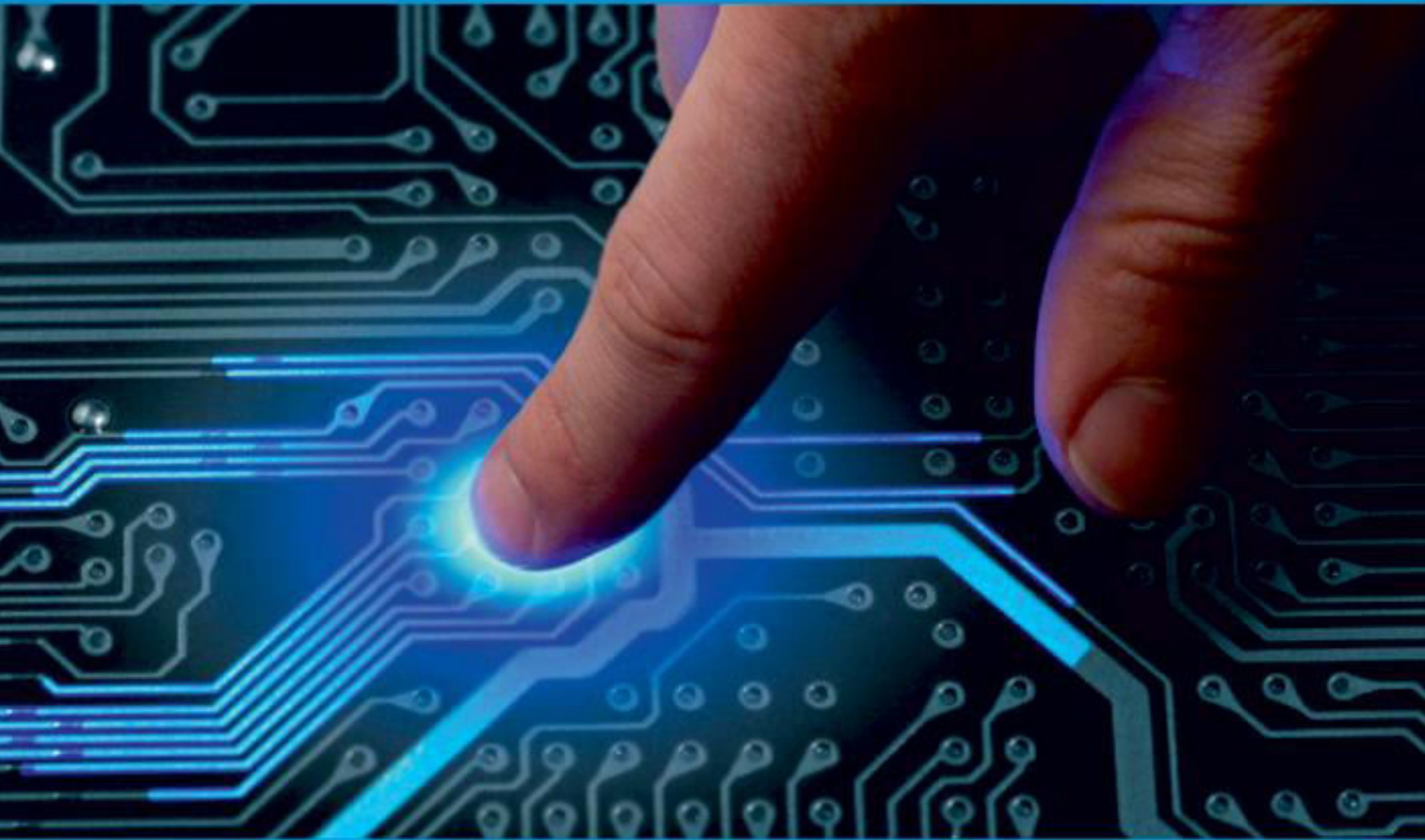
IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 10, Issue 6, June 2022

