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Artificial intelligence-based solutions for COVID-19

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1. Introduction

The new coronavirus disease 2019 (COVID-19) virus has spread out to infect 3,000,000 people from its epicenter in China, causing at least 206,133 deaths over 3 months, between January 2020 and April 2020, in at least 210 countries. The World Health Organization (WHO) reports on the situation on 26 April indicate these figures. The tragic death loss caused by the virus is also accompanied by the impact of the pandemic on the global economy. The lockup measures imposed by several governments have lowered global economic activity, with the Organisation for Economic Co-operation and Development (OECD) stating that the world economy can be affected by its worst growth rate since 2009. Because of the economic downsizing, economic activity has slowed worldwide. The OECD has warned that the growth rate could be as slow as 2.4%, which could lead to recession in many countries. Over a short period, COVID-19 has emerged as one of the world's most significant challenges [1]. The gray areas surrounding the virus itself are additionally complicating in terms of its propagation and treatment to respond to this challenge (Fig. 9.1).

The coronavirus outbreak in 2019 (COVID-19) created a challenge for public health that has a significant effect on our way of thinking regarding our climate and life. The world's worst-case scenario of infectious diseases is a worldwide outbreak. Outbreaks such as influenza, Spanish flu, extreme acute respiratory syndrome, and H1N1 (swine flu) have occurred significantly in the past. COVID-19 is a zoonotic illness that originated in the Wuhan Province of China and spread like flames killing citizens and crippling the world's economy. This virus strain is still under extensive surveillance. The towns were shut down, air travel was prohibited, ships were quarantined, and citizens who had suffered from illness were removed from China [2].

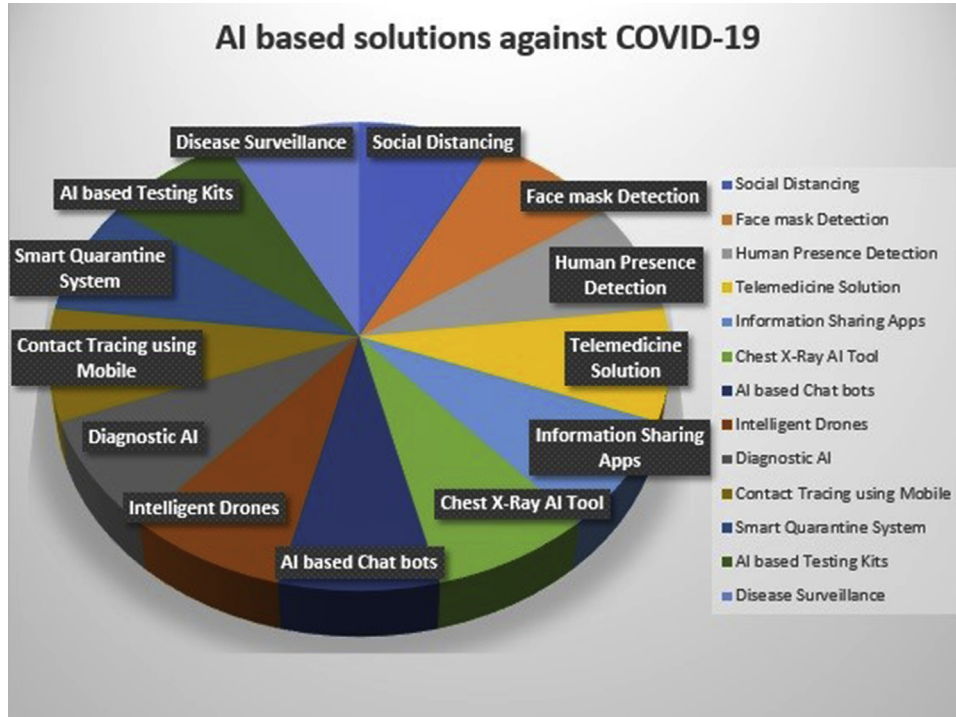


FIGURE 9.1 Artificial intelligence (AI)-based solutions against coronavirus disease 2019 (COVID-19).

In Wuhan, China, at the end of December 2019, the novel coronavirus (COVID-19) spread quickly across the globe. Novel coronavirus influences many facets of society in all sectors. The COVID-19 crisis shocked the world and is impacting our economies, industries, communities, and livelihoods with a devastating, unpredictable, and extremely severe recession and employment losses [3]. When policymakers adapt significantly to the COVID-19 crisis, companies quickly react to evolving expectations of their workers, customers, and suppliers and overcome financial and operational difficulties. If any industry, function, and geography are impacted, the number of potential improvements to be tackled may be daunting. A new global virus could have redirected our interactions with the nation, the environment outside, and even with each other for months to come. Such experts are unsure or worrying regarding any improvements in the coming months or years: are nations still closed? What's the state of restaurants? Newer and more complex forms of technology, smaller pieces, a new passion for the environment, and other pleasures of life are also introduced in periods of conflict [4]. No one understands precisely what is going on, and this is our best guide on how society, schooling, economy, and our preferences are evolving [5,6]. This chapter presents professional prospects in conjunction with specific steps through which business can make positive progress with enormous uncertainty. The COVID-19 pandemic not only remains to be a safety and humanitarian issue but also has significant business consequences. If politicians respond to COVID-19 drastically, businesses must quickly adjust

to the changing demands and threats that their employees, customers, and sellers face. When any field, function, and geography are compromised, the number of potential changes can be daunting [7].

We are surrounded by the unpredictable, unsure, and all kinds of decisions that ultimately leave a mark on things in the short to long term. Application solutions companies have two obligations that are similarly important in each situation: resolving and mitigating the immediate issue. A quite good case is the COVID-19 pandemic. The planet is now saving lives and improving how we adapt globally to outbreaks. The first is faster, but the second has significant long-term consequences. We have started exploring and reviving this idea mostly because of our experiences.

The data collection expands rapidly as work information surface, beyond the capacity even for the human intellect to tackle. Artificial intelligence (AI) is capable of identifying significant data patterns, and this chapter clarifies how this crisis has become a social race card. The use of case-study China has demonstrated its usefulness and justifies the financial investment of technologic development in the recent years. China's success with AI is an instrument for crisis management. Advances in it, such as natural language processing, voice recognition, interpretation, computer learning, and profound preparation, are used not only for diagnosing but also for the production of touch monitoring or the discovery of vaccines, for example, chatbots and facial detection [8]. AI has undoubtedly helped in the prevention and control of the COVID-19 pandemic [9].

We found that AI did not yet influence COVID-19. The lack of data and too many distracting, outer data hamper the usage of AI. Thoroughly combined data protection with public safety issues with tighter communications between humans and AI would be required to resolve these restrictions. They are impossible to be dealt with in due course with the latest pandemic. AI might “support the next pandemic” instead. Meanwhile, it would be necessary to collect diagnostic details on those who are contaminated to save lives and to restrict containment economic devastation [10].

