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A Deep Convolution Neural Network for Detection Covid-19 and Pneumonia Based on the Xception and Resnet50v2 Algorithm

Kaushik Kondu[1], A. Prerana[2], K. Naga Sailaja[3]
[1, 2]*Department of Electronics and Computer Engineering (ECM),* [3]*Assistant Professor, Sreenidhi Institute of Science and Technology, Hyderabad, Telangana, India*

Abstract: ***COVID-19 or Corona Virus Disease – 19 is a very critical and life taking disease. As of today, the virus has taken 62, 00, 000 over lives. Since its first public discovery on a wider scale many Scientists and researchers have built the system and methodologies for predicting the infection or detecting the damage done by the infection. A few of the many ways of determining the COVID-19 infection is by analyzing the X-ray images of the Chest.***

Due to a huge number of people being affected by this virus, it would take a lot of time to and difficulty to cross-check number of X-ray images, otherwise it could be done easily by developing an Artificial Intelligence network which does the job by itself. In the paper, our team have done training couple of Deep Convolutional Networks with a couple of training techniques for classifying X-ray images into three categories: normal, pneumonia, and COVID-19, based on two open- source datasets. We also classify whether the patient has pneumonia or COVID-19, as there is only a slight difference between them, due to which it becomes little tricky to confirm whether the patient has pneumonia or COVID-19.

To overcome this problem, we are classifying whether it is pneumonia or COVID-19 or just a regular flu. In this paper, we bring forward a couple of training algorithms that help the network to learn quick and in an effective approach when the dataset is unbalanced and our team proposes a new network which is a concatenation of two algorithms, Xception and ResNet50V2 networks.

The proposed network has achieved the accuracy by analyzing several features employed by the two networks. Our team has tested this network on 11180 images to generate the real accuracy the network is achieving in actual time. The average accuracy of the proposed network for detecting the cases of COVID-19 to be 99.56 and the overall accuracy for all categories to be 91.4.

Keywords: COVID; Pneumonia; X-ray; Artificial Intelligence; Datasets; algorithms; network

I. INTRODUCTION

This software provides a facility to upload the images and get to know who gets infected with Pneumonia or Covid. It uses machine-learning methods and computer vision to identify the infection of COVID-19 and Pneumonia using x-ray Pictures. First, we use Concatenated Convolutional Neural Networks to classify the images. We then compare a number of classification algorithms that use certain features to predict the disease shown in the x-ray image.

This has been developed to facilitate the identification of disease through x-ray images of the human chest. This would help to easily identify the disease and get reports quickly.

The main aim of this paper is to help in generating statistical reports for organizations like WHO (World Health Organization) and Indian Council of Medical Research (ICMR).

The main feature of this project is that the designer now functions as a problem solver and tries to sort out the difficulties that the medical organization faces. It uses the concatenated networks (ResNet and Xception) which results in more accurate outcomes. Efficiency of the model is high even though data is unbalanced or inconsistent

II. LITERATURE REVIEW

A wide number of researchers have contributed to the development of detection of various diseases using the X-rays. The previous papers by various researchers approached recognition of the disease using algorithms like Xception and ResNet50v2. We will go over prior work done in detection of COVID-19 and Pneumonia and these are some of the proposed systems which weanalyzed.

Table 1. Literature Survey

Title	Methods used	Demerits in the paper
Keles, A., Keles,M.B. & Keles, A.COV19-CNNet and COV19-ResNet: Diagnostic Inference Engines for Early Detection of COVID-19.	CNN and Resnet50V2	The algorithm takes more steps in pre-processing, clustering, classifying and extraction of Images.
Mohammad Rahimzadeh, Abolfazl Attar,A Modified deep convolutional neural network for detecting COVID-19 and pneumonia from chest X-ray images based on the concatenation of Xception and ResNet50v2	Xception and ResNet50v2 algorithms	The model contains a very minimum dataset and training and could have been improved further.
Mohammad Farukh Hashmi, Satyarth Katiyar, Avinash G Keskar, Efficient Pneumonia Detection in Chest Xray Images Using Deep Transfer Learning	Deep Learning Methods and Image Refining	The model only detects Pneumonia only and not COVID-19

III. ARCHITECTURE

When developing a model like this there are a few constraints that have to be kept in mind. The accuracy of the model should not be compromised in the making of the model. To function without compromising the accuracy and the requirements expected from the model. It has be prepared, trained and tested thoroughly. First we begin by obtaining the data-set which contains the X- ray images of the patients who have been infected by COVID-19, Pneumonia and also the normal conditions. Once the data-set is obtained it is time to prepare the Data-set accordingly and then train the algorithm with the present dataset. During the training process the dataset is split into 8 folds or 8 sets. Each set is used to train the algorithm and the accuracy for each set is measured. Once the training stage is completed the algorithm now moves to the testing stage. The algorithm is tested using the images present in the data-set. During the testing an image path is given as the input to the program and the output is given based on the class of the image.

