PNEUMONIA DETECTION FROM CHEST X- RAY USING CNN AND DEEP LEARNING ALGORITHM

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Abstract : Pneumonia is a bacterial infection that causes inflammation in the lungs. Early diagnosis is a key aspect in ensuring a successful treatment process. A skilled radiologist will usually diagnose the condition using chest X-ray images. Pneumonia affects a large number of people, particularly in developing and impoverished countries, where pollution, unsanitary living conditions, and overcrowding are all too widespread, along with a lack of medical infrastructure. Pneumonia is a bacterial infection that causes inflammation in the lungs. Early diagnosis is a key aspect in ensuring a successful treatment process. A skilled radiologist will usually diagnose the condition using chest X-ray images. Pneumonia affects a large number of people, particularly in poor and impoverished countries where pollution levels are high and living conditions are unsanitary. For some reasons, such as the presence of diseases that are obscure in chest X-ray pictures or can be confused with other conditions, diagnosis can be subjective. As a result, computer-assisted diagnostic systems are required to guide physicians. In this study about automated computer aided detection of pneumonia using deep learning were discussed and tabulated results for detection of pneumonia, as well as conclusions and future work.

Pneumonia produces pericardial effusion, which is a condition in which fluids fill the lung and create breathing problems. It is critical to diagnose pneumonia early in order to receive curative treatment and boost survival chances. The most common method for detecting pneumonia is chest X-ray imaging. However, examining chest X-rays is a difficult task that is vulnerable to subjective variability. We intend to develop a technique for detecting pneumonia using chest X-ray pictures in this project. When a data set of x-ray pictures was applied to the input, we used deep learning and a CNN-based algorithm to discriminate the forms of pneumonia with accurate locations.

Index Terms -Convolutional Neural Network, Deep learning algorithm , Chest X-ray dataset.

I. INTRODUCTION

Pneumonia is an acute pulmonary infection caused by bacteria, viruses, or fungus that infects the lungs and leads to inflammation of the air sacs as well as pericardial effusion, which is when the lung fills with fluid. It has been noted in[1] that the death ratio of children's due to pneumonia infection was 15%. The use of computerized tomography (CT), magnetic resonance imaging (MRI), or radiography (X-rays) to examine the lungs for diagnosis is common [2]. The lungs can be examined by X-ray imaging, which is a non-invasive and reasonably affordable procedure. Deep learning is a powerful artificial intelligence tool that helps solve a variety of difficult computer vision challenges.

For numerous image classification challenges, deep learning models, notably convolutional neural networks (CNNs) introduced in [1], were widely employed. However, such models work best when they are given a huge amount of data to work with. Such a large volume of labelled data is difficult to obtain for biomedical image classification challenges since it requires experienced doctors to classify time-consuming tasks [1]. Indoor air pollution is one of the leading causes of pneumonia in children. Under nutrition, a lack of safe drinking water, sanitation, and basic health services are other significant issues. A CNN method is described that can be identify whether or not a person is suffering from pneumonia[3]. Given merely the patient's chest X-ray, CNN architecture properly identify and diagnose viral, bacterial, fungal-caused, and community-acquired pneumonia [4]. Pneumonia is a bacterial, fungal, or viral infection that affects the lungs. It killed over 880,000 children in 2016, accounting for about 16 percent of the 5.6 million children under the age of five who died[5]. The majority of the victims were under the age of two. Early detection of pneumonia can help to save a person's life. Convolutional neural network models are presented for accurately detecting pneumonic lungs from chest X-rays, which can be used by medical practitioners in the actual world to treat

pneumonia [2]. The goal of the study [3] is to create CNN models from the ground up that could identify and hence detect pneumonic patients from chest X-rays with high validation accuracy.

Pneumonia is a bacterial or viral infection of the lungs. It mostly affects the Alveoli, which are little air sacs. Pneumonia causes a dry cough, chest pain, fever, and difficulty breathing. The patient is subjected to diagnostic tests such as chest x-rays, blood tests, and sputum tests in order to diagnose pneumonia. As a result, here developed a new model that uses a chest X-ray to detect pneumonia.

II. LITERATURE SURVEY

A novel diagnostic method based on chest X-ray images and Image Processing and Deep Learning techniques is suggested to detect Pneumonia. The method was put to the test on a well-used chest radiography dataset, and the findings show that the model is capable of being used in an automatic Pneumonia diagnosis system[1]. For pneumonia identification, a deep transfer learning algorithm was used. They used the weighted average ensemble technique in this case. The accuracy of the method provided in this article was roughly 98 percent[2]. The dataset is divided into three sections: train, test, and validation. There are 5856 normal and pneumonia images in all. CNN is a machine learning method that can predict whether or not a person is suffering from pneumonia.[3]

Primarily focuses on presenting the results of various simple CNN architectures and selecting the best architecture based on the best corresponding minimum loss and maximum accuracy, which will assist physicians and the medical world in correctly identifying and diagnosing viral, bacterial, fungal-caused, and community-acquired pneumonia using only the patient's chest X-ray[4]

A novel technique for detecting the presence of pneumonia in chest X-rays is proposed in Picture Handling Procedures. To identify pneumonia, first perform picture pre-processing, then apply image segmentation and thresholding algorithms, followed by contour detection[6]. A lightweight deep learning approach based on a transfer learning notion and a random search optimization technique is provided in this research. A pertained DenseNet-121-based feature extraction method and a DNN-based method with a random search fine-tuning strategy make up the approach[7]. The CNN model, implemented using Python programming and scientific tools were used as dataset provided by the Guangzhou Women and Children's Medical Centre, which is freely available on Kaggle. They resized the high-quality photos, which come in a variety of sizes. Because the source photos were RGB, they were reduced to 200x200 pixels and imported as grayscale[8].