1.1 Present and future COVID-19 contributions by artificial intelligence

AI will contribute to combat COVID-19 in six areas:

- 1.1.1 alerts and early warnings,
- 1.1.2 tracking and prediction,
- 1.1.3 dashboards with info,
- 1.1.4 diagnosis and prognosis,
- 1.1.5 medication and cures,
- 1.1.6 social distancing.

1.1.1 Alerts and early signs

BlueDot has already become legendary for Canada's AI model. It reveals that a reasonably low cost AI device will detect human outbreaks of infectious diseases.

According to news, at the end of 2019, BlueDot [11] forecasted the epidemic, warning the customers on December 31, 2019, before January 9, 2020, that is, before that of the WHO. Researchers operating with BlueDot have released a news article on January 14, 2020, in the *Journal of Travel Medicine*, which identified the top 20 destination towns for Wuhan passangers. The article alerted that these cities could be at the frontline of the disease's global spread. BlueDot is a useful device, but much of its marketing includes a specific distortion and underestimation of the position of human scientists. While the AI-based model was just 30 min quicker, the epidemic still had minimal value. Primarily, social understanding and meaning are needed to understand the danger. The best possible use of AI includes personal feedback from multiple disciplines.

1.1.2 Tracking and prediction

AI can be used to track and forecast the distribution of COVID-19 over time and space. For example, a dynamic neural network has been developed to prevent its spread after a previous pandemic, Zika virus [8], in 2015. However, models such as these need to be retrained using COVID-19 info. This now seems to exist. Algorithms learned to predict seasonal flu at the Carnegie Mellon University are now being retrained on new COVID-19 results [12]. The monitoring and estimation of COVID-19 spread are valuable data sources for preparing for, organizing, and handling the pandemic for public health authorities. They help evaluate the position and effectiveness in raising the epidemiologic curve. They can also offer clear considerations of the possible effect of behavior to minimize or delay the spread. The Robert Koch Foundation, for instance, estimated that by March 28, 2020, the number of infections would exceed 10,922 in the Netherlands. The estimated amount of contaminated patients in the Netherlands was smaller than expected by 8647, according to the Center for Systems Science and Engineering (CSSE) of the John's Hopkins University (JHU), at this stage. This may strengthen the argument that the strategy of the government helps reduce infection development.

1.1.3 Dashboards with info

COVID-19 has been monitored and anticipated, and a database industry that visualizes the pandemic has arisen. The MIT Technology Review has established a rating of such dashboards. They listed UpCode, NextStrain, JHU CSSE, Thebaselab, the BBC, the New York Times, and Health Map among the central panels. Microsoft Bing's AI app is one among some impressive dashboards (Fig. 9.2).

While these dashboards have a global view, more and more countries now have their dashboards. Tableau also built a COVID-19 Data Center with a COVID-19 Starter Workbook to help generate data visualizations and dashboards for the pandemic. Tirthajyoti Sarkar released a Python script to demonstrate how data can be derived from the COVID 19 dataset in the New York Times to build data views on how the infection progresses [13].

1.1.4 Diagnosis and prognosis

Quick and reliable COVID-19 diagnosis will save lives, reduce disease transmission, and produce data for training AI models. In this regard, AI can provide valuable feedback,

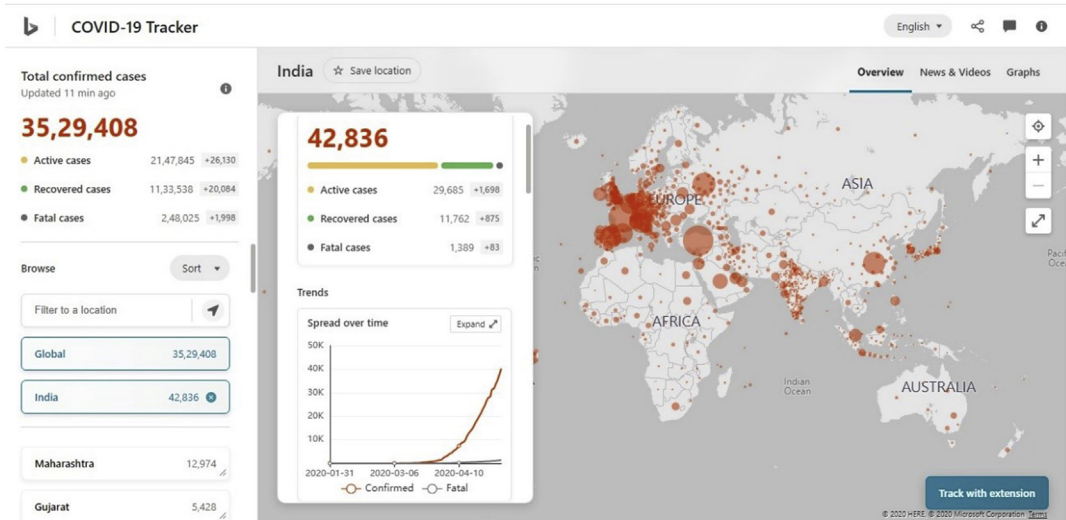


FIGURE 9.2 Screenshot of Bing's coronavirus disease 2019 (COVID-19) tracker, May 5, 2020.

particularly with a medical diagnosis centered on the picture. Studies have shown that AIs can be as accurate as humans, save radiologists' time, and can help conduct a diagnostic quicker and cheaper than with the traditional COVID-19 studies, according to the latest survey by the UN Global Pulse researchers on AI applications for COVID-19 [1]. The scans will be used with both X-rays and computed tomographic (CT) scans. Researchers from China's Huazhong Science and Technology University have used machine learning (ML) as a prediction algorithm to estimate the likelihood of a survivor. Application of AI for COVID-19 treatment and prognosis for patients has stimulated a lot of research but has not been widely implemented yet.

1.1.5 Medication and cures

AI is recognized for its ability to lead to the latest product development even long before the COVID-19 epidemic [14]. A variety of testing laboratories and data centers have announced in the case of COVID-19 that they are hiring AI to try medication and COVID-19 vaccines. The idea is that AI will speed up both the development phases of developing and repurposing medicines. Google's DeepMind, for example, predicted the arrangement of viral information proteins that could be useful in new drug production. However, as DeepMind points out in its website, "we stress that such assumptions of the system have not been experimentally verified, we can not be confident about the exact framework we have." Researchers from South Korea and the United States have published results using ML to identify an existing drug, atazanavir, which could potentially be repurposed to treat COVID-19 [15]. Such medications (and maybe cures) are not expected to be possible early, at least to be successful during the present pandemic. After such medicines have now been detected and tested, safety and science tests, traces, and measures that need to be carried out before such drugs have been approved can take up to 18 months for a vaccine, as predicted.