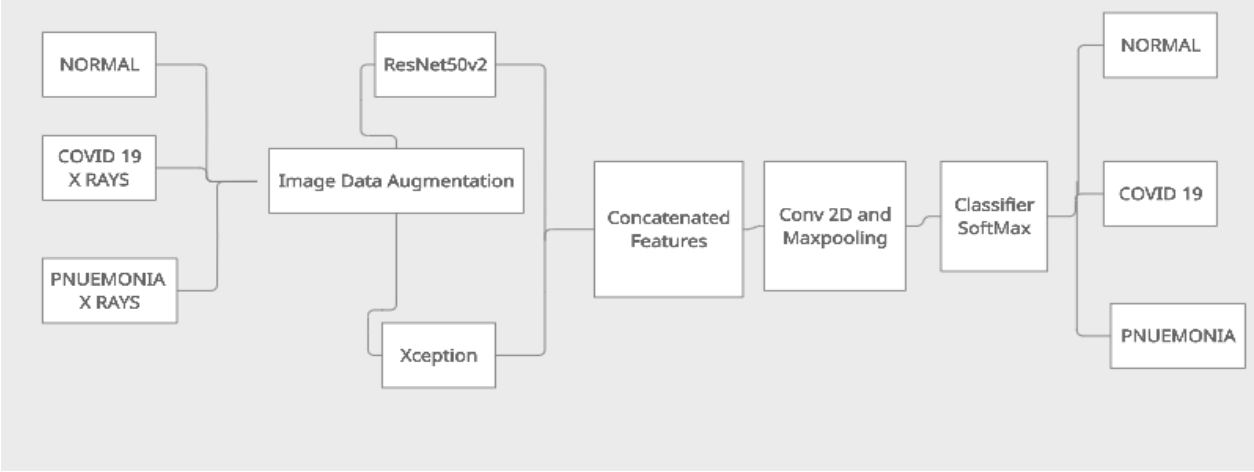


Fig 1 : Architecture of the proposed system

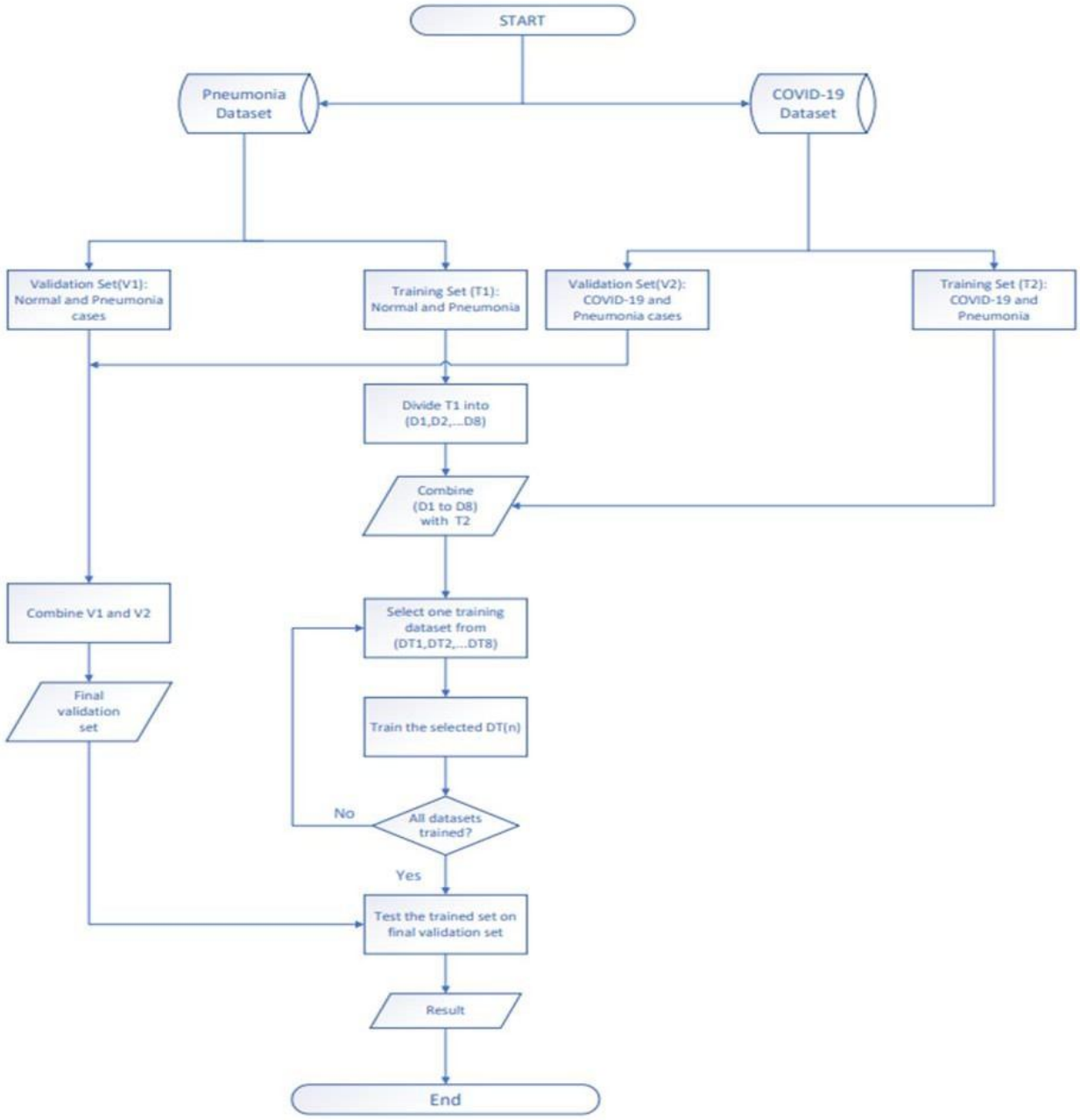


Fig 2 : Data Flow Diagram for the model.

IV. METHODS

There are plenty of existing system that helps us in detecting Pneumonia, COVID-19 individually by using the X-ray images like Alex Net, VGG16, VGG19 and ResNet50 [1]. The existing systems are normal neural network models, accuracy of the model depends on the training data being used, a CNN to segregate and predict the infusion of COVID-19 using lung Computed Tomography scan to detect COVID-19 and segment the lung masses caused by the Coronavirus using 2D and 3D images[3]. COVID-Net uses a lightweightresidual projection expansion projection extension (PEPX) design pattern to investigate quantitative analysis and qualitative analysis [4]. In a different paper, already tutored InceptionV3 ,ResNet50, and ResNetV2 Inception models are using along the transfer of learning techniques to classify Chest radio graph pictures of normal occurrences and corona virus classes. In the proposed system we use the concatenation of two algorithms namely ResNet50v2 and Xception.

The ultimate goal of the new suggested system is for developing a design with improved functionalities. The suggested model should avoid the hindrances faced in the previous systems. The design gives higher accuracy also decreases the error rate. The previous system have various demerits and more hurdles in order for better functioning of the design. The suggested design works to eradicate and decrease the hurdles to a certain level.

V. METHODOLOGY

The research employed a quasi-design. The design of the quasi-experiment is simple. The data which is obtained from the datasets are run through a filter to filter out unwanted data. The Aim was to process the data-sets, train the algorithms with the required data-sets and the verify it for the result.

The total number of X-ray Images used are 11180. Out of all the images present. We have divided the images into two stages. Images that are used to train the data, Images to evaluate the trained data. During training the data we have further divided the images into multiple folds and processed each fold at a time. We have evaluated the results for each fold in order to understand the training methodology and verify if the algorithm is giving the expected results.

Analysis of this data using the test data of learning outcomes i.e. the validity test, reliability test. Reliability test was used to determine the level of the feasibility of the model, if the value is obtained high or reliable then the model can be trusted. We have also evaluated the recall, accuracy and specificity for both the network and also for the concatenation of the networks. This helps us in understanding the accuracy of the model for each network along with the combined accuracy.

