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Case Study

Literature Review: Lung Disease Detection Based on X-ray Using Artificial Intelligence

Putri Ariatna Alia 

¹ Program Study of Software Engineering, Lecturer, Anwar Medika University, Sidoarjo, Indonesia (putriariatna@gmail.com)

Abstract: According to a WHO survey in 2019, 4 of the 10 most common diseases that kill people are lung disease. Lung disease is a significant problem for all of us, but until now there has not been found an effective drug to detect it earlier, so that in general lung disease is diagnosed in a severe condition. One example of a lung disease taken as a sample is pneumonia. This research aims to develop a method that is faster and more accurate in detecting individuals infected with pneumonia by using Artificial Intelligence, especially by using Convolutional Neural Network (CNN) architecture in its learning. The research method used in this study is literature review, in which related articles are collected and processed using the Mendeley application. The criteria used in the selection of articles were articles published in 2020 which discussed the use of Artificial Intelligence in treating pneumonia. Based on the collection and discussion of several existing studies, it can be concluded that by using an Artificial Intelligence system, pneumonia detection in individuals can be carried out through pattern analysis on Lung X-ray results with a high degree of accuracy, using existing training data.

Keywords: Artificial Intelligence, Lung disease, Convolutional Neural Network, X – Ray, Pneumonia.

INTRODUCTION

Pneumonia is an acute respiratory infection that can affect one or both lungs. There is no single cause of pneumonia, pneumonia can be caused by bacteria, viruses or fungi that are in the air. Children with pneumonia will find it difficult and painful to breathe because their lungs fill with pus and fluid. Other symptoms of pneumonia include fever, coughing and wheezing[1].

COVID-19 is a type of virus that can cause pneumonia. Pneumonia sometimes also appear with other lung diseases, such as pulmonary TB. Pneumonia is one of the highest causes of death in children. Data from the World Health Organization states that in 2019, as many as 740,180 children died from pneumonia[2]. COVID-19 (Coronavirus) has created a global health crisis that has prompted the medical industry to continuously seek innovative technologies to monitor and control the spread of the COVID-19 (Coronavirus) pandemic. the majority of medical personnel are currently of the opinion that there are no drugs or therapeutic procedures that can guarantee the recovery of COVID-19 patients. Several drugs, such as lopinavir-ritonavir, remdesivir, hydroxychloroquine, and azithromycin, have undergone clinical trials, but there is no convincing evidence that these drugs can cure patients with [3].

In Indonesia, there are two methods commonly used, namely PCR Swap and Rapid Test. The results of the PCR Swap examination are considered to take quite a long time, so individuals who want to know their status must wait at least 3 days[4]. Apart from that, the problem that sometimes appears in the results of the Rapid Test examination is the level of accuracy. Several cases experienced errors in the decision of the Rapid Test results. The digital health technology sector has played a critical role in developing strategies for and responding to the COVID-19[5] pandemic in various ways. One way that has the potential is through the use of Artificial Intelligence (AI) technology which is believed to be of great benefit in overcoming the problems discussed previously. AI is one technology that can easily track.[6]

spread of this virus, identify high-risk patients, and help control infection in real-time. In addition, AI can also predict the risk of death by fully analyzing previous patient data. In efforts to fight this virus, AI can contribute through population screening, medical assistance, notifications, and advice on effective spread control .

MATERIAL AND METHOD

Based on the level of need and x-ray results of patients with lung disease, many researchers use deep learning models to detect lung disease, one of the methods used is the Convolutional Neural Network.

a. Materials:

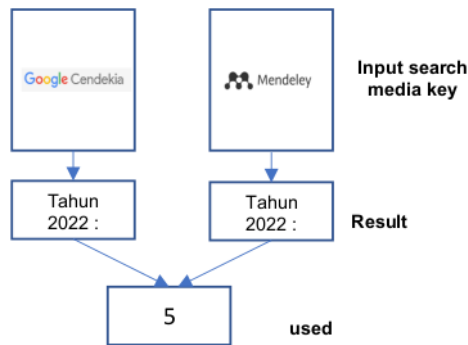
In this literature review, the research materials used include several journals related to lung disease detection using Artificial Intelligence (AI), especially by utilizing the Convolutional Neural Network (CNN) model.

b. Method :

In writing this article, the method used is a literature review. This method involves searching literature both at international and national levels using the Google Scholar search engine and the literature search function available in Mendeley.

RESULTS AND DISCUSSION

The results is :



Picture.1 Result literature review based on google scholar and mendeley.

