significantly cut time from bench to bed (AI). Molecular descriptors and properties can be used by AI to speed up medication repurposing and repositioning by screening attributes of existing approved and validated pharmaceuticals. This may be impossible for a human expert to do.
- AI in development of vaccines
  There has never been a vaccine development race like this before in history of mankind. Discovery can be considerably accelerated by the use of artificial intelligence (AI). [12]
- AI's role in preventing the spread of misinformation
  This pandemic has become an infodemic because of the deluge of knowledge. An effective plan for reducing COVID-19's negative impact might be developed using information from social media sites such as Twitter, Facebook, etc. Machine learning techniques can be used to identify the source of erroneous information and reduce the spread of rumours and disinformation by analysing patterns and sentiment. [13]

Review of Literature:

As the Coronavirus (SARS-COV-2) is more well known, it is a highly contagious disease that has been spreading over the world. The Coronavirus family includes this virus. All of the following symptoms of COVID-19 can be present:

Cough, fever, shortness of breath, headache, muscle discomfort, and a loss of smell and taste are all symptoms of a cold or flu virus (Razai et al., 2020). [14]

Complex issues can be solved with ML by using statistical models (Gale, 1988) [15] and a small bit of knowledge. Algorithms include linear regression, Logistic Regression (LR), Decision trees (DT), Random forests (RF), K-Nearest Neighbors (KNN), support vector machines (SVM), K-means clustering, and the Nave Bayes (NB) model, among others.

When it comes to machine learning (ML), the subsection of Deep Learning (DL) is all about Neural Network (NN) models that use feed-forward and backpropagation to learn different data trends. COVID-19 is also being fought with their assistance.

They aid in the diagnosis of viral disease and forecast the severity of the same. To better predict drug interactions and develop vaccines, pharmaceutical companies use these models to investigate the genetics and mutations of COVID-19.

The paper examined how to properly screen, predict future patients, and diagnose and detect this infectious virus at an early stage. ML's role in reducing the burden on healthcare workers was also discussed. (Naudé, 2020b; Unberath et al., 2020) [16-17] discussed the use of AI in developed countries to combat COVID-19.

ML was used by Kannan et al. (Kannan et al., 2020) [18] to find and develop new drugs that could potentially cure a variety of diseases. [COVID-19. Development of vaccines utilizing ML techniques was the focus of this paper. In (Rahmatizadeh et al., 2020) [19], AI was used to care critically ill patients.

Deep Transfer Learning (DTL), Edge Computing (EC), and DL were all part of a comprehensive investigation, and a DTL pipeline was developed to help prevent further COVID-19 breakouts. In the talk, COVID-19's speech and language processing was discussed (Deshpande & Schuller, 2020) [20]

Q-learning employs sequential decision-making methods. Inputs are matched to the best possible solution, which is based on the preceding output. Depending on the circumstances, it is possible to raise or drop the value of objective function $F\pi$.

While π corresponds to an overall policy, P denotes an individual state. Its best policy is determined by its interactions with the environment. The Q-learning technique and multi-robot collaboration have been employed to prevent the re-emergence of COVID-19-infected patients (Sahu et al., 2021) [21].

Objectives:

- To Study Pandemic situation of COVID 19 and effect
- To Study role of AI and ML in tackling COVID 19
- To overview DenseNet model using x-ray
- To study role of AI and ML in COVID-19 detection and diagnosis.

Research Methodology:

A research technique is a method for resolving a research issue in a methodical manner. It can be viewed as a science that studies how scientific research is carried out. The logic behind the numerous procedures taken by a researcher to investigate his research problem is examined in this article. The researcher must be well-versed in both research methodologies and methodology. The systematic and theoretical analysis of the procedures used in a particular field of study is known as methodology. Theoretical analysis of a branch of knowledge's methodologies and principles is included. It usually includes ideas like paradigm, theoretical model, stages, and quantitative or qualitative methodologies.