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.165

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 6, June 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1006143|

Classification of Chest Pneumonia from X-Ray and CT Images using CNN Models

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ABSTRACT: Inflammation of the lungs brought on by bacteria or viruses is known as pneumonia. Many individuals are affected, particularly in poor and impoverished nations where pollution, unclean living conditions, overcrowding and a lack of medical infrastructure are frequent.As the name suggests, pleural effusion is a disorder in which the lungs become engorged with fluid, making it difficult to breathe. Early detection of pneumonia is critical for efficient treatment and a better prognosis. Usually, chest X-rays are utilized to determine whether a patient is suffering from pneumonia. However, interpreting chest X-rays is challenging and subject to individual interpretation bias. The accuracy of classification was improved using the CNN algorithm and several data augmentation strategies that have been discussed. Several benefits will arise from this, including an enhanced CNN model's accuracy in validation and training.

KEYWORDS: Pneumonia, Overcrowding, Classification, CNN,Characterization.

I. INTRODUCTION

Because of the enormous amounts of data, the demand for complicated skills, and the need for more accuracy while requiring less time complexity, deep learning (DL) approaches are outpacing the most prevalent classical neural system methods. Pneumonia, for example, is rapidly expanding and presenting a serious hazard. As a result, it is difficult to create a country free of sickness. The World Health Organization (WHO) estimates that 4 million people die each year as a result of airborne infections that originate in nuclear families. Pneumonia is a disease that affects the majority of the population. More than 160 million individuals, including children under the age of 5, were determined to have pneumonia, according to a study. A lack of resources and employees might exacerbate the situation in these areas. Pneumonia was shown to be widespread throughout the continent in a study conducted by the World Health Organization. For a wide range of individuals, this strategy is one of the most effective strategies to cure pneumonia. These disorders were previously studied using a variety of models and architectures. Many trials were conducted in order to achieve the best outcomes from the other ways. However, it takes a long time to detect and diagnose these disorders. Because artificial neural networks (ANNs) are so powerful and adaptable in deep learning, this technique is the most often used. There is now a new key model in place that combines excellent collection efforts with a robust neural framework in order to prevent all types of difficulties. It was obvious that in order to diagnose pneumonia and subsequently categorize the photos, a neural network would have to be constructed. Convolutional neural networks (CNNs) employ varying numbers of neurons to "convolve" on a picture and extract the appropriate characteristics from it. This approach is based on this concept. In many areas, this study demonstrates a high degree of practicality, such as the coordination and clarification of the combination's aim and the improvement of the frameworks for diagnosing pneumonia. It has recently been normal practice to employ CNN-based important learning estimates for corrective image orders, even though these identical framework structures exist in the top CNN-based action techniques. There is no arguing with the proposals for corrective picture assessment that include U-Net, Seg-Net, and Cardiac-Net. Reinforcement learning (RL) was utilized to discover the best framework hyper parameters during preparation for formative calculations. There's no doubt that these tactics involve a lot of forethought, no matter how you look at it. To address the issues raised by the pneumonia request, our evaluation employed a different approach and came up with a potentially useful framework model. DNNs, on the other hand, tend to be less popular since they lack the capacity to handle 2D and 3D images and dynamic 2D sections utilizing multiple learning techniques. It features a large pooling layer structure that is plausibly active and healthy, but has poor links to linked responsibilities.

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II. LITERATURE REVIEW

A literature survey is a compilation of all of the relevant books on a certain topic. Researchers and academics' work may be evaluated using this approach to discover, judge, and make meaning of it. The purpose of this section is to demonstrate how our study fits into the existing body of knowledge. Before beginning a new inquiry, researchers should do a literature review to familiarize themselves with the most recent findings in the subject. We may learn more about our issue by doing a literature survey, which will help us discover what we already know and what we don't know. There are a variety of sources that may be used in a literature review: academic and professional journals, books, and the Internet. A literature review of several articles we've studied and utilized for our study is discussed in this chapter.