1.1.6 *Social distancing*

AI is and should be used to handle the pandemic by monitoring public environments and enforcing psychological distancing and lockup interventions for remotely infectious individuals [16]. Infrared cameras are used for tracking crowds for extreme temperatures, for example, at airports and rail stations around China. Often they are used in a facial recognition device, which may decide if the individual is wearing an operating mask at high temperatures. To test whether residents in the British town of Oxford are following the internal distancing steps of the government, an AI-based camera device has been used to search public places. The US computer-based start-up already provides software for 'social distance detection' which uses camera images to detect when social distance standards are infringed and then sends a signal. For more severe cases, computer surveillance by the defense forces is authorized by the Israeli government for detecting and quarantining individuals who may be compromised.

AI will help us battle this epidemic in areas of patient monitoring, medical support, warning, and advice on outbreak control. This system can enhance preparation, diagnosis, and recorded outcomes. The patient COVID-19 is a diagnostic device focused on proof [17]. Since the beginning of 2020, the coronavirus disease has spread rapidly across the globe. A deep learning model that reliably identifies COVID-19 and differentiates it from community-acquired pneumonia and other lung diseases is beneficial to establish automated, precise identification of COVID-19 utilizing chest CT [18]. This paper provides fresh insight into how AI and big data enhance COVID-19. It also contributes to more work to avoid the COVID-19 epidemic [19]. The proposed models are used to detect mild, easy-to-deteriorate patients in severe/critical cases to obtain timely treatments while minimizing medical resource limitations [20].

They are recommended for low-cost diagnosis of COVID-19 and other emerging infectious diseases with AI-coupled self-testing and tracking systems. In particular, in places with limited links to laboratory facilities, timely adoption and the effective operation of the proposed program can minimize COVID-19 transmission and related mortalities [21]. The CT 64 images diagnostic method was built for the diagnosis of COVID-19 and other specific lung infectious diseases. The CT image classification was based on AI. According to studies, the consistency, responsiveness, and specificities of the AI system were documented. COVID-19 recognition performance and other common lung diseases that have equivalent sensitivity and specificity [22]. The symptoms include free text input in 36 languages, complemented by illness-relevant monitoring queries. Such findings and usability combine to render Symptoma a possible big weapon to tackle COVID-19 worldwide [23]. The deep learning system automatically centered, without human help, on irregular areas that exhibited compatible features with recorded radiologic findings. Deep learning is a handy tool to quickly screen COVID-19 and to find potential high-risk patients and can help improve medical resources and prevent them from experiencing severe symptoms [24]. Moreover, all lesion areas for faster inspection have been automatically identified by the program. As of today, the system was deployed

in 16 hospitals and over 1300 tests are performed per day [25]. For the early identification of S-COVID-19-P, the ML algorithm was used to develop a diagnostic aid model with no CT images, and diagnostic performance was better than lymphopenia, higher C-reactive protein levels, and higher interleukin 6 levels upon admission. Also, the new diagnosis model help, which would provide the right balance between standard medical principles and limited medical resources, discussed the optimized triage strategy in fever clinics to identify S-COVID-19-P at an early date [26].

In order to tackle the sequential decision-making issue, a refinement learning system, the AI, has been developed to extract implicit information from a quantity of patient data that exceeds the human clinicians' several life-length experience [27]. They have examined recent developments in biomedical application of AI, including diagnosis of diseases and prediction, living support, biomedical information, and biomedical research [28]. The purpose of this chapter is to understand COVID-19 outbreak by using a model of graph theory. The universal problems of the world were consistently solved in applying different aspects of mathematics. The COVID-19 mathematical modeling has given principles of graph theory. Methods to control the spread of certain pandemics have also been suggested [29]. The chapter gives a summary of AI and the big data and then describes the proposals for the battle against COVID-19. Furthermore, the chapter outlines the problems and the issues linked to the state-of-the-art solutions [30].

A new conceptual architecture that integrates the COVID-19 blockchain and AI is introduced. The key solutions that blockchain and AI can deliver to fight the COVID-19 outbreak were particularly highlighted, and recent research efforts on the use of blockchain and AI in various applications in the COVID-19 struggle [31]. Presentation of COVID-19 etiology discovered by AI is on the basis of the precise COVID-19 disease model, which was constructed within a period of 5 weeks and is in best accordance with the epidemiologic character, dynamics of transmission, medical features, and biologics of COVID-19 [32]. An early assessment of AI against COVID-19 is provided in this chapter. The key areas in which AI is able to contribute to the war against COVID-19 are discussed. These areas will possibly not be dealt with in good time during this pandemic. Meanwhile, comprehensive diagnostic knowledge about who is contagious would be important to save lives, train AI, and minimize financial harm [33]. The AI program also enhanced the identification of COVID-19 patients with RT-PCR scans, which correctly detected 17 out of 25 (68%) patients and all patients were marked as COVID-19 negatives. The proposed AI system can help quickly diagnose COVID-19 patients if CT tests and associated clinical history are available [34].

This chapter is designed in the following manner: [Section 1](#) describes the Present and future of COVID-19, [Section 2](#) describes the Technologic solutions to help combat the COVID-19 outbreak, [Section 3](#) specifies the limitations of technical solutions in a short time of this epidemic and the future scope. Finally, the conclusion is also presented in [Section 3](#).

2. Technologic solutions to help combat the COVID-19 outbreak

Countries worldwide operate to contain and reduce infection. Businesses are using technology that maintains consistency and ready businesses for the modern standard by digitally transforming them. It provides policy and technical support programs and facilities.

2.1 Disease surveillance using artificial intelligence

Monitoring is essential for infectious disorders such as COVID-19. The spread of the virus worldwide was due to human activities, particularly migration. BlueDot is a Canada-based company that has leveraged ML and natural language processing to monitor, accept, and disclose the virus spread more rapidly than the WHO and the US Core (Fig. 9.3).

Technologies like this will be used in the immediate term to forecast the likelihood of zoonotic diseases for humans and take account of factors such as climate change and human activities. Combining medical, scientific, traveling, and social details, including family background and living patterns, will make it possible to forecast the patient risk profiles and health results with accuracy and specificity. While there might be questions about the potential breaches of people's civil liberties, the regulatory laws facing many AI systems ensure that such technology is used responsibly.

2.2 Artificial intelligence-based CHATBOT and robot advisory services

The increase of COVID-19 incidents has shown the vast ability of healthcare and response programs. AI can build a multilingual interactive healthcare provider to respond to COVID-19 queries, offer reliable information and specific guidance, to prescribe protective measures, to track and manage symptoms, and to advise people whether they need medical treatment or home self-isolation.

Fortunately, AI-powered chatbots are the next development in Chatbot technology to solve this issue (Fig. 9.4). AI-driven chatbots should be able to grasp the intent behind consumer requests, take note of the entire context of the interaction as it communicates with each consumer, and react to queries spontaneously and humanely through ML and natural language processing.

