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Application of Artificial Intelligence to Address Issues Related to the COVID-19 Virus

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Abstract
Artificial intelligence (AI) plays a major role in addressing novel coronavirus 2019 (COVID-19)-related issues and is also used in computer-aided synthesis planning (CASP). AI, including machine learning, is used by artificial neural networks such as deep neural networks and recurrent networks. AI has been used in activity predictions like physicochemical properties. Machine learning in de novo design explores the generation of fruitful, biologically active molecules toward expected or finished products. Several examples establish the strength of machine learning or AI in this field. AI techniques can significantly improve treatment consistency and decision making by developing useful algorithms. AI is helpful not only in the treatment of COVID-19-infected patients but also for their proper health monitoring. It can track the crisis of COVID-19 at different scales, such as medical, molecular, and epidemiological applications. It is also helpful to facilitate the research on this virus by analyzing the available data. AI can help in developing proper treatment regimens, prevention strategies, and drug and vaccine development. Combination with synthesis planning and ease of synthesis are feasible, and more and more automated drug discovery by computers is expected in the near future to eradicate the COVID-19 virus.

Keywords
COVID-19, artificial intelligence, virus, machine learning, applications

Introduction
Amid the worldwide health crisis, the medical discipline is looking for new technologies to monitor and control the spread of the novel coronavirus 2019 (COVID-19) pandemic infection. Artificial intelligence (AI) is one such technology that can easily track the spread of this virus; it identifies the high-risk patients and is useful in controlling this infection in real time. It can also predict the mortality risk by adequately analyzing the previous data of the patients. AI can help us to fight this virus via patient screening, medical checkups and help, notifications, and suggestions about infection control.1-3 This technology has the potential to improve the planning, treatment, and reported outcomes of the COVID-19 patient, being an evidence-based medical tool. Figure 1 shows the general procedure of AI-based applications that help medical practitioners identify COVID-19 symptoms.

Figure 1 summarizes the testing, screening, and monitoring of suspected cases, which lead to minimizing virus infection, by AI, including machine learning–based treatment.4-6 There are significant steps of treatment that include high accuracy and reduce the complexity and time taken when using an AI method. Medical and paramedical professionals are not only focused on treatment of the patient but also involved in the control of disease with applications of AI.

These test analyses were done based on the major symptoms that occurred or were observed by machine learning techniques, which have the highest-accuracy prediction and minimize the long time previously taken during the whole process, making these techniques more usable in the future.7,8

Major Applications of Artificial Intelligence in COVID-19 Pandemic Conditions

Actual and Potential Contributions of Artificial Intelligence against COVID-19

AI can contribute to the fight against COVID-19 in six areas: (1) early warnings and alerts, (2) tracking and prediction, (3) data dashboards, (4) diagnosis and prognosis, (5) treatments and cures, and (6) social control.

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Early Warnings and Alerts. AI can quickly analyze irregular symptoms and other “red flags,” and thus alarm the patients and healthcare authorities, and provide solutions to be followed in COVID-19 pandemic cases. AI can help analyze the level of infection of this virus by identifying clusters and hotspots, and can successfully do the contact tracing of the individuals and also monitor them. It can predict the future course of this disease and its likely reappearance.

Data Dashboards (Disease Surveillance). With an infectious disease like COVID-19, AI surveillance is crucial. Human activity—especially migration—has been responsible for the spread of the virus around the world. Canada-based Blue Dot has leveraged machine learning and natural language processing to track, recognize, and report the spread of the virus quicker than the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC). In the near and distant future, technology like this may be used to predict zoonotic infection risk to humans, considering variables such as climate change and human activity. The combined analysis of personal, clinical, travel, and social data, including family history and lifestyle habits, obtained from sources like social media would enable more accurate and precise predictions of individual risk profiles and healthcare results. While concerns may exist about the potential infringement to civil liberties of individuals, policy regulations that other AI applications have faced will ensure that this technology is used responsibly.