In the year 2021, Rohit Kundu et al. [1] proposed a method of Pneumonia detection in chest X-ray images using an ensemble of deep learning models. In this study, they havedesigned an ensemble framework of three classifiers, GoogleNet, ResNet-18, and DenseNet-121, using a weighted average ensemble scheme where in the weights allocated to the classifiers are generated using an ovel scheme.

In year 2020, M F Hashmi et al. [2] proposed a method in detecting pneumoniaeffectively using chest X-ray images using Deep Transfer Learning. An optimum solution for the detection of pneumonia from chest X-rays is proposed in this paper. Data augmentationwasusedtoaddresstheproblemofthelimiteddataset,andthen,state-of-the-artdeeplearning models were fine-tuned for pneumonia classification. Then predictions from thesemodelswere combined,usinga weight classifierto computethefinal prediction.

In the year 2020, Tawsifur Rahman et al. [3] proposed a method of transfer learningwith deep convolutional neural network (CNN) for pneumonia detection using chest x-ray (2020). In this work, chest X-ray pneumonia database was used, which comprised of 5247chest X-ray images with resolution varying from 400p to 2000p. Out of 5247 chest X-rayimages, 3906 images are from different subjects affected by pneumonia and 1341 images arefromnormal subjects. This datasetwas segmentedintotraining and test set.

In the year 2020, Vikas Chouhan et al. [4] used the AlexNet, DenseNet121, InceptionV3, ResNet18 and GoogLeNet architectures. The diagnosis is based on a classifying committee composed of CNN models. Each model was part of the hypothesis of inducing the diagnosis through a vote. The majority vote, in their work, was used to combine the results of the classifiers. Therefore, the diagnosis corresponds to the class that achieved the highest number of votes. This approach obtained an average test time per image equivalent to 161 ms for the model. In addition, they achieved high percentages of classification for X-ray images. This shows that deep networks are an area of research that can help diagnose pneumonia.

In the year 2020, Ken Jon M et al. [5] proposed a method ofovercoming the vanishing gradient problem of recurrent neural networks. The author used theMATLAB version 2018 software to train and built an artificial neural network from thecollected dataset. The “Adam optimizer” was used to stabilize the training process. A total of90 recurrent neural networks (RNN) models were developed and investigate the effects of thefollowing methods applied in this type of text classification problem. Deep learning modelswereevaluated bycomparing theclassification accuracy resultsof theRNNmodels.

In the year 2020, Khalifa NEM et al. [6] proposed a method of deep learning modeland machine learning methods for the classification of potential coronavirus treatments on asingle human cell. The introduced model consists of three phases. The first phase is thepreprocessing phase that converts the numerical values of the 1024 cell features to a digitalimage. The second phase is the training phase based on machine learning algorithms fornumerical features. The third phase is the testing phase and the evaluation of proposed modelaccuracyfortreatment classification and prediction.

III. LITERATURE SUMMARY

We're interested in finding out more about deep convolutional neural networks and if they can be utilized to detect chest pneumonia based on the reviews in these articles. We don't have to make any decisions or utilize any human techniques while doing jobs that are meant to be automated. A chest X-ray may reveal whether or not a patient has pulmonary pneumonia. Results for supplied datasets are extremely accurate when pre-trained models using transfer learning are utilized. On the basis of these findings, it seems that deep learning using CNNs may have a significant influence on the automated identification and extraction of crucial characteristics from X-ray pictures, which is critical for determining what's wrong with the chest in cases of respiratory illness like pneumonia. Scientists have used the CNN approach to analyze chest X-rays and extract more useful information that may be used by algorithmic

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classification systems.

IV. EXISTING SYSTEM

1. ManualclassificationofchestpneumoniabasedonchestX-rayorCTscan:
Radiologists use chest scans based on chest X-rays or CT scans to tell the difference between a person with pneumonia and a healthy person. But this method has its own problems, like a lack of experts (radiologists) who can read the results and the fact that reading thousands of x-rays is a lot of work. AI-driven models are used to solve these problems.