2.3 Diagnostic artificial intelligence, facial recognition, and fever detector artificial intelligence

Action steps like quarantine can be implemented soon to avoid further spread of the infection. The relative lack of professional experience needed to assess medical observations because of the number of cases is an impediment to fast diagnosis. Throughout the COVID-19 crisis, AI increased diagnosis time by technology such as the one built by

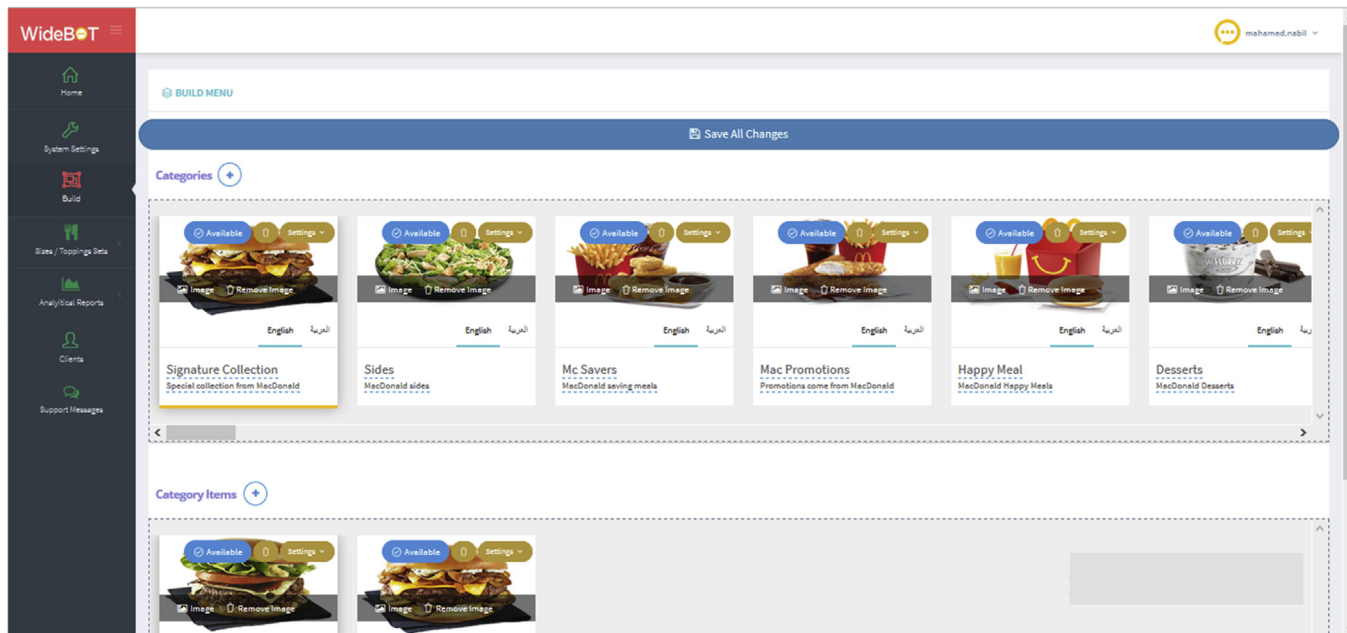


FIGURE 9.3 WideBot platform.

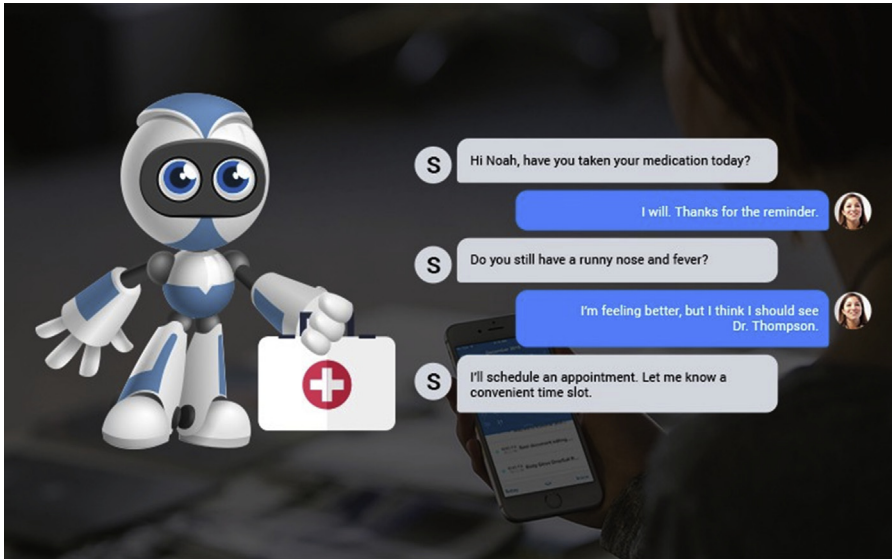


FIGURE 9.4 Artificial intelligence-based CHATBOT.

LinkingMed, an oncology data portal headquartered throughout Beijing, and medical data analyst. Pneumonia, a common complication of infection due to COVID-19, can now be diagnosed with an accuracy of 92% and 97% of the test data in less than 60 s by analyzing a CT scan. The open-source AI model was made possible by not only examining CT images and defining lesions but also quantifying them by numbers, volumes, and proportions. The Paddle, Baidu's open-source, deep learning platform was the driving force of this new initiative in China.

Thermal cameras are used to identify people with fever (Fig. 9.5). The downside to the system is the need for a human operator. Now cameras have been introduced in airports,



FIGURE 9.5 Facial recognition and fever detector.

schools, nursing homes, etc. with multisensor AI technology. The technology senses people with fever and tracks their movements automatically, recognizes their faces, and decides if the person has a face mask.

2.4 Intelligent drones and robots

Due to the strict social distance measures needed to monitor the spread of the virus, public use of drones and robots has been speeded. In order to ensure compliance, some drones aim to identify individuals with no face masks, while others are used to relay information and to clean public areas to wider audience (Fig. 9.6).

By using their drones, MicroMultiCopter, a technology company based in Shenzhen, has reduced the possibility of transmission of viruses in cities by transporting medical samples and quarantine materials. Patient care has gained even as robots are used for the delivery of foods and drugs, without any risk to health staff. Robots have also filled the role of room cleaning and sterilization of isolation wards. The Pudu Technology Catering Center has expanded its scope to the health sector by deploying its robots for these purposes in more than 40 hospitals.



FIGURE 9.6 Intelligent drones and robots.

2.5 Curative research artificial intelligence and information verification artificial intelligence

The lack of a definitive cure for the virus was part of the trouble for the medical community. As businesses like the British company Exscientia have demonstrated, AI can be a game-changer. Became first as AI-designed drug molecule to be used for clinical trials earlier this year. Following the 5-year average time, the algorithm establishes the molecular structure in conventional research techniques. In the same way, AI may be responsible for producing new coronavirus antibodies and vaccines, either wholly developed from scratch or repurposed drugs (Fig. 9.7). For example, Google's AI firm DeepMind uses its AlphaFold framework to construct structural models of proteins linked to a virus to help scientists understand the illness around the world. Although the findings have not been tested experimentally, it is a step in the right direction.

