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Review Article

Discussing Artificial Intelligence's Role in Combatting The COVID-19 Pandemic: A Review

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ABSTRACT

The COVID-19 pandemic is considered one of the most dangerous diseases that have emerged in recent years, as it began at the end of 2019 in China and quickly spread to become a severe epidemic. This virus has become, in a short period of time, threatening millions of the earth's populations, and infected individuals show symptoms that may lead to the loss of their lives. In this article, the author concentrates on the significance and methods of artificial intelligence strategies in facing COVID-19 and the primary role of these technologies. AI techniques have been applied in various areas, including creating diagnostic tools, predicting disease transmission, identifying new treatments, and improving resource allocation. Moreover, these techniques have been employed to analyze medical images to find symptoms of COVID-19 in patients, speeding up diagnosis and reducing transmission risks. Public health professionals can more efficiently allocate resources thanks to machine learning models that have been trained on data from other pandemics to anticipate the spread of COVID-19 and identify possible outbreaks. Large datasets of currently available medications have also been analyzed using AI to find potential new molecules.

1. INTRODUCTION

Artificial intelligence (AI) is a branch of computer science that focuses on the development of computer systems capable of performing tasks that normally require human intelligence, such as visual perception, decision-making, speech recognition, and language translation. AI systems are beneficial for carrying out tasks at a size and speed beyond human competence, increasing efficiency and productivity. AI systems learn and improve independently [1]. Machine learning, deep learning, natural language processing, robotics, and computer vision are just a few of the many subfields that make up AI. Machine learning is the ability of computers to learn and develop without explicit programming, deep learning is a subset of machine learning that uses algorithms to simulate how the human brain processes data and forms patterns, and natural language processing is the process of teaching computers to understand human language, and computer vision is the process of teaching computers to perceive and interpret images [2]. AI is frequently utilized to automate processes like fraud detection, logistics, traffic control, and personalized marketing across a variety of industries, including healthcare, banking, transportation, education, and entertainment. AI has been and will continue to play a vital role in the creation of new technologies, the enhancement of corporate operations and analytics, and the automation of tedious and repetitive jobs so that people may concentrate on more creative and strategic work [3]. The corona virus, also known as COVID-19, has spread quickly over the world and is responsible for a serious worldwide health problem. Artificial intelligence (AI) has become an important weapon in the fight against the virus in the face of this pandemic [4]. The COVID-19 response has benefited greatly from the use of AI applications in many different ways. To find patterns, trends, and insights, AI enables the study of enormous amounts of data, including patient records, clinical research, and epidemiological data. This analysis supports disease detection, monitoring, virus spread forecasting, and mortality risk assessment. The creation of diagnostic tools is one significant application of AI in COVID-19. AI algorithms can process patient data and medical pictures to rapidly and correctly diagnose COVID-19 instances, assisting medical practitioners in immediately identifying and treating patients. Additionally, AI-driven chatbots and virtual assistants have been put into use to enlighten people who are worried about COVID-19, classify their symptoms, and provide recommendations [5]. The use of AI in drug development and discovery is also essential. In-depth bioinformatics and chemical compound databases can be screened and analyzed by machine learning algorithms to find prospective remedies or repurpose current medications for COVID-19. This has sped up the quest for virus-fighting medications and vaccinations [6]. Additionally, AI has been used in contact tracing initiatives to help track and map the virus's transmission. AI can support public health authorities in implementing targeted initiatives by analyzing

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data from many sources, including mobility patterns, social media, and medical records [7]. AI has played a vital part in the COVID-19 response in Iraq, with AI technology being essential to many different parts of crisis management. AI has been applied to studying viruses, advancing medicine and treatment research, identifying and diagnosing viruses, forecasting their evolution, and controlling disease outbreaks[8-10]. AI has been used well in several areas, including the detection of disease clusters, the tracking of COVID-19 cases, the forecasting of future outbreaks, the assessment of mortality risk, and the facilitation of resource allocation for disease management. AI algorithms can offer useful insights to enhance decision-making processes in the Iraqi healthcare system by analyzing data and patterns. Additionally, AI has helped identify COVID-19 cases. Healthcare workers can more efficiently detect and treat COVID-19 patients with the use of AI-powered tools that can diagnose patients quickly and accurately by analyzing medical pictures and patient data [11]. Overall, AI has been essential in managing resources, diagnosing infections, comprehending the COVID-19 virus, and anticipating outbreaks in Iraq. Its implementation has the potential to enhance the healthcare system's capabilities in combating the pandemic [12].

