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PNEUMONIA DISEASE PREDICTION USING CHEST X-RAYS USING DEEP CNN

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ABSTRACT

A number of different viral infections can culminate in pneumonia, a potentially fatal lung infection. Since that pneumonia and other lung disorders are closely related, diagnosing and treating pneumonia on chest X-ray images can be challenging. Convolutional Neural Network models,VGG16 which are pretrained CNN models,used in our proposal rather than freshly trained CNN models, have lately been used to improve the performance of numerous medical activities. Systems based on deep learning and image processing that can quickly process hundreds of CT and X-ray pictures will speed up the identification of pneumonia, including COVID19 and SARS, and will help with its containment. One of the most promising fields of study is medical image analysis, which offers tools for diagnosing and making judgements about a variety of illnesses. We compare current Deep Convolutional Neural Network architectures in this research for automatically binary classifying photos of pneumonia using fine-tuned versions of sklearn. The image chest X-ray and CT dataset was used to test. As a consequence, we may draw the conclusion that the fine-tuned versions of Sklearn and Keras function incredibly well, with an improvement in training and validation accuracy.

Keywords:
pneumonia, cnn, sklearn ,deep learning, image processing.

I) INTRODUCTION

One sort of lung infection that can affect either lung is pneumonia. There are several potential causes of this illness, including bacteria, viruses, and fungus. The patient experiences breathing difficulties because the infection causes the lung sacs to swell with pus or fluids. The majority of cases of pneumonia occur in emerging and poor nations, where factors such as overcrowding, pollution, and unhygienic environments make the problem worse and medical resources are in short supply. As a result, preventing the condition from turning deadly may depend on early identification and treatment. Epidemics and long-term illnesses have historically resulted in significant crises that took a long time to settle and killed a lot of people. Diseases that spread across communities over an extended period of time are referred to be epidemics or outbreaks. In actuality, the definition of an epidemic is the incidence of more occurrences of sickness, injury, or other health conditions than anticipated in a certain place or among a particular group of people within a specified period of time.Most of the cases make the claim that they have a common cause.Epidemics of pneumonia have happened before. A lung illness called pneumonia is most frequently brought on by a virus or bacteria. The air sacs in one or both lungs become inflamed due to the infection. The air sacs may get clogged with pus or liquid, leading to cough with phelgm or pus, fever, and breathing difficulties. It has earned the moniker "the old man's buddy" because it frequently reduces the amount of anguish experienced by persons who are already near death. Viral infections cause around one-third of pneumonia occurrences in adults. It often begins as an infection of the upper respiratory system that spreads to the lower respiratory system. Pneumonia can be brought on by the micro aspiration of contaminated secretions that damage the lower airways. The majority of germs reach the lungs by tiny aspirations of organisms that are present

in the nose or throat. It impairs the lungs while also harming other organs and interfering with other bodily processes. The following are a few pneumonia symptoms and warning indications:
1) Fever and cough.
2) Smoking and shortness of breath
3) Chest ache while talking deep breath.
4) Nausea.
5) Less body temperature.

II) LITERATURE SURVEY

Several researchers have automated the diagnosis of lung infections and illnesses using chest X-rays during the last ten years using deep learning. Liang and Zeng[1] have suggested a new deep learning architecture that combines residual thought and dilated convolution to categorise child pneumonia picture bay. The suggested technique utilised residual structure and dilated convolution, respectively, to address the issues of over-fitting, deterioration of the depth model, and loss of feature space information induced by the increase in depth of the model. effectively addresses the issues of poor picture quality, partial occlusion, and/or overlap in the inflammatory region of chest X-rays.The work presented in (Jaiswal et al., 2019), a deep learning-based strategy is proposed for locating and identifying pneumonia in chest X-ray pictures. The segmentation model for identification is based on Mask-RCNN, which may include both global and local information. A Deep Learning framework has been suggested by Bhandary et al[4]for studying lung cancer and pneumonia. They really suggested two distinct deep learning methods, the first of which was Modified AlexNet. Support Vector Machine was used to categorise chest X-ray pictures into the normal and pneumonia classes, and its performance was verified using data from other pretrained deep learning models. A method for detecting consolidations in chest x-ray radiographs using Deep Learning, particularly Convolutional Neural Networks, is provided in the work of Behzadi-khormouji et al.[5],enabling radiologists in making more accurate diagnoses.To increase the models' accuracy,they employed a Deep Convolutional Neural Network that was previously trained using ImageNet data.