Pandemic confusion has eventually contributed to the propagation of misinformation across social media channels. Although no systematic assessment has been carried out to determine how much misinformation exists, the figure is significant. Technologic giants such as Google and Facebook battle the tide of deception, phishing, disinformation, and malware. A coronavirus/COVID-19 quest offers an alert sign with links to checked information sources. On the other hand, YouTube explicitly connects users to the WHO and related reputable organizations. Images that are wrongly scanned are taken when uploaded. Although the world is continuously searching for the results of COVID-19, the awareness, courage, and additional efforts of IT can be obtained from the initiatives mentioned earlier. The shining light in this tunnel provides the much-needed optimism the world needs in these turbulent times when the AI community partners with other solutions sectors. Although the world is continually striving for the effects of COVID-19, the knowledge, bravery, and additional efforts of IT can gain from the initiatives mentioned earlier.



FIGURE 9.7 Curative research for artificial intelligence-driven drug discovery.

2.6 Sales prioritization using artificial intelligence and matching demand and supply

AI drives sales and businesses planning struggle strategies and improving sales strategies. These models identify which customers are most likely to buy a company's product or service says at Babson College, Massachusetts. These models can help salespeople increase profitability and performance by demonstrating growing consumers are a priority. Brands already have an insight into what their consumers think and expect, but this awareness became much more critical because of the COVID-19 pandemic. Around the same moment, it becomes more challenging to gather evidence on what consumers say. When people sit at home, they have switched from physical experiences to alien encounters, where they have clear input. They are most inclined to bank online instead of visiting a bank, where they can speak with the cashier, and because you cannot eat out anymore, you can order delivery online. Throughout the entire field, the same trend is repeated. This change generates a lot of unstructured digital data that is challenging to grasp. This is when AI will remove the clutter to figure out what users like and need.

Companies are keen to balance demand and supply, and this situation will be profoundly crucial. A significant steel corporation has details about the various factors that may affect steel production, such as car production. The measurements of demand depend on external data to suit their supply chains. For companies to manufacture only consumer goods, they must satisfy the requirement and not leave it unfulfilled. AI solutions can process this data. Cognitive supply chains will feel the consequences and trade-offs in real-time, which can thus contribute to strategic differentiation at the next level. Smart inventory management systems are sophisticated and so are the entirely digitized supply lines and inventory management systems that are still on the field by themselves. The anticipatory shipping technology from Amazon, which estimates and effectively rotates the demand for goods in different areas, remains a typical example.

2.7 Artificial intelligence-based fast-developed testing kit

In this method, rather than a person combining the products, the samples are inserted into a testing system (Fig. 9.8). In a robot arm, the solution is pipetted, and liquid is mixed at the same time during a range of tests. The processing of samples will be quicker than manual checks. The risk of human error or contamination is, therefore, reduced.

2.8 Smart quarantine information system and mobile phone technology data for contact tracing

Inbound passengers are put in quarantine, with signs of having traveled to or from a country at risk. Information is collected for the quarantine information system about inbound travelers from the Ministry of Foreign Affairs, airlines, and significant telecom firms (Fig. 9.9). To easily recognize and insulate the patient suspected of coronavirus infection or treat the infection, frontline health workers should have a full background of



FIGURE 9.8 Artificial intelligence-based fast-developed testing kit.

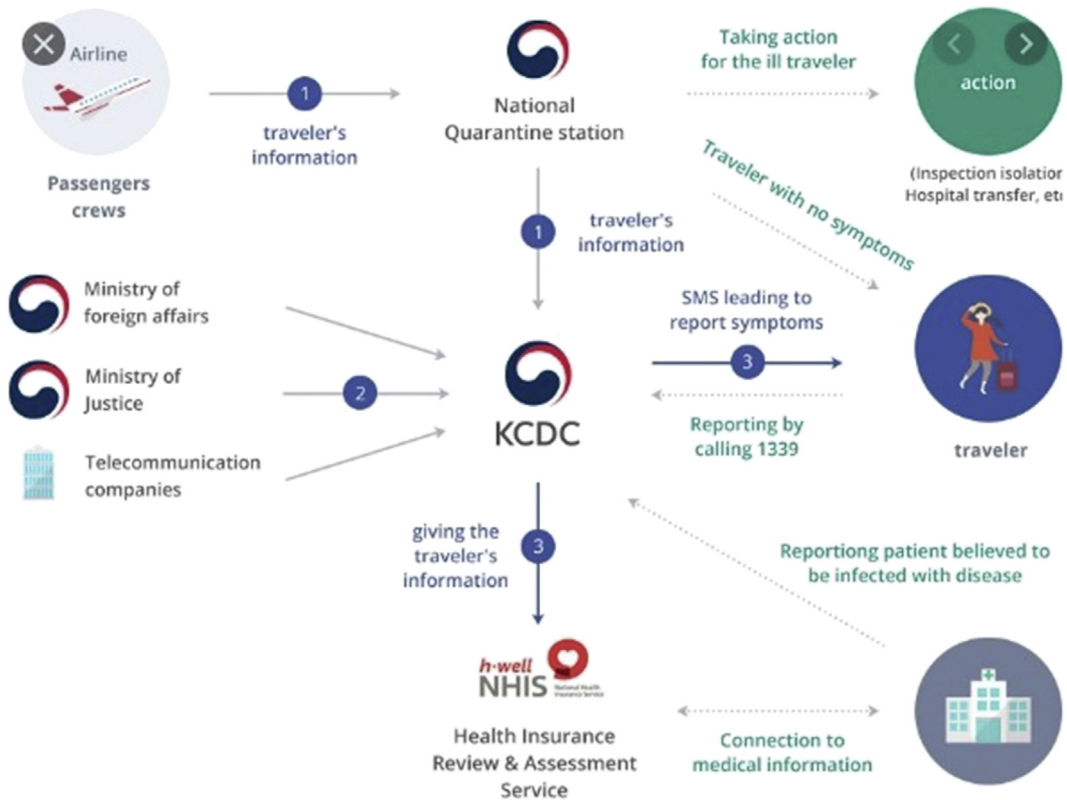


FIGURE 9.9 Smart quarantine information system.

the movement. Bound travelers must download a self-health test mobile app in their smartphones and provide health conditions during their incubation period of 14 days with this device. The app often collect texts and is directed by the cooperation of telecom providers to disclose signs of coronavirus infection that the person may have acquired during the quarantine.

Authorities will track and prove people who may recently have come into contact with an infected person with movements from cell phones, credit card transaction data, and CCTV footage. In some instances, detailed maps of infected individuals can be released, showing precise movements, allowing those who felt they might be in contact with an infected person to try checks.