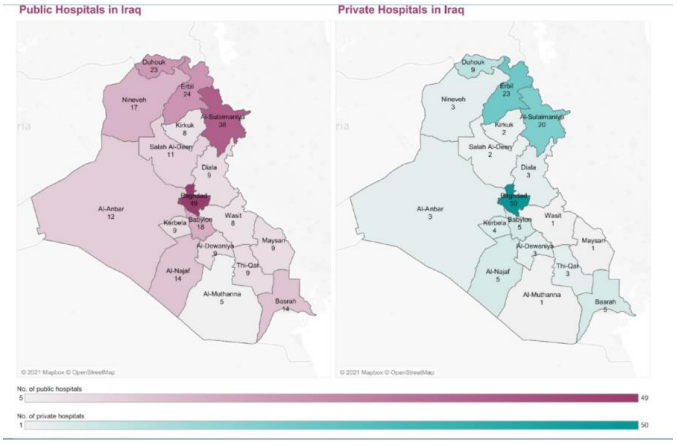

Fig. 1. shows how many public and private hospitals there are in Iraq today and how they are distributed [13].

2. AI AND THE DIAGNOSIS OF COVID-19

The use of artificial intelligence (AI) to the study of medical imaging has been considered as having a positive impact on disease diagnosis and prognosis [14]. AI-based image analysis approaches offer more precise, effective, quick, dependable, and reproducible information on the diseases when compared to classic image processing methods. Image analysis, image segmentation of infected lung areas, and clinical evaluation classifications are the foundations of AI-based methods for COVID-19 diagnosis. These AI-based methods have demonstrated a lot of promise for commercialization. In actuality, just a handful techniques have already been commercialized[15]. The standard AI models for diagnosing COVID-19 are shown in Fig 2.

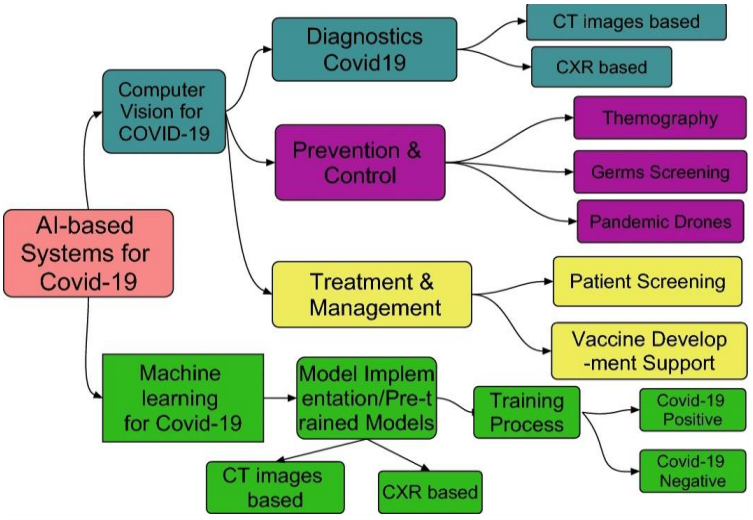

Fig. 2. Standard Model of AI-system for Diagnostic of COVID-19 [14].

COVID-19 has been diagnosed with the help of AI in a number of methods. Here are a few examples:

1. Analysis of chest X-rays and CT scans: AI algorithms have been created to analyze chest X-rays and CT images to find patterns and features that point to COVID-19 infection. These algorithms can assist radiologists and healthcare workers in accurately identifying possible COVID-19 patients by training AI models on big datasets of imaging data [16-18].

