

Implementation of Artificial Intelligence and Big Data to Overcome Covid-19 Pandemic

1st Christopher Jody Widiyono
Duta Bangsa University Surakarta
Surakarta, Indonesia
christopherjody1@gmail.com

2nd Joni Maulindar
Duta Bangsa University Surakarta
Surakarta, Indonesia
joni_maulindar@udb.ac.id

Abstract—At this time, where the COVID-19 pandemic caused by a new type of corona virus is occurring, the demands in the health sector are becoming heavy. Seeing the increasing number of confirmed cases of COVID-19 patients and the number of existing cases of death, a solution is needed to deal with this crisis. Artificial Intelligence and Big Data are technologies that can be adapted to deal with the COVID-19 pandemic. This review will discuss how technology based on Artificial Intelligence and Big Data can be implemented to help medical personnel carry out initial diagnoses and various kinds of research to assist drug and vaccine discovery.

Keywords — COVID-19, Artificial Intelligence, Big Data

I. INTRODUCTION

A. COVID-19

A new corona virus named COVID-19 was first discovered in the city of Wuhan, Hubei Province, China in December 2019. WHO states that this virus can cause respiratory diseases that cause coughs, fever and pneumonia. This disease has spread in China and has now been identified in various countries on an international scale. The WHO Emergency Committee has declared the spread of the virus a pandemic due to its rapid spread from person to person and many are not immune to the virus.

Generally, COVID-19 occurs in humans and several types of animals, including camels, cows, cats and bats. First, humans infected with the new COVID-19 virus at the epicenter of the original incident, Wuhan, had links to seafood and live animal markets, indicating animal-to-human transmission. Subsequently, the increase in the number of patients who did not come into contact with animals resulted in human-to-human spread. Then, on March 11, 2020, WHO announced the outbreak of the new corona virus COVID-19 as a pandemic as the number of confirmed cases reached 118,000 with more than 4000 deaths.

The clinical presentation of COVID-19 is complex and manifests itself as fever, cough and severe headache. There are several techniques for detecting COVID-19, such as NAT (Nucleid Acid Test) and CT (Computed Tomography). NAT is used to detect non-sticky acids specifically for nucleic acid sequences and living species, especially viruses or bacteria that can cause disease in the blood, tissue or urine. Although NAT detection techniques and their tools are quite important in detecting the COVID-19 virus, CT Scan is the most effective and useful technique for detecting the severity of pneumonia.

Recently, the World Health Organization (WHO) has reported COVID-19 as a pandemic and thousands of patients have spent hours waiting in hospitals for CT Scan Image results. This not only burdens the health system and frustrates

the patient, but can also pose a serious risk of cross-infection with other patients. In particular, in Hubei province, suspected cases of COVID-19 patients and cases under medical observation need to go through CT imaging of the lungs. In addition, the number of radiologists compared to the number of patients is very far from being balanced. As a result, this overwhelms the medical system and doctors. This results in delays in detection and quarantine of infected persons, and less efficient patient care[1]

B. Artificial Intelligence

Artificial Intelligence is a developing technology for smart applications in various segments. Some well-known examples of AI include, self-contained vehicles (eg, autopilot in cars and drones), automotive, medical and telehealth diagnostics in health, cyber system security (eg, malware detection and botnets), AI banking in finance, imaging and processing. natural language in computer vision and modulation classification in wireless communication. Of the various branches of AI, Machine Learning (ML) and Deep Learning (DL) are two important approaches. Generally, ML is represented as the ability to study and extract meaningful data patterns. The performance and systems of ML-based algorithms rely heavily on feature representation. Meanwhile, DL is able to solve complex systems by studying simple representations. DL has two main features namely: 1) Ability to learn the correct representation shown by one of the DL features and 2) DL allows the system to learn data from an in-depth method, multiple layers are used sequentially to increase meaningful representation [2].

C. Big Data

The significant development of The Internet of Things (IoT) is generating a huge explosion of devices and sensors that can be used anywhere. The more than expected increase in the volume of data connected with the complex analytical techniques empowered by Artificial Intelligence has led to the emergence of the era of Big Data. Big Data is already used in a wide area of industrial application domains, including healthcare where electronic health records (EHRs) have been exploited by the use of intelligence analysis to facilitate medical care. For example, Big Data in the health sector has the potential to support patient health analysis, assistants for diagnosis and drug manufacturing. Big Data can be generated from a number of resources which include online social graphics, mobile devices (eg, smartphones), IoT devices [2].

II. METHOD

The research methodology used is a careful review of scientific articles sourced from the Google Scholar database.