2. AlexNet:
Alex Krizheusky came up with the AlexNet deep learning model. It uses Rectified Linear Unit (ReLU) instead of the sigmoid function that is used in most neural networks. In the 2012 ImageNet Large Scale Visual Recognition Challenge, this model was right 84 percent of the time (ILSVRC). It only has eight layers. Because the model isn't very deep, it's hard to scan for all the features, so the models aren't very good. Because of this, it takes more time to get more accurate results.

3. ResNet34:
The ResNet34 was the first ResNet architecture. To turn a plain network into a residual network, shortcut connections were added to the plain network. The VGG neural networks (VGG-16 and VGG-19) were used as a model for the plain network. The convolutional networks in the VGG neural networks have 3x3 filters. But ResNets have fewer filters and are easier to understand than VGGNets. The 34-layer ResNet can do 3.6 FLOPs, while the smaller 18-layer ResNet can only do 1.8 bn FLOPs.

ProblemStatement
In the past 20 years, medical imaging, especially radiology using x-rays, has gone through a huge change thanks to scientific research. But when professionals talk to patients and try to figure out what's wrong with them, they find some important problems. A group of professionals slows down the process of figuring out what's wrong and how to treat it, so patients have to wait for a long time. So, it gives doctors more work to do, and since they are still people, they still make mistakes. Doctors often make decisions based on their gut feelings and years of experience instead of the information-rich data that is hidden in the data set. This practice leads to biases, mistakes, and high medical costs that hurt the quality-of-care patients get.

Proposed Solution
Deep learning makes it possible to make end-to-end models that use input data to get promised results without any manual work. In this project, we have come up with a way to automatically predict chest pneumonia using pre-trained transfer models and X-ray images of the chest. To do this, we used SVM and CNN models that had already been trained to make more accurate predictions for two different sets of X-ray images and CT-scans from healthy and pneumonia patients. The proposed models are built from start to finish without having to manually extract, select, and classify features. Radiologists have been asked to use a high-accuracy decision support system to automatically diagnose and find people who might have chest pneumonia.

Objectives
The main goal of the project is to make a system that can classify pneumonia and then use that classification to look at how well a few deep CNN models work. The following goals have been set up to make this happen:

- To use a deep learning neural network to pull features from chest X-rays and CT scans of people with chest pneumonia.
- To come up with a way to find pneumonia early.
- To make a computer-aided diagnosis system that uses chest X-ray and CT images to automatically find pneumonia by changing the image size, the batch size, and the number of epochs.