2.9 Artificial intelligence for improving diagnosis efficiency and patient classification, and chest X-ray artificial intelligence image support decision tool

A new program was created to classify confirmed cases into four categories: mild, moderate, severe, and extremely serious. Separate care is provided to each group and required in another facility based on the seriousness of the situation. Different care is provided to each group and required in another facility based on the severity of the condition.

The chest X-ray software classifies intensive-care patients using X-ray images and can analyze the lung in just 3 s (Fig. 9.10). While a large number of studies have established a full AI-Hub for the disease diagnostics medical platform, JLK inspection uses the AI and big data technology of different imaging equipment.

The AI procedure is used in hospitals to analyze lung cancer within seconds. The firm has developed an AI-based, handheld chest X-ray camera that can scan the chest for an unexpected injury in just 3 s and view the heat map.

2.10 Mobile apps for information sharing

After the virus outbreak, several mobile apps have increased in many countries. It became essential to educate and inform the public about knowledge sharing. For already increased medical staff and volunteers, this will be a significant challenge. For starters, a mobile app was created to guide people with problems to the closest checking station available. Another marks the closest retail area for available masks. A public chat robot is used with AI techniques to advise people who need help on how to react to coronaviruses, and another AI-based speech robot automatically appeals.

2.11 Face Mask Detection System using artificial intelligence

In tandem with the Computer Vision Face, the Mask Detection System uses existing IP and CCTV cameras to detect people without masks. The Face Mask Recognition

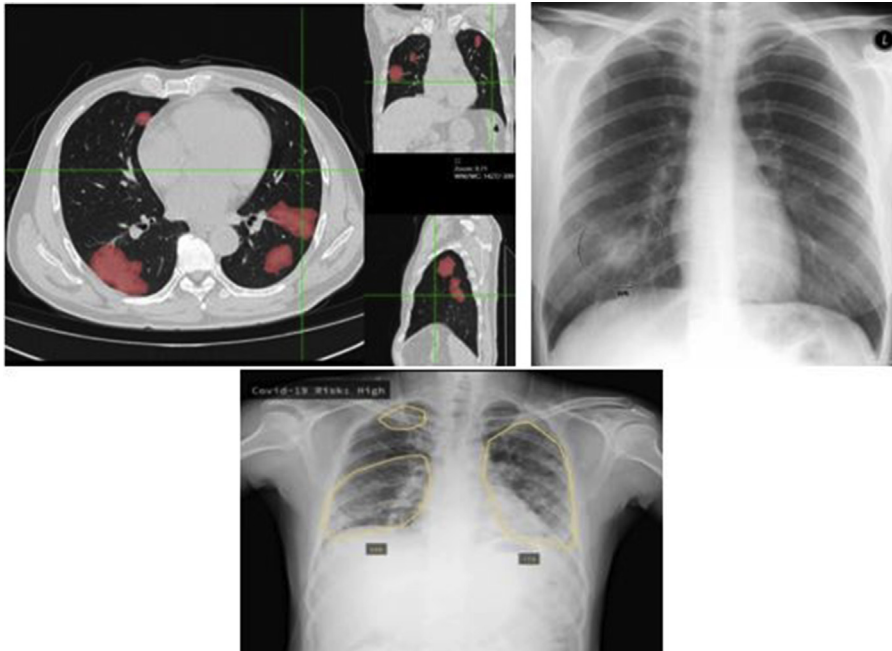


FIGURE 9.10 Chest X-ray artificial intelligence image support tool.

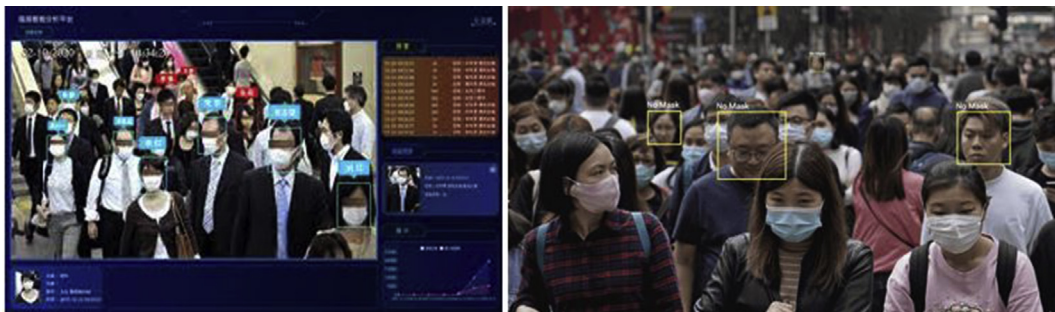


FIGURE 9.11 Proposed system of Face Mask Detection using artificial intelligence.

Technology uses Artificial Network to determine that a person is not wearing a mask (Figs. 9.11 and 9.12). The device can be attached without a mask to any current or new IP cameras. App users can even attach images and phone numbers to warn them if they do not wear a mask. If the camera picks up a façade that is not remembered, the administrator will be alerted.

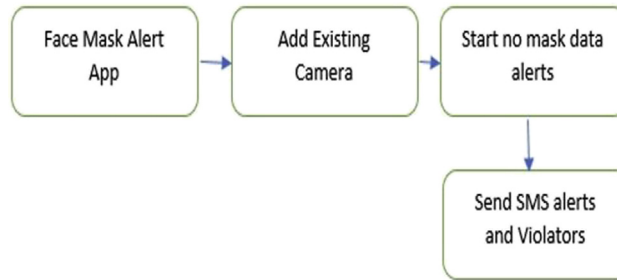


FIGURE 9.12 Working mechanism of the proposed system of Face Mask Detection using artificial intelligence.

2.12 Human Presence Detection System using facial recognition

The Human Presence Detection System allows you to use current IP cameras to identify individuals with facial recognition techniques at a quarantine center.

The Human Presence Detection System requests the patient to be in quarantine centers at specific intervals with an IP camera. If a person is not made accessible at a given time, a warning informs the system and the monitoring authority of the incident. The Human Presence Detection Program often allows individuals to access the software on mobile devices and to exchange details about their position periodically (Fig. 9.13). If someone from the quarantine center is discovered to be absent, the network monitors their location and alerts authorities of the location of the person.

Managing and incorporating their details in the program show alerts and results created from the database report when the consumers are unable to connect with anyone through an IP camera or the position report for the live position of an individual.



FIGURE 9.13 Human Face Detection using artificial intelligence.

This system manages the presence threshold for action to be taken or the time interval before the camera. The user needs to be present, and it displays internet camera's video stream.

2.13 Telemedicine solution for healthcare institutes

Physicians and nurses may use telemedicine software, and pharmacists use it to link to nurses remotely. Doctors can be accessed via video by patients (Fig. 9.14). It decreases the spread of the virus to large populations by linking patients with doctors online. On behalf of patients, physicians may prescribe the drug to prevent maltreatment.

