International Journal of Advanced Technology in Engineering and Science
Vol. No. 10, Issue No. 06, June 2022
www.ijates.com
ijates
ISSN 2348 - 7550

RAPID COVID-19 DIAGNOSIS USING DEEP LEARNING OF CT SCANS

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ABSTRACT

Several studies suggest that COVID-19 may be accompanied by symptoms such as a dry cough, muscle aches, sore throat, and mild to moderate respiratory illness. The symptoms of this disease indicate the fact that COVID-19 causes noticeable negative effects on the lungs. Therefore, considering the health status of the lungs using X-rays and CT scans of the chest can significantly help diagnose COVID-19 infection. Due to the fact that most of the methods that have been proposed to COVID-19 diagnose deal with the lengthy testing time and also might give more false positive and false negative results. We will use artificial intelligence (AI) image-based diagnosis methods in order to detect coronavirus infection with zero or near to zero false positives and false negatives rate. Our goal is find the most accurate COVID-19 detection method among AI method i.e., convolutional neural network (CNN).

KEYWORDS: *Covid-19, Lung CT Scan images. Deep Learning, CNN.*

1. INTRODUCTION

The new Coronavirus infection was first reported in Wuhan, China, and since then it has strongly spread out since January 2020 worldwide. The World Health Organization (WHO) declared the outbreak from the Corona virus disease 2019 (COVID-19) to be a public health emergency of international concern on the 30th of January, 2020. The specific symptoms of COVID-19 are fever, dry cough, sore throat, loss of taste, or smell. In addition to this, the unspecific symptoms are tiredness, headaches, and breathlessness (3 %). Normally, it takes 5-6 days for the symptoms to be shown in the patient's body. Animals are also able to transmit this infection and themselves getting affected. Mainly two similar viruses were reported earlier, which were Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV) and the Middle East Respiratory Syndrome Coronavirus (MERS Coronavirus).

These viruses caused major respiratory problems and are zoonotic in nature. In the current scenario, the COVID-19 test results take more than 24 hours to detect the virus in the human body. There is an urgent need to recognize the illness in the early stage and to put the infected immediately under quarantine because no specific drugs are available for COVID-19. The Chinese government reported that the diagnosis is confirmation of COVID-19 by the real-time polymerase chain reaction (RT-PCR). RT-PCR suffers from high false-negative rates and utilizes a lot of time. The low sensitivity RT-PCR test is not satisfactory in the present pandemic

situation. In some cases, the infected are not possibly recognized on time and do not receive suitable treatment. The infected can be assigned sometimes as COVID-19 to healthy people because of a false-negative result. Deep Learning is the most efficient technique that can be used in medical science. It is a fast and efficient method for the diagnosis and prognosis of various illnesses with a good accuracy rate. They are specifically trained models to classify the inputs into different categories desired by the programmers. In the medical field, they are used to detect heart problems, tumors using image analysis, diagnosing cancer, and many other applications. It is also used to differentiate the CT Scan images of the patients infected with COVID-19 as positive or not infected.

2. LITERATURE REVIEW

Several studies and research work have been carried out in the field of diagnosis from medical images such as computed tomography (CT) scans using artificial intelligence and deep learning. Dense Net architecture and recurrent neural network layer were incorporated for the analysis of 77 brain CTs by Grewal et al. [1]. RAD net demonstrates 81.82 % hemorrhage prediction accuracy at the CT level. Three types of deep neural networks (CNN, DNN, and SAE) were designed for lung cancer calcification by Song et al. [2]. The CNN model was found to have better accuracy as compared to the other models. Using deep learning, specifically convolutional neural network (CNN) analysis, analysis, Gonzalez et al. [3] could detect and stage chronic obstructive pulmonary disease (COPD) and predict acute respiratory disease (ARD) events and mortality in smokers. During the outbreak time of COVID-19, CT was found to be useful for diagnosing COVID-19 patients. The key point that can be visualized from the CT scan images for the detection of COVID-19, was ground-glass opacities, consolidation, reticular pattern, and crazy paving pattern [4]. A study was done by Zhao et al. [5] to investigate the relation between chest CT findings and the clinical conditions of COVID-19 pneumonia. Using the dataset, they developed an AI-based diagnosis model for the diagnosis of COVID-19 from the CT images. On a testing set of 157 international patients, an AI-based automated CT image analysis tools for detection, quantification, and tracking of coronavirus was designed by Gozes et al. [8]. The accuracy of the model developed was 95 %. The common chest CT findings of COVID-19 are multiple ground-glass opacity, consolidation, and interlobular septal thickening in both lungs, which are mostly distributed under the pleura A deep learning-based software system for automatic COVID-19 detection on chest CT was developed by Zheng et al. The sensitivity of chest CT in suggesting COVID-19 was 97 % as shown by Ai et al.