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V. SYSTEM DESIGN

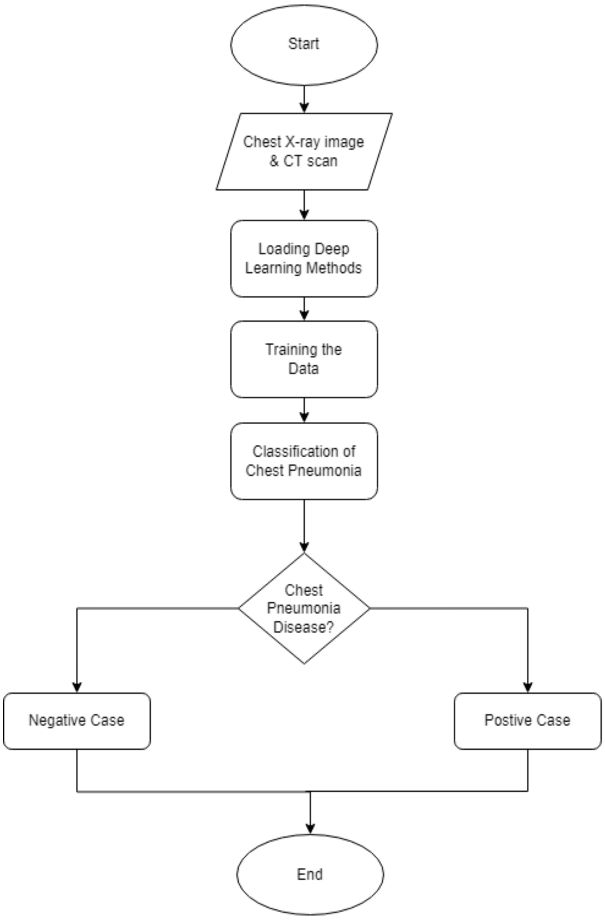

Fig 1: Flow diagram

We have used a dataset of chest pneumonia X-ray images and CT scans from the Kaggle dataset repository to test how well high-tech, pre-trained Convolutional Neural Networks can automatically diagnose chest pneumonia from chest X-rays. Implementation of pre-trained transfer models, such as Inception, Xception, VGG16, and RestNet50, on chest X-ray images that pay attention to deep convolution neural network was suggested as an unintentional way to find pneumonia, which is depicted in the fig.1. To reach these goals, a sequence of 116 pneumonia and 317 regular chest X-ray images is saved and then used by 2-dimensional global mean pooling sheet and completely linked sheet by ReLU activation function for training stage. Finally, we defined the result as cataloguing X-ray images as positive or negative for pneumonia disease.

VI. METHODOLOGY

Themechanismofclassificationofpneumoniaandperformanceanalysisoffew DeepCNNmodelsbased on classification is detailed in this section.

- Collecttherequiredimagedatasetandperformthepre-processingofimagescollectedinorder to bringthe images inparticulardimensionsrequired bythe model.
- Oncethepre-processing isdone,thedataissubjectedtosegmentation.
- Afterthesegmentation,thetrainingdataisusedtotrain themodelinall aspects.
- Eachmodelistrainedandtestedindividuallyforthecollecteddatasetbasedonwhichthemodel givingbetteraccuracyis identified.
- Atlast,themodelpredicts whetherthe personisaffected withpneumonia or not.

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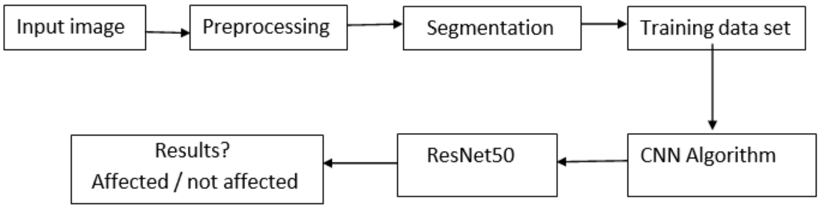