- Doctor calendar scheduling
- Consultation using video calling
- Treatment of medicine

It enables virtual hospital appointments, electronic scheduling lists, real-time clinical record exposure, and surveillance. We can improve the relationship between patients and healthcare professionals using emerging technology.

2.14 Machine learning social distancing application

This application will help identify the safe distance between people (Fig. 9.15).

Many nations have become acquainted with steps aimed at slowing down the progress of the COVID-19 pandemic. This ensures that people outside will regularly stay at least 2 m apart. While this is a strict precondition for the overwhelming majority of firms, employees in enterprises who have been accepted as essential and continue to operate through this duration of quarantine may consider it not easy to follow this law. It



FIGURE 9.14 Telemedicine solution using artificial intelligence.



FIGURE 9.15 Machine learning social distancing.

is not a new notion. Reuters reported not long ago that Amazon is now utilizing specific tools to track the gaps between its warehouse staff. The system also contains several innovations that companies slowly use to track their workers. At the moment, there are numerous low-cost AI solutions that companies can purchase to show each worker in a store or respond to each delegate on a line. Much as the detector of Landing AI, these devices slowly banner alerts when procedures deviate from a specific pattern. The coronavirus pandemic has only exacerbated this phenomenon.

3. Limitations and future scope

AI had no impact yet, but data scientists have faced the task. In order to fight against COVID-19 and subsequent pandemics, AI can become a weapon. The existing implementation of AI is currently constrained by a shortage of data on the one side and over data on the other. Historical resources are insufficient to train AI models and not enough databases and frameworks are available to operate with, as well as there are future challenges in large-scale Hybris, nonalgorithms, and a torrent of research and sketches that must be transferred and tested before clinical trials occur. In comparison, as AI becomes easy to use, for instance, in surveillance, we would presumably see more commitment but with possible adverse long-term impacts on privacy and related human rights issues.

First, more recent training data on COVID-19 is required with regard to the need for more details. There needs to be more transparency and knowledge exchange to boost the AI capacity, and more collaborative and multidisciplinary work is required. Besides, additional diagnostic tests are needed. Promising progress has been made in many important initiatives that understand the value of creating and exchanging current datasets and disease knowledge. One was the Global Research on Coronavirus Data Base of the WHO with ties to other related programs. The collaborative project involving Semantic Scholar (Semantic School), Allen Institute for Artificial Intelligence, Microsoft, Facebook, and others, which is perhaps one of the most innovative of these projects, would allow the COVID-19 Open Research Dataset (CORD-19), comprising about 44,000 scientific content currently accessible for data mining, openly available.

The “COVID-19 Open Research Dataset Challenge” was published by Kaggle, a competition for data science based on this data. Zindi, Africa’s largest technology innovation forum, has also introduced an innovation to “accurately estimate the distribution of COVID-19 across the world over the next few months”. Elsevier has released early stage and peer-reviewed work on COVID-19 as well as 20,000 associated ScienceDirect publications and all data mining texts in its Latest Coronavirus Knowledge Center. Like the Human Coronavirus discovery Environment Patent and Testing Works digital databases, Lens has made accessible all of its patent knowledge to promote the quest for innovative and repurposed drugs. AWS COVID-19 is a public data base described by Google as ‘a centralized repository,’ a repository of current and curated dataset on or relating to the propagation and characteristics of the new coronavirus (SARS-CoV-2) and its associated diseases, COVID-19, on its Cloud Platform, to be made available by Google (until September 15, 2020).

The COVID-19 free access to the data and research literature is supported not only by major technologic firms, publishers, and institutions but also by smaller enterprises and nongovernmental organizations (NGOs).

There is not merely the lack of data, but also paradoxically, so much data. AI applications are limited. As has been noted, as the pandemic spreads and the epidemic consumes the press and social media, so much big data noise is generated, and details data become overloaded, this was the lesson of the unsuccessful effort of Google Flu Patterns. Data curation and algorithmic modification are becoming especially important, all of which require human common sense.

There are currently more than 100 scientific papers about the pandemic. However, this potential shortage of knowledge may play a significant part in data collection software. The COVID-19 Evidence Navigator, which includes machine-produced proof charts on the pandemic that are regularly revised from PubMed, is an indicator for an effort in this regard.

3.1 Conclusion

COVID-19 has severe consequences for all sectors around the world, as it adapts remotely to the ‘new normal’ of an organization. COVID-19 has become one of the most

significant obstacles confronting the planet in the 21st century in a brief period. The index is growing exponentially as work information surface is beyond the potential of humans to do it alone. AI describes large data models, and this chapter should clarify how this challenge has become one of the ace cards of humanity. AI has also, from an epidemiologic, medical, therapeutic point of view, played a significant role in countering COVID-19. It is essential to establish objective time series data for AI training. Throughout this context, there is a growing abundance of international initiatives; however, further medical research is necessary not only for the supply of training data to allow AI models to become operational but also for better pandemic management and cost reduction. Also, it is necessary to know if AI can be an efficient tool to counter potential pandemics and epidemics. We have discussed possible solutions to COVID-19 using AI as a countermeasure. Eventually, although the influence of AI so far has been relatively small, the pandemic and policy responses to the pandemic will intensify economic digitalization, including a push toward greater human job automation. As such, the AI technologic developments that may emerge from the current crisis may entail accelerated progress in the implementation of suitable AI governance mechanisms.

References

- [1] J. Bullock, A. Luccioni, K.H. Pham, C.S.N. Lam, M. Luengo-Oroz, Mapping the Landscape of Artificial Intelligence Applications against COVID-19, ArXiv, 2020. <https://arxiv.org/abs/2003.11336v1>.
- [2] World Health Organization, Countries Agree on Next Steps to Combat Global Health Threat by MERS-CoV, WHO, 2019.
- [3] How AI is tracking the Coronavirus Outbreak, n.d. Available from: <https://www.wired.com/story/how-ai-tracking-coronavirus-outbreak/>. (Last accessed on 18 February 2020).
- [4] J.C. Morganstein, R.J. Ursano, C.S. Fullerton, H.C. Holloway, Pandemics: health care emergencies, in: R.J. Ursano, C.S. Fullerton, L. Weisaeth, B. Raphael (Eds.), *Textbook of Disaster Psychiatry*, second ed., Cambridge University Press, Cambridge, UK, 2017, pp. 270–283.
- [5] G.W.K. Wong, T.F. Leung, Bird flu: lessons from SARS, *Paediatr. Respir. Rev.* 8 (2) (2007) 171–176.
- [6] Smith, Responding to global infectious disease outbreaks: lessons from SARS on the role of risk perception, communication, and management, *Soc. Sci. Med.* 63 (12) (2006) 3113–3123.
- [7] R.J. Scarfone, S. Alexander, S.E. Coffin, et al., Emergency preparedness for pandemic influenza, *Pediatr. Emerg. Care* 22 (9) (2006) 661–671.
- [8] M. Akhtar, M. Kraemer, L. Gardner, A dynamic neural network model for predicting risk of Zika in real-time, *BMC Med.* 17 (171) (2019), <https://doi.org/10.1186/s12916-019-1389-3>.
- [9] W.J. Broad, AI. Versus the Coronavirus, *The New York Times*, March 26, 2020. <https://www.nytimes.com/2020/03/26/science/ai-versus-the-coronavirus.html>.
- [10] W. Heaven, AI Could Help with the Next Pandemic - but Not with This One, *MIT Technology Review*, March 12, 2020.
- [11] I. Bogoch, A. Watts, A. Thomas-Bachli, C. Huber, M. Kraemer, K. Khan, Pneumonia of Unknown aetiology in Wuhan, China: potential for international spread via commercial air travel, *J. Trav. Med.* 27 (2) (2020) 1–3.