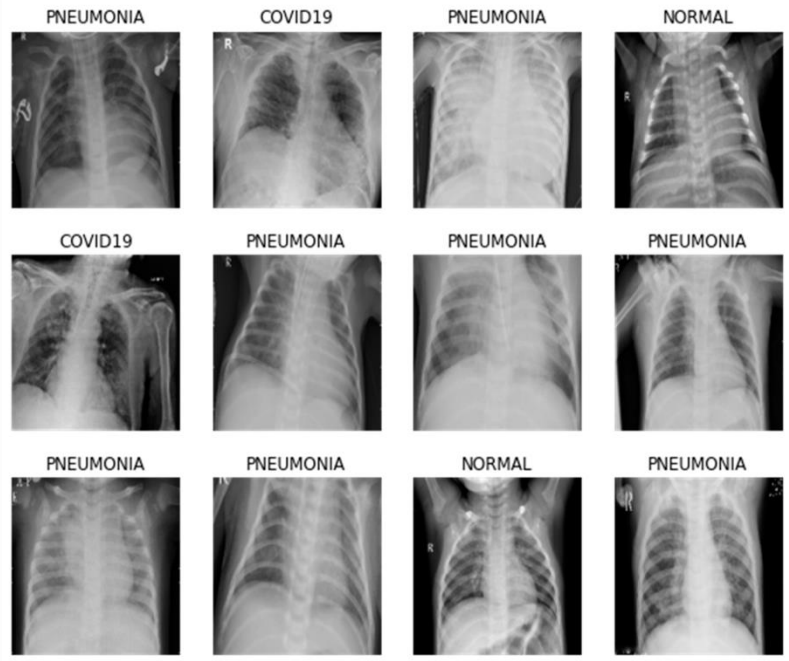

Fig. 3. Examples of health, the illness, and COVID-19 chest X-ray [19].

2. Symptom screening and triage: To help with the initial screening and triage of those who could have COVID-19, AI-powered chatbots and symptom checkers have been developed. Natural language processing (NLP) techniques are used by these tools to communicate with users, elicit pertinent information about their symptoms, travel experiences, and exposure risks, and offer suggestions for subsequent actions, such as self-isolation or seeking medical assistance [20].
3. Predictive analytics: AI models can examine enormous volumes of clinical and epidemiological data to spot trends and forecast the spread of the virus. These models can aid in forecasting illness development, resource allocation, and intervention planning by taking into account diverse elements such population demographics, mobility data, and social interactions [21].
4. Drug discovery and vaccine development: AI has been used to look for COVID-19 vaccines and therapies. Large libraries of already available medications or molecular structures can be quickly analysed by machine learning algorithms to find possible candidates that could be repurposed or altered to target the virus. By assisting in the identification of viral epitopes and predicting vaccination efficacy, AI can also help to hasten the process of vaccine development [22][23].

3. INFECTION TRACKING AND PREDICTIONS VIA ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) can play a significant role in infection tracking and prediction by leveraging different data and advanced analytics methods. Here is some ways AI can be applied in this context:

- Data analysis: To find patterns and correlations connected to infections, AI systems can analyse vast amounts of data, including patient records, demographics, environmental data, and social media feeds. AI can assist in locating probable sources of illness outbreaks and monitoring their spread by analysing this wide-ranging data.
- Early Detection: Predictive models can be created using AI to find probable illness outbreaks before they spread widely. AI can identify early warning signals and inform public health officials by analysing real-time data from diverse sources, including hospital records, emergency room visits, and disease surveillance systems.

- Recognition of Patterns: AI algorithms are capable of identifying patterns in infection data, such the geographic spread of infections, the development of symptoms, or the effects of therapies. Understanding how illnesses spread and how to successfully deal with outbreaks can be helped by this information.
- Vaccine Development: By analysing enormous volumes of biomedical data, such as genomic details, protein structures, and clinical trial outcomes, AI helps quicken the process of vaccine development. Machine learning algorithms can aid in the selection of possible vaccination candidates, the estimation of their efficacy, and the design optimisation of vaccines.
- Contact tracking: By analysing data from numerous sources, including mobile phone records, GPS data, and public transit logs, AI can improve contact tracking attempts. AI can assist public health officials in more efficiently tracing and controlling the spread of illnesses by identifying those who may have had in contact with an infected person.
- Resource Allocation: By examining data on hospital capacity, medical supply inventories, and population patterns during outbreaks, AI can help to optimize resource allocation. AI can assist authorities in allocating resources by forecasting the demand for healthcare resources.
- Raising Public Awareness: Chatbots and virtual assistants powered by AI can deliver accurate and current information on infections, including symptoms, preventative measures, and treatment options. To offer relevant and easily available information to the general public, these AI systems can be integrated into websites, social media platforms, and mobile applications.