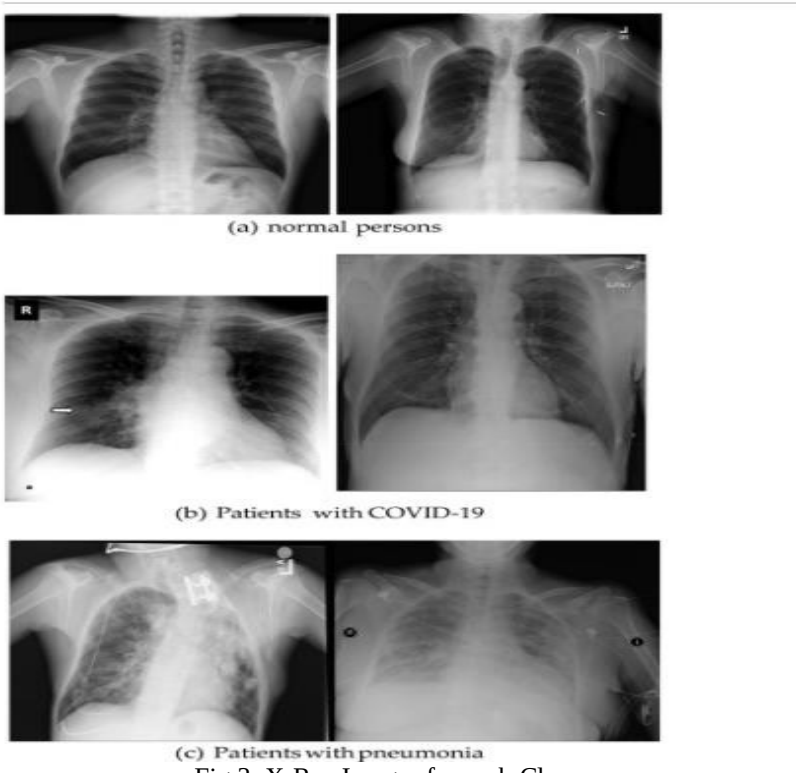


Fig 3: X-Ray Images for each Class

VI. RESULTS

The aim was to devise a system that can detect the infection of COVID-19 and differentiate it with Pneumonia and normal conditions by processing an X-ray Image. The model has proven to be matching with the expected result.

We have verified this network on 180 cases of corona virus, 6000 cases of pneumonia, and 5000 normal cases. The cause for having less training data compared to the validation data is that We had less occurrences of corona virus in comparison with many normal and pneumonia cases. To solve this issue, we have divided our pictorial data set for training in 8 distinct folds. Our team has tested the design using the rest of the available data so that our tutored network final result would be clear. It is noticed that exceptionally, in fold3, we had 30 cases of corona virus for validation, and 150 Other cases were allocated to train

The trained model learns all different features extracted from different x-ray images using concatenated networks of Xception and ResNet 50v2.If any Known X-ray is given to model it will predict that image according to extracted features. If the extracted feature from the X- ray image given is similar to class-0, it will predict as Covid else if the extracted features are similar to class-1, it will be predicted as Normal else it will predict as pneumonia.

NETWORK TYPE	COVID	PNEUMONIA	NORMAL
Concatenated	99.504506	91.596034	91.712830
ResNet50v2	99.256752	90.074160	90.254665
Xception	99.477963	91.521711	91.622580