Fig 2:Methodology

VII. RESULTS AND DISCUSSION

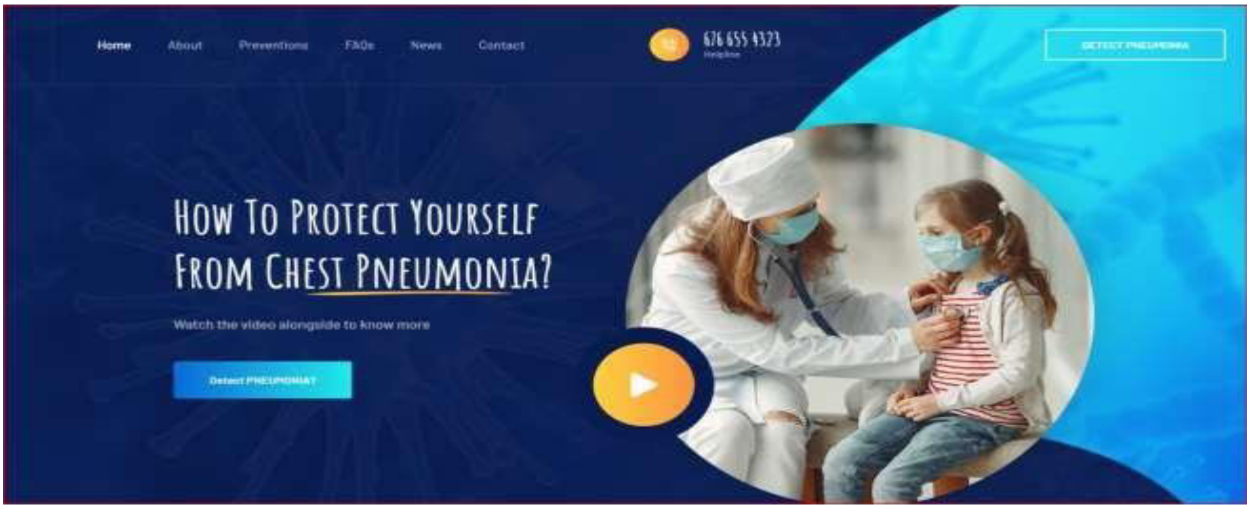

Fig 3:Home Page

Description: Fig.3 showshome page where there is an introduction on pneumonia and information regarding prevention from pneumonia, frequently asked questions and latest news.The "detect pneumonia" optionis used to diagnose the disease.

Fig 4:DetectPneumonia

Description: Fig.4shows pneumonia detection page where chest X-ray and CT scan imagesare uploadedto obtain theresults.

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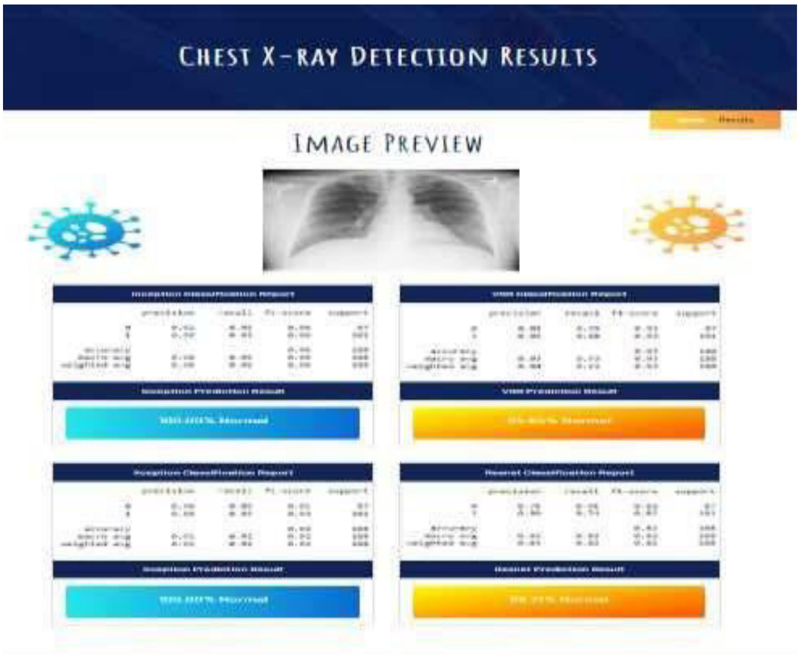

Fig 5:Chestx-ray result–NotAffected

Description: Fig.5 shows chest x-ray detection results; here the depicted result is "Normal" because the patient whose chest x-ray we have uploaded is not affected by pneumonia.