- [12] E. Gruenwald, D. Antons, T. Salge, COVID-19 Evidence Navigator, Institute for Technology and Innovation Management, RWTH Aachen University, 2020. K. Hao, This is how the CDC is trying to forecast coronavirus spread, MIT Technol. Rev. (March 13, 2020).
- [13] T. Sarkar, Analyze NY times covid-19 dataset, Medium Data Sci. (March 30, 2020).
- [14] D. Coldeway, Molecule.one uses machine learning to make synthesizing new drugs a snap, TechCrunch (October 3, 2019).
- [15] B. Beck, B. Shin, Y. Choi, S. Park, K. Kang, Predicting commercially available antiviral drugs that may act on the novel coronavirus (2019-nCoV), Wuhan, China, through a drug-target interaction deep learning model, bioRxiv (February 2, 2020). <https://doi.org/10.1101/2020.01.31.929547>.
- [16] A. Rivas, Drones, and artificial intelligence to enforce social isolation during COVID-19 outbreak, Medium Data Sci. (March 26, 2020).
- [17] Z. Hu, Q. Ge, L. Jin, M. Xiong, Artificial Intelligence Forecasting of COVID-19 in China, arXiv preprint arXiv:2002.07112, February 17, 2020.
- [18] L. Li, L. Qin, Z. Xu, Y. Yin, X. Wang, B. Kong, J. Bai, Y. Lu, Z. Fang, Q. Song, K. Cao, Artificial Intelligence Distinguishes COVID-19 from Community-Acquired Pneumonia on Chest CT Radiology, March 19, 2020, p. 200905.
- [19] Q.-V. Pham, D.C. Nguyen, T. Huynh-The, W.-J. Hwang, P. Pathirana, Artificial intelligence (AI) and big data for coronavirus (COVID-19) pandemic: a survey on the state-of-the-arts, Comput. & Soc. (2020). <https://doi.org/10.13140/RG.2.2.23518.38727>.
- [20] X. Bai, C. Fang, Y. Zhou, et al., Predicting COVID-19 malignant progression with AI techniques, The BMJ (n.d.), medRxiv 2020.03.20.20037325. <https://doi.org/10.1101/2020.03.20.20037325>.
- [21] T.P. Mashamba-Thompson, E.D. Crayton, Blockchain and artificial intelligence technology for novel coronavirus disease-19 self-testing, Diagnostics 10 (4) (April 1, 2020) E198. <https://doi.org/10.3390/diagnostics10040198>. PMID: 32244841.
- [22] M. Fu, S. Yi, Y. Zeng, et al., Deep learning-based recognizing COVID-19 and other common infectious diseases of the lung by chest CT scan images, The BMJ (n.d.), medRxiv 2020.03.28.20046045. <https://doi.org/10.1101/2020.03.28.20046045>.
- [23] A. Martin, J. Nateqi, S. Guarin, et al., An artificial intelligence-based first-line defense against COVID-19: digitally screening citizens for risks via a chatbot, Sci. Rep. (n.d.), bioRxiv 2020.03.25.008805. <https://doi.org/10.1101/2020.03.25.008805>.
- [24] S. Wang, Y. Zha, W. Li, et al., A Fully automatic deep learning system for COVID-19 diagnostic and prognostic analysis, The BMJ (n.d.), medRxiv 2020.03.24.20042317. <https://doi.org/10.1101/2020.03.24.20042317>.
- [25] S. Jin, B. Wang, H. Xu, et al., AI-assisted CT imaging analysis for COVID-19 screening: building and deploying a medical AI system in four weeks, Appl. Soft Comput. (n.d.), medRxiv 2020.03.19.20039354. <https://doi.org/10.1101/2020.03.19.20039354>.
- [26] C. Feng, Z. Huang, L. Wang, et al., A novel triage tool of artificial intelligence assisted diagnosis aid system for suspected COVID-19 pneumonia in fever clinics, Ann. Transl. Med. (n.d.), medRxiv 2020.03.19.20039099. <https://doi.org/10.1101/2020.03.19.20039099>.
- [27] M. Komorowski, L.A. Celi, The Artificial intelligence clinician learns optimal treatment strategies for sepsis in intensive care, Nat. Med. 24 (11) (2018) 1716–1720.
- [28] G. Rong, A. Mendez, et al., Artificial intelligence in healthcare: review and prediction case studies, Eng. J. 6 (Issue 3) (March 2020) 291–301.
- [29] H.R. Bhapkar, P. Mahalle, P.S. Dhotre, Virus graph and COVID-19 pandemic: a graph theory approach, Preprints (2020). <https://doi.org/10.20944/preprints202004.0507.v1>, 2020040507.

- [30] Q. Pham, D.C. Nguyen, T. Huynh-The, W. Hwang, P.N. Pathirana, Artificial intelligence (AI) and big data for coronavirus (COVID-19) pandemic: a survey on the state-of-the-arts, Preprints (2020). <https://doi.org/10.20944/preprints202004.0383.v1>, 2020040383.
- [31] D.C. Nguyen, M. Dinh, P.N. Pathirana, A. Seneviratne, Blockchain and AI-based solutions to combat coronavirus (COVID-19)-like epidemics: a survey, Preprints (2020). <https://doi.org/10.20944/preprints202004.0325.v1>, 2020040325.
- [32] B. Lovetrue, The AI-discovered aetiology of COVID-19 and rationale of the irinotecan + etoposide combination therapy for critically ill COVID-19 patients, Preprints (2020). <https://doi.org/10.20944/preprints202003.0341.v1>, 2020030341.
- [33] W. Naudé, Artificial intelligence vs COVID-19: limitations, constraints and pitfalls, AI Soc. (2020). <https://doi.org/10.1007/s00146-020-00978-0>.
- [34] X. Mei, H. Lee, K. Diao, et al., Artificial intelligence-enabled rapid diagnosis of patients with COVID-19, Nat. Med. (2020). <https://doi.org/10.1038/s41591-020-0931-3>.