3. EXISTING METHOD

This model emphasizes an existing method that which is designed using the some of the algorithms of deep learning and machine learning algorithms. Here the process is performed using the LSTM, RNN, Ensemble algorithm and SVM where these algorithms are unable to perform accurately and couldn’t get the proper accuracy.

4. PROPOSED SYSTEM

In our proposed method we are performing the classification of either the person is infected with the Covid-19 or not using Convolution Neural Network (CNN) of deep learning. As Covid-19 causes pleural effusion, a condition in which fluids fill the lung, causing respiratory difficulty. Early diagnosis of Covid-19 is crucial to ensure curative treatment and increase survival rates. Hence, proper classification is important for the proper treatment that which will be possible by using our proposed method. Further implementation as shown below.

5. METHODS OR TECHNIQUES USED

The major requirement for implementing this project using python programming language along with deep learning, machine learning, computer vision and also with python libraries. we are using CNN algorithm in our proposed method.

IMPLEMENTATION

System

Create Dataset:

The dataset containing images of the Lung CT Scan images with the Covid-19 affected and without Covid-19 i.e., normal are to be classified is split into training and testing dataset with the test size of 30-20%.

Pre-processing:

Resizing and reshaping the images into appropriate format to train our model.

Training:

Use the pre-processed training dataset is used to train our model using CNN, LSTM, RNN, SVM and ensemble algorithms.

Classification:

The results of our model is display of CT scan

User:

Upload Image

The user has to upload an image which needs to be classified.

View Results

The classified image results are viewed by user.

Images are either with Covid-19 or normal.

6. RESULT

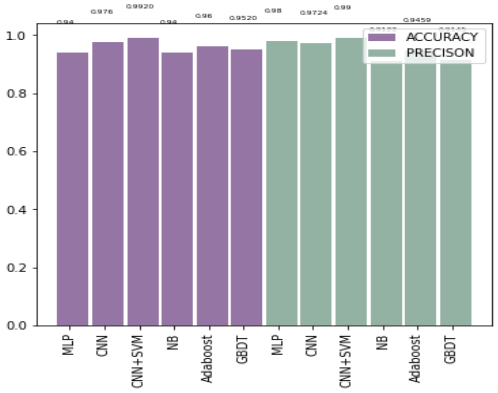

Figure 1:Simulated Graph

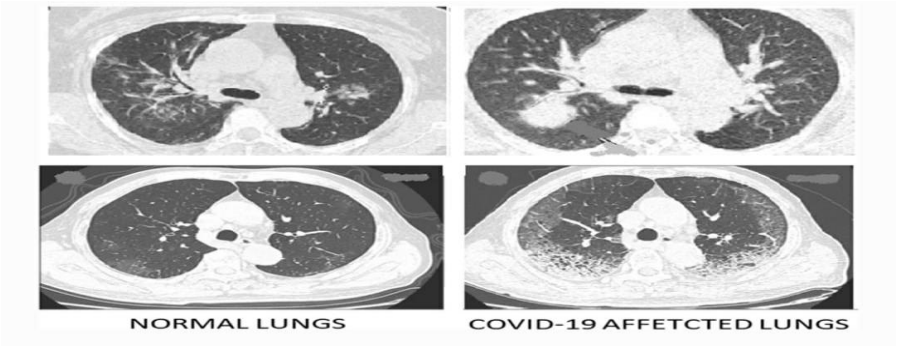

Figure 2: Covid-19 infected and not infected lungs

CT scan images can be used for the COVID-19 screening of patients. It gives a detailed image of the particular area, using which we can detect the internal defects, injuries, dimensions of the parts, tumors, etc. Compared to the current RT-PCR method, a CT scan is a reliable method. It is an efficient method for the classification of the images of COVID-19 patients. The results are provided accurately and quickly. There are some side effects of CT scan screening that patients can get exposed to radiation if multiple CT scans are conducted. The graph shown in Figure is a comparison between accuracy in percentage for 6 different deep learning networks that have been used in our study.

7. CONCLUSION

To come up with an efficient way for the detection of covid-19, different reference papers were studied based on Covid19 detection using various deep learning models to classify the subjects into category of normal and suspicious based on various features. In that CNN is considered to be more powerful than other neural networks. Hence the implemented model is practically effective and efficient.

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