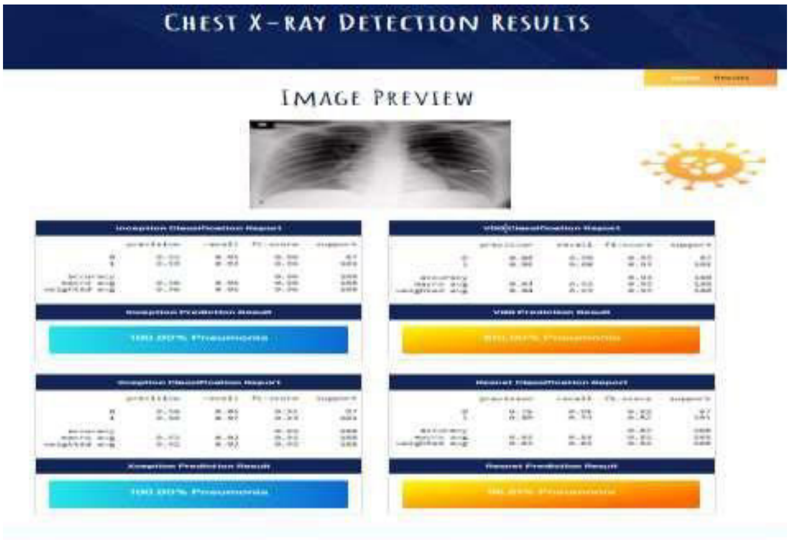

Fig 6:Chestx-rayresult–Affected

Description: Fig.6 shows chest x-ray detection results; herethe depicted result is "Pneumonia" because the patient whose chest x-ray we have uploaded is affected by the disease.

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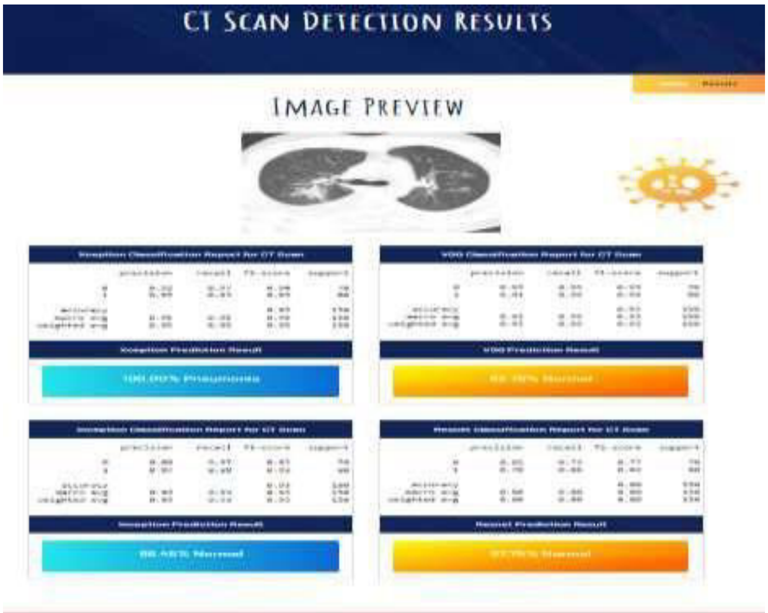

Fig 7:CTscanimage result –Notaffected

Description: Fig.7 shows CT scan detection results; herethe depicted result is “Normal” because the person whose CT scan image we have uploaded is not affected by the disease.