III) PROBLEM STATEMENT

Our system foretells the occurrence of pneumonia, a lung infection that can be brought on by a number of factors, including the accumulation of liquid or pus in the lung sacs, which causes shortness of breath.The ability to predict a this disease before it strikesa patient enables the doctor to provide an early diagnosis, saving the patient's life. The use of chest x-ray pictures to determine a patient's status about pneumonia.

IV) PROPOSED SYSTEM

Recently, Deep Learning (DL) techniques have shown to have enormous promise with cutting-edge performance in image processing and computer vision .These methods have been used in a number of medical imaging modalities with excellent segmentation, detection, and classification performance. Some DL techniques include lung cancer detection, skin cancer detection, breast cancer detection and classification, etc. Even though these techniques have demonstrated great effectiveness in medical imaging, they require a lot of data that isn't presently accessible in this area of applications. Due to the lack of medical imaging datasets, our effort will optimise (Transfer learning; Bhandary et al. 2020)) the top layer of the following deep learning (DL) architectures: CNN, Sklearn, and Keras, and compare how well they perform.Input layer, convolutional layers, pooling layers, full-connection layers, and output layer are the five layers that make up a CNN model . Also, it is well known that the CNN model may be trained from beginning to end, enabling feature extraction, selection, and ultimately classification or prediction. Although it is difficult to explain how a network processes or analyses a picture, it is known that features gathered from multiple levels of a network perform better than features created by humans. The following architecture describes the baseline CNN we've suggested for our experiment: incoming layer X-Ray pictures are the inputs used in our investigation.The settings specify the size of the picture (244x244). Convolutional layers: A convolution is a linear process that entails multiplying a collection of input weights by a set of convolutional coefficients. It is intended for two-dimensional input, and an array of input data is multiplied by a two-dimensional array of weights (filters). The suggested design consists of three layers, each having a 3x3 filter and no padding. By summarising the existence of features in individual feature map patches, a technique known as "pooling layers" allows for the downsampling of feature maps. There are two different types of pooling techniques: average pooling and maximum pooling. Max pooling was employed in the suggested architecture to determine the maximum value in each patch for each feature map. The maximum pooling is 2x2 with a 2 stride. ReLU layers: For each convolutional layer, we employed 4 ReLU layers. Fully linked layers or inner-product layers: treats the input data as a straightforward vector and generates a single vector as the output. In this model, there is just one inner-product layer. The last one is an output layer with sigmoid activation that is fully coupled.The following are the advantages of the proposed system:

1. Simple.
2. Accurate results
3. Speed.
4. Less complex.
5. Time Saving.

V) METHODOLOGY

In the first step, we select an image as the input for the object prediction. The second step involves performing object recognition, which is connected to the training Tensor Flow, which has pictures of various items.The CNN (convolution Neural Network) model is used in the third stage. CNN would choose a unique set of activation characteristics and classifiers for comparison using two convolutional layers. Validate the system numerous times with coaching datasets. The fourth step involves converting the input picture into pixels by providing it as an input parameter. The execution of Next Input transforms the pixel picture into a tensor.