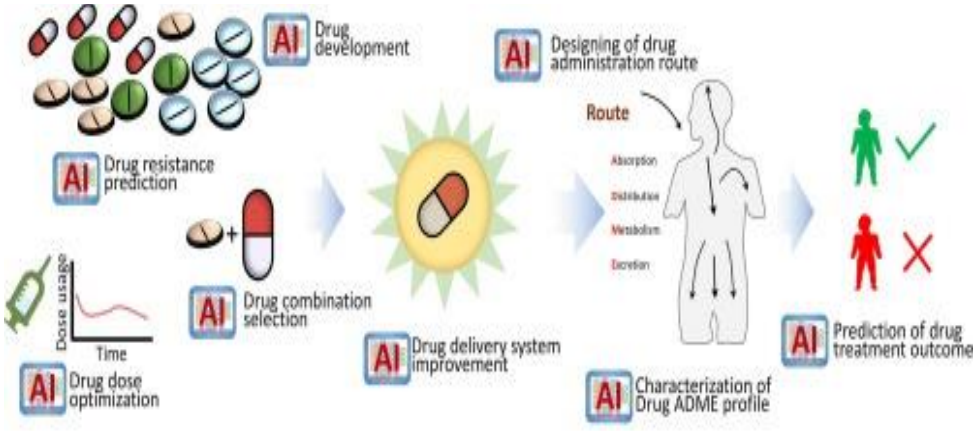

Fig. 4. AI and machine learning assisted drug delivery for effective treatment of infectious diseases [24].

4. DEVELOPING VACCINES AND TREATMENTS WITH THE HELP OF AI

Artificial intelligence (AI) can development of vaccines and treatments for different diseases. Here are some ways AI can assist in this process:

- Drug Discovery: By analysing enormous volumes of biomedical data, such as genomic information, protein structures, and chemical properties, AI helps speed up the drug discovery process. The search space for experimental testing can be trimmed down using machine learning algorithms, which can also identify prospective drug candidates and forecast their efficacy and safety profiles. AI can also help with virtual compound screening to find the ones that have the best chance of being effective against particular targets among enormous libraries of compounds [25].
- Repurposing Existing Drugs: AI algorithms may examine vast databases of currently available medications and their known side effects to find candidates for prospective repurposing. AI can assist in identifying licenced medications that may have potential therapeutic benefits for new indications by looking at drug-target interactions and taking into account the commonalities between various disorders. Compared to creating completely novel medications, this method can drastically shorten the development process and save expenses.
- Clinical Trial Design: Using historical data from earlier trials, patient records, and other pertinent sources, AI can optimise the design of clinical trials. AI can assist in designing more successful and efficient trials by taking into account a variety of variables, including patient profiles, treatment regimens, and trial outcomes. This can improve patient selection, shorten trial times, and raise the likelihood of successful therapy discovery.
- Personalised Medicine: By examining specific patient data, including as genetic data, medical history, and lifestyle factors, AI can help in the development of personalised treatment techniques. In order to forecast how patients would likely respond to particular therapies, machine learning algorithms can find patterns and connections. This makes it

possible to create individualized treatment programmers and identify patients who will most likely benefit from particular medicines.

- Prediction of Side Effects: AI algorithms can examine vast datasets of patient records, clinical trial data, and adverse event reports to spot trends and anticipate possible drug side effects. This can aid in evaluating the safety profiles of medications and optimising treatment schedules to reduce negative effects.
- Real-time Monitoring: AI can monitor patient health and treatment outcomes by analysing real-time data from wearable technology, electronic health records, and other sources. AI can detect early indications of therapeutic response or unfavorable outcomes by continuously analysing this data, enabling prompt interventions and alterations to treatment plans.

5. ROBOTICS AND AUTOMATION IN DANGEROUS ENVIRONMENTS

Automation and robotics are essential for increasing efficiency and safety in hazardous areas. We can save lives and increase productivity by using robots and automated systems in dangerous situations. Here are some significant uses of automation and robotics in hazardous situations:

- Industrial Manufacturing: Automation has completely changed how products are made, notably in sectors like chemical, automotive, and aerospace manufacturing. Robots are used to carry out repetitive operations, work in poisonous or high-temperature conditions, and handle hazardous products, lowering the chance of accidents and exposure to harmful substances [26].
- Robots are frequently utilised at nuclear power facilities for decommissioning, inspection, and maintenance tasks. They can enter restricted spaces or areas with high radiation levels, reducing the amount of radioactive material that people are exposed to. These robots carry out tasks like radiation measurements, reactor checks, and handling hazardous garbage [27].
- Robots assist in search and rescue operations in disaster-stricken areas where human presence could be dangerous. Without endangering human rescue crews, drones with cameras and sensors can find survivors, evaluate structural damage, and gather vital information. Remotely operated vehicles (ROVs) are also useful for underwater search and rescue missions [28].
- Mining Industry: There are many risks associated with mining activities, such as unstable tunnels, toxic fumes, and falling rocks. For a variety of jobs, including excavation, material handling, and mine mapping, robots can be used. Real-time data on mining conditions is provided by autonomous vehicles and drones with sensors, enabling safer and more effective operations [29].
- Oil and Gas Exploration: Inspections, maintenance, and repairs are carried out by robotic systems in oil refineries and offshore drilling platforms. These robots can manoeuvre intricate pipes, tanks, and other risky environments, minimising the need for employees to be exposed to sweltering heat, harmful chemicals, or precarious heights [30].
- Disposal of Hazardous Materials: The handling and disposal of hazardous materials makes substantial use of automation and robotics. To manage chemical spills, radioactive waste, or explosive materials, specialised robots are created. To protect human workers from potential danger, they can perform duties including containment, decontamination, and the removal of hazardous materials [31].
- Firefighting: To help firefighters put out flames in hot, toxic conditions, firefighting robots are being created. These robots reduce the risk to firefighters by entering burning buildings, moving through smoke-filled spaces, and performing functions including water spraying, gas detection, and victim identification [32][33].

6. AWARENESS AND EDUCATION BY AI

The use of artificial intelligence (AI) can greatly help spread knowledge and educate people about a variety of topics. Here are some examples of how AI can be used to raise awareness and provide education:

- Personalized Learning: In order to offer personalised learning experiences, AI systems can examine individual learning patterns, preferences, and strengths. AI can improve educational outcomes and engagement by customising the pace, substance, and style of instruction to each learner.
- Intelligent tutoring systems: These tools can offer pupils individualised instruction, criticism, and support. By helping students understand challenging ideas and perform better, these systems can pinpoint the areas in which they are having difficulty and provide focused assistance.

- Language acquisition: AI can help with language acquisition by offering interactive language activities, automated language assessment, and feedback on pronunciation. Applications for language learning that use AI can simulate conversations, correct grammar, and offer word ideas, allowing learners to practise and improve their language abilities.
- Virtual reality (VR) and augmented reality (AR) technology: By combining AI with VR and AR technologies, immersive educational experiences can be produced. In order to better comprehend and retain difficult concepts, students can explore historical landmarks, travel to far-off places, or take part in interactive simulations.
- Natural Language Processing (NLP): NLP is a technique that allows AI systems to comprehend and process human language. The availability and accessibility of educational resources can be improved by chatbots and virtual assistants with NLP skills that can deliver information, respond to inquiries, and give advice on a variety of subjects.
- Promoting Awareness and Social Causes: AI can be used to spread knowledge about social issues like public health, human rights, and climate change. Data analysis, social media algorithms, and chatbots with AI capabilities can all facilitate the spread of knowledge, conversation, and support for vital causes.
- Content Recommendation: AI algorithms can examine user behaviour and preferences to make tailored recommendations for educational content. This function aids students in learning more, broadening their knowledge, and pursuing new interests.
- Accessibility and Inclusivity: By giving people with disabilities access to tools, AI technology can enhance accessibility. For instance, educational films and lectures can be accessible to those with hearing problems thanks to systems powered by AI that provide captioning and transcription.

7. CONCLUSIONS

Due to its ability to detect and track cases, regardless of how widely a virus has spread, artificial intelligence is the science that is being utilized to lessen the growing workload of healthcare professionals. This science offers healthcare workers the chance to receive training in a multidisciplinary manner and supports their decision-making. Additionally, it can be used to resolve potential emergencies by determining the number of healthcare personnel and the number of beds required by assessing areas with high infection rates. Future epidemic prevention efforts are anticipated to depend heavily on artificial intelligence techniques, which will also make it possible to adopt laws that limit social and economic harm and promote health care. Ultimately, more research will be conducted on the application of artificial intelligence in the fight against corona virus.

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Conflicts of Interest

The author's disclosure statement confirms the absence of any conflicts of interest.

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