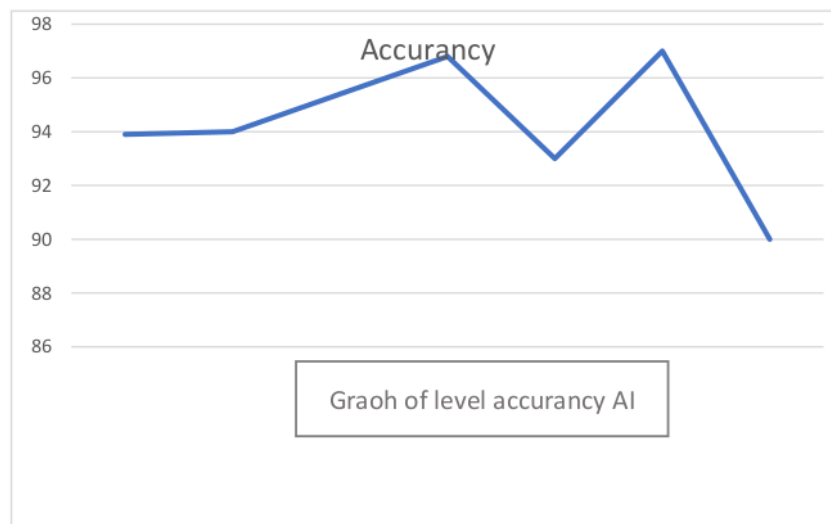
The following are some of the studies used in the discussion: (Source: top search data) [7]:

- Artificial Intelligence-Based Detection of Pneumonia in Chest Radiographs, Author : Becker, J., Decker, J. A., Römmele, C., Kahn, M., Messmann, H., Wehler, M., Schwarz, F., Kroencke, T., & Scheurig-Muenkler, C
- Pemanfaatan Kecerdasan Buatan (Artificial Intelligence) Untuk Mendeteksi Hasil Ct Scan Paru-Paru Pasien Yang Terinfeksi Covid-19, Author : Hanifudin, R., Rokhmayati, P., Nugraha, N. P., Alrasyid, M. A., & Rosyani, P.
- Using Artificial Intelligence to Detect COVID-19 and Community-acquired Pneumonia Based on Pulmonary CT: Evaluation of the Diagnostic Accuracy. Radiology, Author : Li, L., Qin, L., Xu, Z., Yin, Y., Wang, X., Kong, B., Bai, J., Lu, Y., Fang, Z., Song, Q., Cao, K., Liu, D., Wang, G., Xu, Q., Fang, X., Zhang, S., Xia, J., & Xia, J

- 6
- d. Tuberculosis detection in chest radiograph using convolutional neural network architecture and explainable artificial intelligence. Nafisah, S. I., & Muhammad, G.
 - e. Can AI Help in Screening Viral and COVID-19 Pneumonia?, Author : 5. Chowdhury, M. E. H., Rahman, T., Khandakar, A., Mazhar, R., Kadir, M. A., Mahbub, Z. Bin, Islam, K. R., Khan, M. S., Iqbal, A., Emadi, N. Al, Reaz, M. B. I., & Islam, M. T
Artificial intelligence and innovation to optimize the tuberculosis diagnostic process. Revista Peruana de Medicina Experimental y Salud Publica Author : 6. Curioso, W. H., & Brunette, M. J. (2020)

DISCUSSION :

From the results of research conducted by a number of previous researchers, it appears that there are variations in the test pattern, the amount of training data, test data, and the correlation model used. It can be concluded from all these studies that Artificial Intelligence can be used to analyze and detect X-ray scan results of people infected with pneumonia quickly and with a good level of accuracy, with an average accuracy above 90%. For research that will be described in subsequent articles, the author will try to study and apply these methods and implement them in a system that uses the Python programming language.



CONCLUSION

The conclusion that can be drawn from the collection and discussion of several studies is that the use of Artificial Intelligence (AI) can be used to detect COVID-19 infection by analyzing patterns found in CT scan results of the lungs. This can be done by utilizing the level of accuracy of existing training data. For further research, it is suggested that a more in-depth literature review be carried out by involving better journals and expanding the discussion in detail.

AUTHORS' CONTRIBUTIONS (must be filled)

Putri Ariatna : Conceptualization, Methodology, Software, Agung Teguh : Data curation, Writing-Original draft preparation. Warna Agung and Erik Yohan : Translate.

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FUNDING INFORMATION

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DATA AVAILABILITY STATEMENT

No new data were created or analysed during this study. Data sharing is not applicable to this article.

DISCLOSURE STATEMENT

With the increasing number of cases of lung disease, it is hoped that this research can help medical staff for the initial diagnosis of people with lung disease.

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