The scientific article data that has been collected is the result of a search with the keyword "Artificial Intelligence For Service Covid-19" and analyzed to identify the implementation of Technology, AI and Big Data that can be applied to fight the COVID-19 pandemic.

III. RESULT

A. Early Detection and Diagnosis of COVID-19

Big Data can enable real-time disease outbreak surveillance. COVID-19 is an unexpected phenomenon and therefore, there are a number of data sets containing new numbers of infections from various countries and even in some cases, data within cities. Combined with existing information about the movement of people, this makes a perfect dataset to serve as a conceptual combination of mathematical models and Artificial Intelligence. Blue Dote, which is a startup in Toronto using Artificial Intelligence to improve surveillance systems appears to be the first to detect an epidemic of the outbreak, hours after the reported chaos at the epicenter of Wuhan, is well ahead of Chinese policy and other international institutions and agencies.[3]. This certainly can be an effective method to be applied as an outbreak detection alert if it is used by countries around the world. Units

The increasing number of patients who continue to add to the burden on medical personnel makes a demand for a system that can make early diagnoses without having to wait for CT Scan results or other laboratory tests which tend to take longer and lead to inefficiency and unwanted transmission because of the increase as well. number of patients. Several countries have developed special telephone services to treat patients with COVID-19 symptoms. A technology based on Artificial Intelligence (Symptoma) which is useful for providing diagnoses based on clinical symptom references with more than 20.00 other diseases with an accuracy rate of up to 90%[4].

With Artificial Intelligence and Big Data, several findings that will help medical personnel and COVID-19 patients can be worked out and developed in accordance with the demands of the existing circumstances. One of them is software and framework for diagnosing patients who are suspected of having COVID-19. COVID-MobileXpert is an implementation of Artificial Intelligence and Big Data that is able to label patients and follow-up based on chest X-ray (CXR) results. With a research method that uses a dataset of COVID-19 patients, the level of accuracy and sensitivity of the COVID-Mobile Xpert will continue to increase and can improve the performance of medical personnel in making initial diagnoses.[5].

Several platforms can also carry out early diagnosis by integrating findings on CT scans with clinical symptoms, traces of exposure to viruses and laboratory tests which are then used to predict disease evolution and monitoring processes. [6], [7]. However, some of the obstacles that are often encountered are the similarity of symptoms between COVID-19 and other diseases such as pneumonia. A case study on this subject has also produced a breakthrough based on Artificial Intelligence that is able to distinguish COVID-19 from pneumonia and classify it in detail. By developing

the concept of deep learning, classification can be done and the level of accuracy is increased so that it can help radiologists in providing diagnosis, even surpassing the performance of the radiologist itself in terms of speed [8], [9].

A case study conducted by [10] also succeeded in making an application to calculate the death rate for COVID-19 patients. An ANN (Artificial Neural Network) that can provide a specific person's mortality rate to inform clinical management decision making at the earliest opportunity. ANN analyzes patient data including demographics, comorbidities, smoking history, and displays symptoms and predicts patient-specific mortality rates during hospitalization.

B. Potential in Medicine and Vaccines

The use of Artificial Intelligence and Big Data is also used in the drug and vaccine sector. With this technology, the discovery of new drugs or the use of similar drugs that can treat COVID-19 is a benefit from an economic and scientific perspective, especially when medically tested drugs and vaccines are not yet available. Artificial Intelligence is used for drug research by analyzing the data available on COVID-19. This can be useful for drug delivery design and development. This technology can be used to accelerate the real-time drug research process, which if done according to normal procedures will take a lot of time and speed up the process significantly which is impossible for humans to do.[11].

A case study conducted has produced a DL model that is trained using a specific COVID-19 virus data set. Then, this trained model was used to check 4,895 commercially available drugs and discover potential high affinity inhibitors.[2]. Artificial Intelligence can quickly help identify types of therapy and vaccine candidates.

IV. CONCLUSION

Based on the explanation that has been stated above, we know that the use of AI and based technology Big Data is very effective in overcoming various kinds of problems that arise due to the COVID-19 pandemic. Starting from an application that functions as an initial diagnosis that is able to distinguish various types of diseases that have similar symptoms to COVID-19 to a Machine Learning concept to find drugs or vaccines that might have the potential to help the healing process of COVID-19 patients. The prospect of the technology above is very large, seeing the increasing use of Artificial Intelligence and Big Data in every aspect of human life, even in the health sector. Continued development can create a healthy environment that is smart and likely to tackle the next challenges.

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