

A Review Paper on Covid-19 Detection using Deep Learning

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Abstract – COVID-19 which is also known as novel coronavirus is one of the deadliest pandemic is still is an ongoing global pandemic which is a serious problem to face. In this kind of situations, the methods used to detect the disease was itself a problem since it was hard to detect the symptoms and the detection method like RT-PCR which was most predominantly used had some flaws which resulted in false reports and was very much time-consuming process resulting in the worsening of the situation. Thus, an alternate technique must be developed for accurate in the detection of disease like using the help of Radiography images and Deep Learning techniques on CNN architecture which perhaps was one of the fastest, much more accurate and reliable way. In this paper we the use of X-Ray images (CXR-s) & CT scan images and its application to deep learning models to distinguish between the Covid-19 affected patient's and normal patients was discussed.

Key Words: COVID-19, Deep Learning, Convolution Neural Network (CNN), X-Rays, CT scan, CXR, RT-PCR

1. INTRODUCTION

Covid-19 has resulted into one of the deadly disease that has impacted the whole world by its influence due to which day to day life of the whole world has got affected and its spread has resulted into danger for the whole world as its causing death by the contact of the virus and hence to stop its spread some precautions are needed to be taken so that the treatment of the patient could be started as early as possible to decrease the death rates and thus preventing the spread of Covid-19. The CT Scan images and the X-Ray Scan images can be used as an alternate method to detect Covid-19 affected patients. We have reviewed the use of deep learning models for detection of COVID-19 using the Chest X-rays and CT scans.

2. LITERATURE SURVEY

2.1 Detection of Covid-19 in Chest X-ray Image using CLAHE and Convolutional Neural Network, Buyut Khoirul Umri, Muhammad Wafa Akhyari, Kusrini Kusrini, IEEE 2020

In this paper the authors have chosen to take the aid of computer technology to detect Covid-19 since there are flaws in current Covid-19 detection mechanisms for an example RTPCR test, Rapid test which have high false rates due to which many people across the globe may suffer. Thus, this research was to provide a more accurate way to detect Covid-19 using chest X-Ray images. This research has examined up to a total of 200 X-Ray chest images of the Covid-19 patients and normal chest images. CLAHE is the process which involves histogram equalization procedure to process X-ray datasets and analyses the performance levels of CNN that are combined with itself basically it improves the quality of images that had been classified to get significant outcomes. Along with the CNN basic model, the VGG16 a transfer learning model is also used. The results of this research reveal that the accuracy of VGG16 compared to CNN basic model is low which is in contrary should be high, this happened because they have taken such a limited amount of dataset which was insufficient for training and the validation of the model. Since nearly all hospitals have an X-ray machine this method of Covid-19 virus detection can be used since they do not need any special kit.

2.2 EDL-COVID: Ensemble Deep Learning for COVID-19 Case Detection From Chest X-Ray Images,

Shanjiang Tang, Chunjiang Wang, Jiangtian Nie, Neeraj Kumar, Yang Zhang, Zehui Xiong, Ahmed Barnawi, IEEE 2021

The authors of this research paper have taken into consideration the factors like overfitting, high variance and generalization errors and limited number of datasets which are not suitable for an accurate Covid-19 detection model. They have used datasets involving various chest X-Ray images and chest CT scan images as they have high sensitivity towards pulmonary diseases. They have used Ensemble Deep learning model it should have multiple deep learning models as a combination to make predictions with multiple models instead of a single model. However here instead of training different multiple deep learning models they have generated different multiple deep learning models using a single neural network which violates the model diversity required for ensemble learning which affects the model since the

accuracy of the model depends on the diversity of these multiple deep learning models. Various models like Alex Net, COVID_MTNET, HSMA_WOA, etc. were used to aid in the main processing. They have used a dataset of around 15,477 chest X-Ray images for model training and evaluation containing three cases i.e., Covid-19 patients X-ray images, Normal people X-ray images and Pneumonia patient X-Ray images. The results show that this EDL-Covid can detect COVID-19 cases with good promising results of 96% sensitivity and with an accuracy of 95%