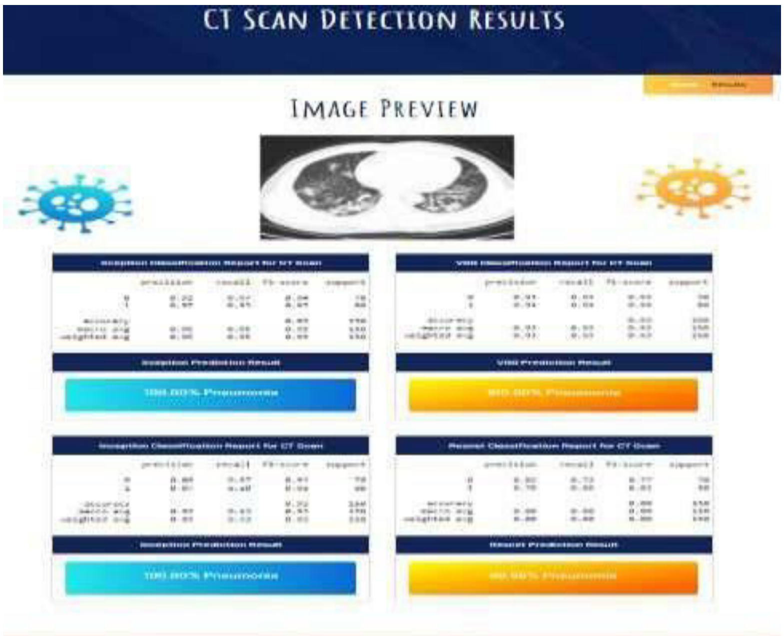

Fig 8:CTscanimage result –Affected

Description: Fig.8 shows CT scan detection results; herethe depicted result is “Pneumonia” because the person whose CTscan image we have uploaded is affected withpneumonia.

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VIII. CONCLUSION AND FUTURE SCOPE

Thisis a consolidation of work in the field of prediction of chest pneumonia using CNNmodels InceptionV3, Xception, VGG19 and ResNet50. Chest pneumonia forms a vital part ofmortality rate. The UNICEF says that India is second in the number of people who die from pneumonia. To find out if someone has chest pneumonia, they need to take a number of lab tests and imaging studies. In this paper, it is shown how easy it is to tell the difference between real and fake cases of pneumonia from a small set of X-ray and CT scans.Automationappliedto thefield ofprediction canlead tohigh benefitinthe healthcaredomain. The literature review assisted us in comprehending the existing technology shortcomings. Theproblemswereformulatedwherethegapswereidentified.Forthedefinedproblem,wepresented a set of objectives and methodology to be followed to predict the diseases. Varioustechnologieslike,Jupyternotebook,KerasandTensorFlowareusedinthesuggestedapproach.

In the future, we may look into ways to improve the quality of images, such as making the contrast stronger or taking other pre-processing steps. We might also think about segmenting the lung image before classifying it to help the CNN models get better at extracting features. Also, since four CNN models are needed to train the proposed ensemble, the cost of computation is higher than that of the CNN baselines that have been developed in studies. In the future, we may try to cut down on the amount of computing needed by using methods like snapshot ensembling.

REFERENCES

[1] RohitKundu, Ritacheta Das,Zong WooGeem,Gi-TaeHan,RamSarkar.“PneumoniaDetectioninchestX-rayimagesusinganensembleofDeepLearningmodels”CreativeCommonAttribution. (2021).

[2] Mohammad Farukh Hashmi, Satyarth Katiyar, Avinash G Keskar, Neeraj Dhanraj Bokde andZong Woo Geem. “Efficient Pneumonia Detection in Chest X-ray Images Using Deep TransferLearning”MDPI,Basel,Switzerland. (2020).

[3] Tawsifur Rahman, Muhammad E. H. Chowdhury, AmithKhandakar, Khandaker R. Islam,Khandaker F. Islam, Zaid B. Mahbub, Muhammad A. Kadir, Saad Kashem “Transfer Learningwithdeep convolutionalneural network forpneumonia”. (2020).

[4] Vikash Chouhan, Aditya Khamparia,Deepak Gupta, Prayag Tiwar, Catarina Moreira,RobertasDamaševičiusandVictorHugoC.deAlbuquerque“Anoveltransferlearningbasedapproachforpneumonia detectioninchestx-rayimages”MDPI,Basel,Switzerland.(2020).

[5] KenJonM.Tarnate,Dr. MadhaviDevaraj,JoelC. DeGoma “Overcomingthevanishinggradientproblem ofrecurrent neural networks”. (2020).

[6] NourEldeenMKhalifa, MohamedHamed NTaha, Gunasekaran,MohamedLoeyManogaran,MohamedLoey.“Adeep learningmodel andmachinelearningmethods fortheclassification ofpotential coronavirus treatmentson asingle humancell”.(2020).