Diagnosis and Prognosis. AI technology can track and forecast the nature of the virus from the available data, social media, and media platforms, concerning the risks of infection and its likely spread. Furthermore, it can predict the number of positive cases and deaths in any region. AI can help identify the most vulnerable regions, people, and countries and take measures accordingly. AI can help identify the most vulnerable regions, people, and countries and take measures accordingly. AI is used for drug research by analyzing the available data on COVID-19. It is useful for drug delivery design and development. This technology is used for speeding up drug testing in real time, because standard testing takes plenty of time, and hence AI helps to accelerate this process significantly, which may not be possible by a human. AI techniques are also used to identify effective drugs for the treatment of COVID-19 patients, and AI has become a powerful diagnostic test tool to control and prevent viral diseases, including COVID-19. AI techniques have application in developing vaccines for emerging diseases, and their treatments have faster rates than existing techniques and are also used in clinical trials during vaccine development. The various applications of AI in clinical trials at different stages of COVID-19 are given in Figure 2.

| Early Warnings and Alerts | Data Dashboards (Disease Surveillance) | Diagnosis and Prognosis |
|---------------------------|---------------------------------------|-------------------------|
| AI can quickly analyze irregular symptoms and other “red flags,” and thus alarm the patients and healthcare authorities, and provide solutions to be followed in COVID-19 pandemic cases. | With an infectious disease like COVID-19, AI surveillance is crucial. Human activity—especially migration—has been responsible for the spread of the virus around the world. | AI technology can track and forecast the nature of the virus from the available data, social media, and media platforms, concerning the risks of infection and its likely spread. Furthermore, it can predict the number of positive cases and deaths in any region. AI can help identify the most vulnerable regions, people, and countries and take measures accordingly. |

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**Figure 1.** General procedure of artificial intelligence (AI)-based applications to identify novel coronavirus 2019 (COVID-19) symptoms.
Due to a sudden and massive increase in the number of patients during the COVID-19 pandemic, healthcare professionals have a very huge workload. Here, AI is used to reduce the workload of healthcare workers.\textsuperscript{14,15} It helps in early diagnosis and early-stage treatment provision by using digital approaches and decision science, and it offers the best training to students and doctors regarding this new disease. AI can affect future patient care and address more potential challenges, which reduces the workload of medical practitioners.

**Treatments and Cures.** With the help of real-time data analysis, AI can provide updated information that is helpful in the prevention of this disease. It can be used to predict the probable sites of infection, the influx of the virus, and the need for beds and healthcare professionals during this crisis. AI is helpful for future virus and disease prevention, with the help of previous mentored data over data prevalent at different times. It can identify the traits, causes, and reasons for the spread of infection. In the future, this will become an important technology for fighting against other epidemics and pandemics. It can provide preventive measures and fight against many other diseases. In the future, AI will play a vital role in providing more predictive and preventive healthcare.\textsuperscript{16}

**Social Control.** Before the world was even aware of the threat posed by COVID-19, AI systems had detected the outbreak of an unknown type of pneumonia in people from China.\textsuperscript{17} Because the outbreak has now become a global pandemic, AI tools and technologies can be used to support the efforts of policy makers in the medical community and society to manage every stage of the crisis and its aftermath.\textsuperscript{18}

**Conclusion**

Artificial intelligence is an up-and-coming, useful tool to identify early infections due to coronavirus, and it also helps in monitoring the condition of infected patients. It can significantly improve treatment consistency and decision making by developing useful algorithms. AI is helpful not only in the treatment of COVID-19-infected patients but also for their proper health monitoring. It can track the crisis of COVID-19 at different scales, such as medical, molecular, and epidemiological applications. It is also helpful for facilitating and analyzing the research on viral diseases (e.g., COVID-19) using available data. AI can help in developing proper treatment regimens, prevention strategies, and drug and vaccine development.

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