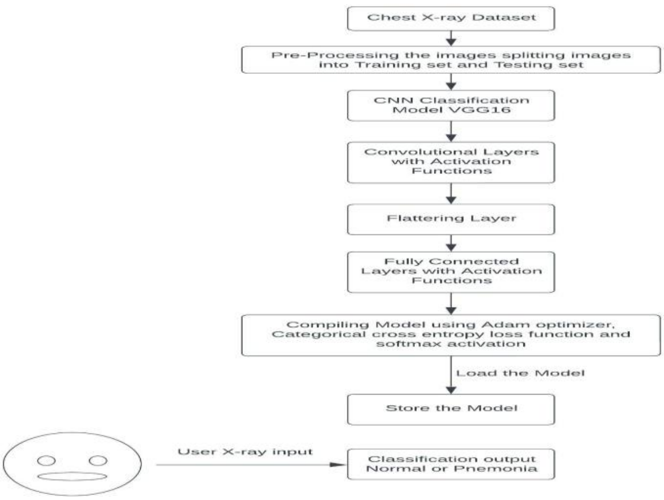

fig 1:Proposed system architecture

VI) RESULTS

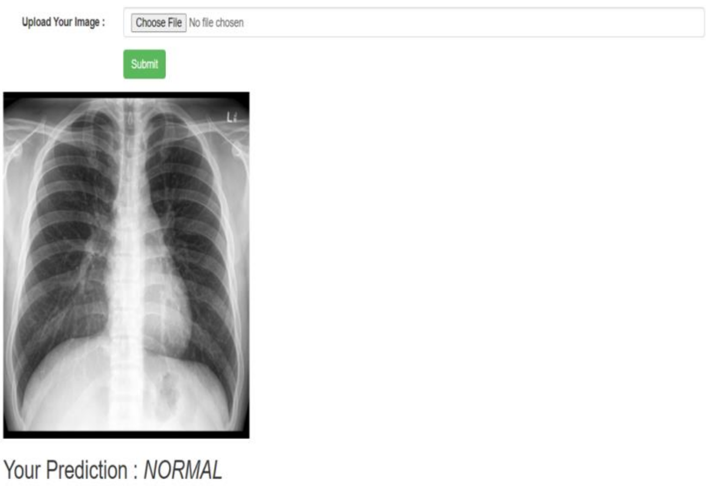

fig 2:Prediction of Pneumonia

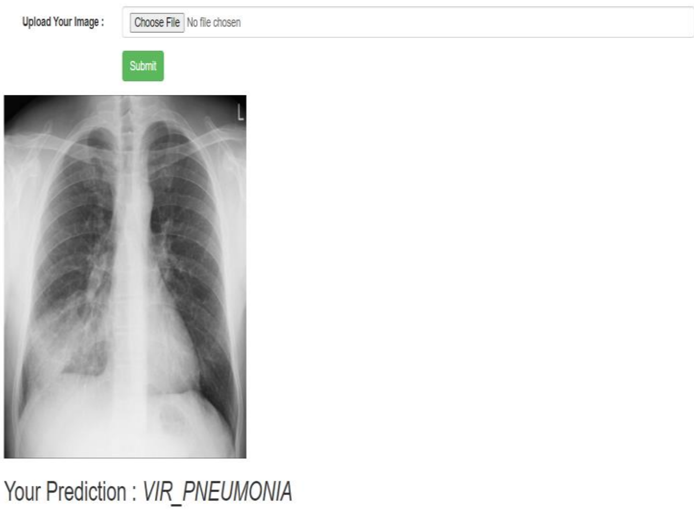

fig 3:Prediction of Viral Pneumonia

CONCLUSION

In this paper, we introduced Deep Learning architectures-based automated algorithms for classifying chest X-rays into pneumonia and the normal class (a baseline CNN, Keras & Sklearn). The trials were carried out employing chest X-ray and CT dataset in order to achieve this. Several performance indicators were used to evaluate performances. Compared to other architectures , the CNN & Keras model and Sklearn performed quite well (accuracy is higher than 96%). Deep learning detection, segmentation, and classification will be used in ongoing efforts to create a comprehensive solution for pneumonia.

FUTURE SCOPE

By incorporating several datasets of respiratory illness types, we will eventually categorise and monitor its variants that are infectious agents or microbes as well. Also, if the patient is found to have pneumonia, we can also recommend the required precautions and treatments. More datasets, more advanced feature extraction methods based on deep learning, such as You-Only-LookOnce (YOLO), and U-Net, which was created for biomedical picture segmentation, may also help the performance.

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