Result and Discussion:

Retrained deep learning models, such as ResNet50, InceptionV3, VGG-19, and Inception ResNet2, have been demonstrated for the detection of COVID-19-infected patients utilising chest x-ray and CT scan images. FIGURE 2 depicts a traditional CNN for the identification and diagnosis of COVID-19 using a retrained ResNet50, InceptionV3, VGG-19, and Inception ResNetV2 architecture (Fig. 2). [22]

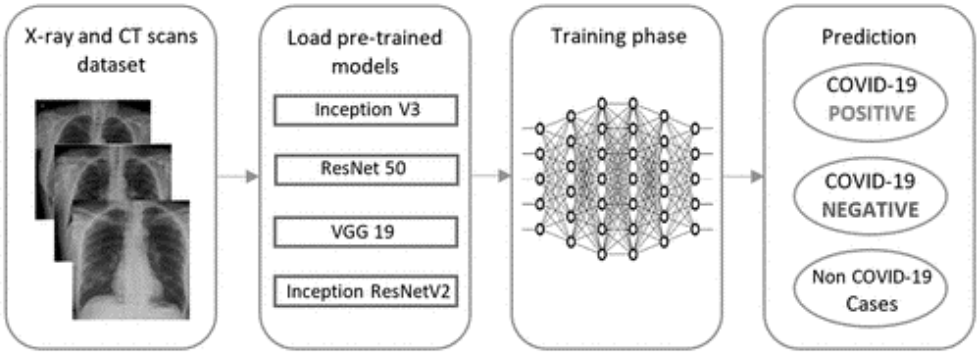
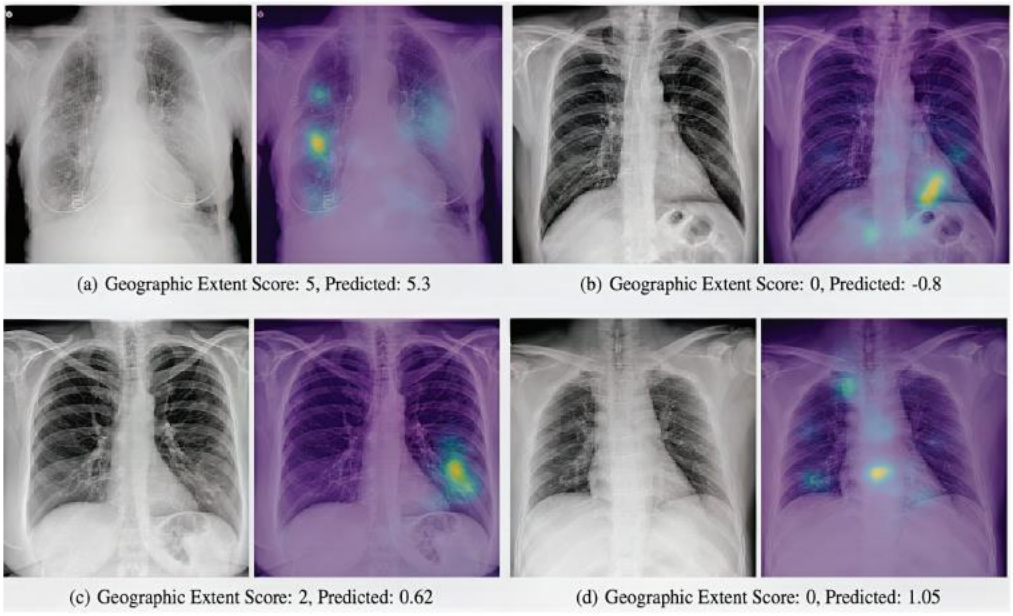


Fig. 2: DL-based frameworks for the identification and diagnosis of COVID-19

Abbreviations: DL, deep learning; COVID-19, coronavirus disease.