This paper shows comprehensive outlook on the future of AI, drawing on micro, meso- and macro-perspectives[9]. Pneumonia Detection Using CNN based Feature Extraction aims to improve the medical adeptness in areas where the availability of radiotherapists is still limited by analysing observed the performance of various pretrained CNN models along with distinct classifiers[10].

III. METHODOLOGY

Now a day there are many methods for diagnosis of pneumonia like blood test, sputum test, pulse oximetry test but all these methods give inaccurate identification of pneumonia, the most widely used method is diagnosis of pneumonia using chest X-ray and MRI scan. If it is compared the CT-SCAN and MRI Imaging techniques, the MRI imaging cost is very high as compared to chest X-ray. However, the number of physician who examine chest X-ray is nominal as compared to 450 millions of people who affected by pneumonia. So here proposed to develop a system for pneumonia detection using chest X-ray images which employed deep learning and CNN based algorithm to differentiate the types of pneumonia with exact locations when x-ray images data set will be applied to the input and this implemented work will defiantly reduce the cost for the diagnosis and elaborate the new features while di-noising the patient. The main objective Using X-ray images detect the pneumonia.
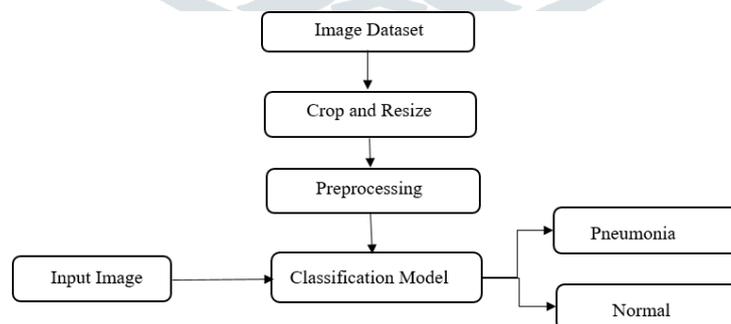
Block Diagram of Algorithm –

fig.1 block diagram of pneumonia using chest x-ray image

Steps-

☐ Apply real time image dataset.

☐ Apply Cropping and resizing operation to figure out the essential information. To remove unwanted information in given image, here we perform cropping operation. It also helps to reduce complexity of algorithm.

☐ In Pre-processing block, we can prepuces images in dataset.

☐ In classification module, we use Dense Net model and Deep learning methods.

☐ The results will be compared in terms of-

    1) Pneumonia detection accuracy.

IV. VRESULTS

In this section, the result of implemented CNN based model is presented. The dataset is downloaded from kaggle website, which is already split into three sections –training set, testing set and validation set. The evaluation and performance of model is analysed with training accuracy and loss, testing accuracy and loss. Training set contain 5234 of normal and pneumonia chest x-ray images which are given to train the model and testing set which contain 624 images are used to test the model. Here we gave 4 epoch and model shows training accuracy 88% with 29% loss and testing accuracy 91% with 22% loss. Here the results of implemented algorithm are tested by giving different image data set at the input having infected and no infection pneumonia images.
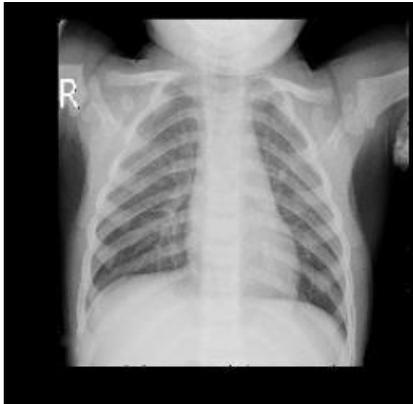

fig.2 input image applied to
the developed model (no infection)

fig.3 input image applied to the
developed model (no infected)

fig.2 and 3 shows the input image applied to trained model which is normal chest x-ray, the train sequence model compares the features of the applied image with the prediction value received by the train model and gives message that the person is safe and not infected by Pneumonia.

The message window shows the results as follows.
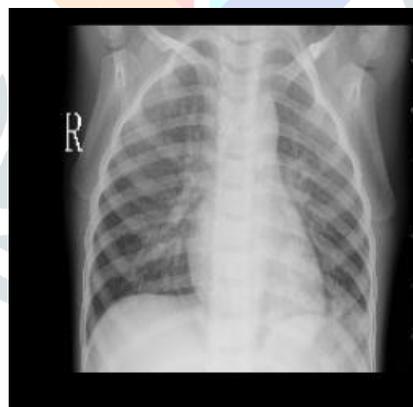
Person is Safe

fig.4 input x-ray image of pneumonic person

Person is Not Safe

fig.4 is chest x-ray image of infected person applied to the developed model then the model shows the result as the person is infected and not Safe. The message window shows the results as follows.

V. CONCLUSION

This paper describe the use of deep learning Densenet121 model to identify weather the person is infected with pneumonia or not by analyazing chest X-ray images. As per the results observed for different chest x-rays images the model presented gives the results with around 88% accuracy and hence it will be more benificial to identify the pneumonia infection with high accuracy.

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