2.3 COVID-19 Detection Using Deep Learning Methods, Mehmet Sevi, İlhan AYDIN, IEEE 2020

The authors used four models CNN, VGG16, VGG19, and InceptionV3, and the performance of each model is tested and found out that VGG16 and VGG19 performed well as compared to other models. Data set is collected from universities and consists of COVID-19 positive cases, healthy patients, and chest radiographs of viral pneumonia patients. The data set includes chest X-ray images of a total of 657 images (219 COVID-19 patients, 219 healthy patients, and 219 viral pneumonia patients). A total of 657 chest X-ray images have been examined for the diagnosis of COVID-19 using deep learning methods and found out that VGG19 is most successful and gives a higher accuracy rate of 95% while InceptionV3 is the most unsuccessful method for a given dataset.

2.4 Covid-19 Classification Using Deep Learning in Chest X-Ray Images, Zehra KARHAN, Fuat AKAL, IEEE 2020

The authors used transfer learning model of ResNet-50 based of pre-trained convolutional neural network on chest X-ray images. Data set created from different sources and they are Italian Society of Medical Radiology (SIRM) dataset Corona Virus open-supply shared statistics set, statistics set created through compiling recognized photos from articles, Chest x-ray photos statistics set. Classification of Covid-19 cases was performed using the ResNet-50 model and achieved 99.5% classification accuracy which can help in clinical practice and also used in situations where possibilities are insufficient (RT-PCR test, doctor, radiologist).

3. CONCLUSIONS

The Covid-19 pandemic has affected every person and has caused very major disturbance to the healthcare systems particularly throughout the world. Hence, the early detection of this disease is necessary for curbing its exponential growth rate thus resulting in the prevention of this rapidly growing disease which now is becoming more dangerous because of the virus taking further mutations like alpha, beta, delta and the newer omicron variant which has 26 unique mutations and are less effective to vaccine antibodies. The main purpose of this

paper is to study and understand the alternate methods for the early and accurate detection of this Covid-19 disease using Chest X-Rays and CT scans. Using the help of artificial intelligence techniques, the detection of Covid-19 disease can be carried out in a cheap, fast and effective way. These models showed very promising accuracies which were particular based on CNN based algorithms. But the problem with these earlier models is that there were limited number of datasets available for the training and testing of models due to which the efficiency of the models could not be evaluated. Also, we found out that by increasing the number of layers in the network doesn't improve the accuracy of the model. Instead, we found that transfer learning-based approach proved to be very promising and had accuracies closer to 99%. In future works for developing a more efficient and accurate detection model larger dataset should be used for training the model combined with some feature extraction methods like HOG. Also, image augmentation should be carried out for further improving the model efficiency. Finally, compared to the current standards used for detection i.e., RT-PCR tests is a very time-consuming process due to this an alternate method needs to be found out for the early detection of this disease.

REFERENCES

- [1] B. K. Umri, M. Wafa Akhyari and K. Kusriani, "Detection of Covid-19 in Chest X-ray Image using CLAHE and Convolutional Neural Network," 2020 2nd International Conference on Cybernetics and Intelligent System (ICORIS), 2020, pp. 1-5, doi: 10.1109/ICORIS50180.2020.9320806.
- [2] S. Tang et al., "EDL-COVID: Ensemble Deep Learning for COVID-19 Case Detection From Chest X-Ray Images," in IEEE Transactions on Industrial Informatics, vol. 17, no. 9, pp. 6539-6549, Sept. 2021, doi: 10.1109/TII.2021.3057683.
- [3] M. Sevi and İ. AYDIN, "COVID-19 Detection Using Deep Learning Methods," 2020 International Conference on Data Analytics for Business and Industry: Way Towards a Sustainable Economy (ICDABI), 2020, pp. 1-6, doi: 10.1109/ICDABI51230.2020.9325626.
- [4] Z. KARHAN and F. AKAL, "Covid-19 Classification Using Deep Learning in Chest X-Ray Images," 2020 Medical Technologies Congress (TIPTEKNO), 2020, pp. 1-4, doi: 10.1109/TIPTEKNO50054.2020.9299315.