The use of ML and DL techniques on CXR pictures of the lungs can effectively track disease development. ML has been utilized to obtain precise findings from CT scans and X-rays. A single X-ray image depicts both the participation of the lungs and their ambiguity. A DenseNet model patient's severity is shown in fig .3[23]



The COVID-19 severity may be predicted using the DenseNet model, as shown in Fig. 3.

In the battle against COVID-19, AI focuses on viral and patient identification, medical imaging techniques, disease monitoring, and prognosis. There are a number of modern technologies for coronavirus plague that we found in Table 1[24].

Table 1: Different implementations of recent technologies for conflict COVID-19 pandemic.

System	Functions	Digital technology	Benefits	Drawbacks
Tracking	Monitoring the occurrence of disease in real time	Wearable and smartphone data in real time; data dashboards; migration maps; machine learning	Provide a means of representing the distribution; constraints on the scope; allocation of available resources; and provision of predictions	Controlling and controlling it can be time consuming and expensive, and it has the potential to threaten privacy.
Infection Screening	Individuals and populations are screened for the illness, as well as for signs of it.	Infrared cameras, temperature sensors, smartphone apps, and web-	It is possible to track and isolate patients for the purpose of study and to learn more	As a result of the difficulties in diagnosing asymptomatic people using self-reported

System	Functions	Digital technology	Benefits	Drawbacks
		based toolkits are all examples of AI.	about the incidence and pathology of various diseases.	symptoms or vital sign monitoring, the high costs, managerial requirements, and regulatory oversight, this method may violate people's privacy.
Contact tracing	People who may have come into contact with an infected individual are traced and identified.	The technology and wearable; the system of global positioning; cellphones application; real-time tracking of mobile phone devices.	Monitors the spread of the virus and isolates anyone who has been exposed to it.	As a result of the app being disabled, if the mobile phone is gone, or Wi-Fi or cell connectivity is insufficient, it may violate privacy, identify people who have not been exposed but have had contact, or have difficulty identifying those who have been exposed.
Quarantine and self-isolation	Sick people are identified, tracked down, and quarantined.	Apps for smartphones; artificial intelligence (AI); cameras and digital camcorders; global positioning systems;	Isolates and inhibits the spread of infectious diseases	There is a violation of civil liberties; food and supplies can be restricted, and people who exit quarantine without detectors are not detected.
Clinical management	Diagnoses and monitors the health of patients.	AI for diagnostics, ML, and telemedicine platforms	Medical decisions, diagnostic tools and risk prediction are	Medical privacy may be jeopardised; it is difficult to evaluate

System	Functions	Digital technology	Benefits	Drawbacks
			aided by this technology, which allows for better service delivery.	patients accurately; it is expensive; machinery may malfunction.

Fig. 4: Pandemic time evolution in different context

Figure 4 illustrates the evolution of a pandemic across time, highlighting the various contexts and AI applications that go along with them. Following the timeframe provided by the WHO GIP, it is clear which phases of a pandemic should be addressed first (2009). Fig. 4 shows a variety of data generated at different times and in different parts of society. X-Ray and CT scans at hospitals generate clinical data that can be used for a variety of applications, including outbreak prediction and spread tracking, diagnosis, and drug production and repurposing, all of which can be improved by artificial intelligence. It is important to note that at certain points in a pandemic's spread, scientific articles report on the data gathered and cases tested in order to better understand the disease's characteristics. [25]

Conclusion:

The COVID-19 epidemic has put people's safety and security at risk around the world. Machine learning (ML) and deep learning (DL) are two areas of technology that are flourishing right now. ML has contributed greatly in aiding people in the fight against COVID-19. The pros and cons of each of the following strategies were analysed. The severity of the disease's progression, as well as drug and vaccine development for COVID-

19 using ML, were both examined. However, AI has played a significant role in the fight against coronavirus and helped researchers develop systems to reduce the risk of infection, deliver services, and manage public health emergency situations. Despite this, AI still requires substantial funding and resources in order to respond effectively to public health threats.

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