Table 2 : Accuracy Values for Three Networks

VII. CONCLUSION

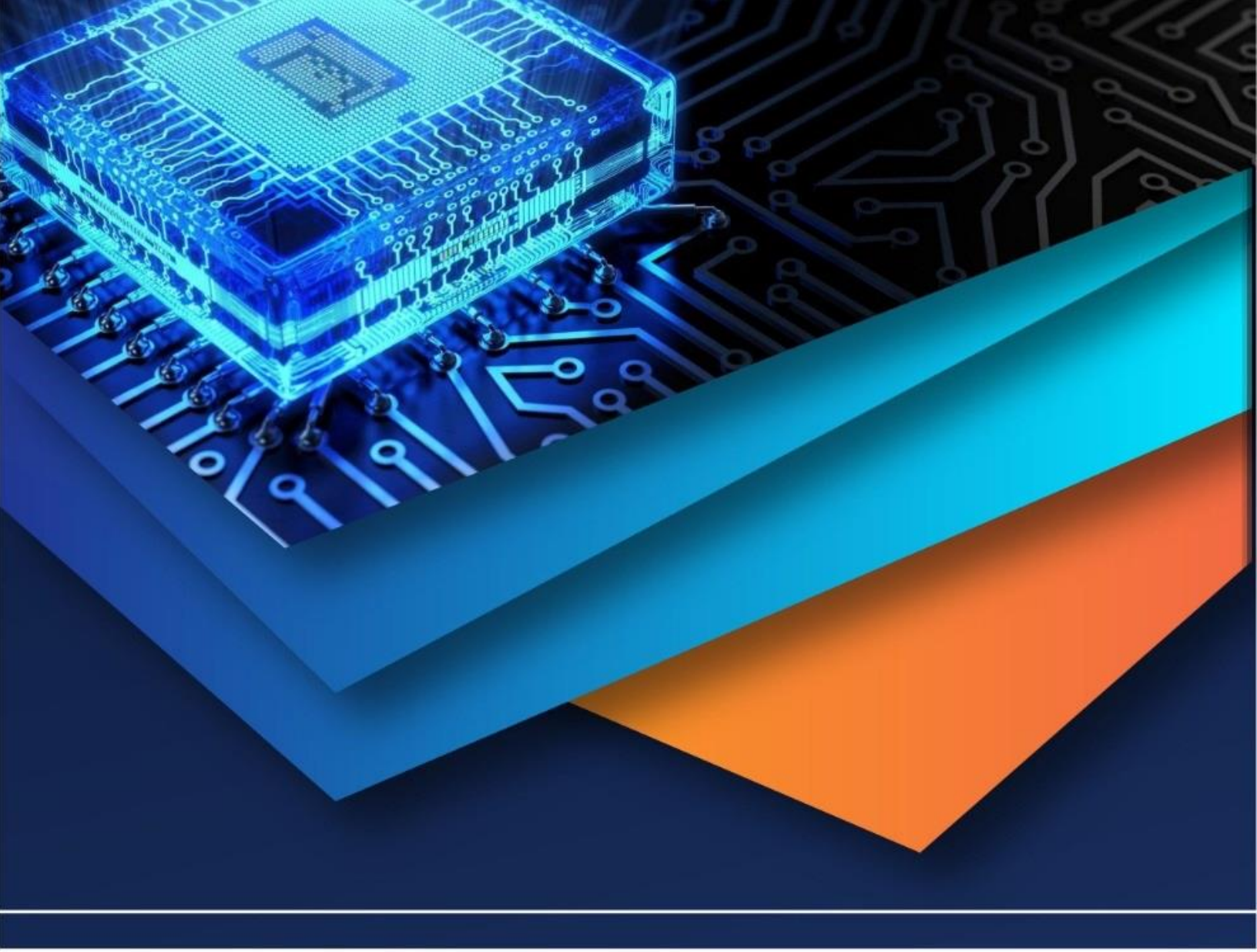
This application provides a place to upload X-ray image of a human chest which will then check whether the person is diagnosed with COVID-19 or Pneumonia. It has been developed with the exception of scalability and in a modular manner. All modules in the system are tested with valid data and invalid data and everything works successfully. Thus, the system has achieved all the identified objectives and is able to replace the existing system. Obstacles are met and successfully overcome. The plan is designed as determined in the design phase. It provides a great idea for making a complete application that meets the needs of the user. It is also very flexible. Verification tests performed have significantly reduced errors. Provisions have been made for software development. The app has been tested with live data and has yielded a successful result. So, the software seems to work well.

VIII. LIMITATIONS AND FUTURE STUDIES

The limitations of the proposed design can be adjusted with minor changes in the future. The First limitation being the lack of data-sets for COVID-19. There are only a few data-sets for COVID-19 whereas we can find numerous image data-sets for Pnuemonia or normal lung conditions. If the data-sets are found then one can easily train the data with more Images.
The future scope for this model would include more number data-sets which can increase the scope for testing and training.

REFERENCES

[1] Keles, A., Keles, M.B. & Keles, A. COV19-CNNet and COV19-ResNet: Diagnostic Inference Engines for Early Detection of COVID-19. Cogn Comput (2021).
[2] Mohammad Farukh Hashmi, Satyarth Katiyar, Avinash G Keskar, Efficient Pneumonia Detection in Chest Xray Images Using Deep Transfer Learning. Deep Transfer Learning. Diagnostics 2020.
[3] Rohit Kundu, Ritacheta Das, Zong Woo Geem ,Gi-Tae Han,Ram Sarkar Pneumonia detection in chest X-ray images using an ensemble of deep learning models. PLoS ONE 16(9): e0256630(2021).
[4] World Health Organization, “Antigen-detection in the diagnosis of SARS-CoV-2 infection using rapid immunoassays,” 2020. WHO Publications,6 October 2021 COVID-19: Laboratory and diagnosis.



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