Detection of pneumonia using cnn

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***Abstract*— Pneumonia is one of the diseases that people may additionally come across in any length in their lives. approximately 18 percentage of infectious illnesses are caused by pneumonia. Pneumonia may additionally bring about loss of life within the following tiers. for you to diagnose pneumonia as a scientific circumstance, lung Xray pics are robotically tested through the sector professionals inside the scientific practice. in this take a look at, lung Xray images which can be to be had for the analysis of pneumonia were used. The convolutional neural network was hired as characteristic extractor, and a number of present convolutional neural community models together with, VGG16 and VGG19 were applied so that you can realize this precise assignment. Then, the number of deep functions changed into decreased from 1000 to 100 through using the minimum redundancy most relevance algorithm for each deep version. accordingly, we carried out a hundred deep features from every deep version, and we combined these functions a good way to offer an efficient characteristic set consisting of totally three hundred deep capabilities. in this step of the experiment, this selection set become given as an enter to the choice tree, ok-nearest neighbors, linear discriminant evaluation, linear regression, and aid vector device studying fashions. eventually, all models ensured promising consequences, mainly linear discriminant evaluation yielded the maximum efficient consequences with an accuracy of 95.36 percentage. consequently, the outcomes point out that the deep functions supplied sturdy and consistent features for pneumonia detection, and minimum redundancy** maximum relevance method turned into discovered a beneficial device to reducethe size of the characteristic set.

INTRODUCTION

Pneumonia is a lung parenchyma infection regularly caused by pathogenic microorganisms, elements of bodily and chemical, immunologic injury and other pharmaceuticals. There are numerous popular pneumonia category methods: pneumonia is classifiedas infectious and non-infectious primarily based on one of a kind pathogeneses in which infectious pneumonia is then labeled to micro-organism, virus, mycoplasmas, chlamydial pneumonia, and others, at the same time as non-infectious pneumonia is classed as immune-related pneumonia, aspiration pneumonia because of physical and chemical factors, and radiation pneumonia. Pneumonia is classed as CAP (community-obtained pneumonia), HAP (hospital-acquired pneumonia) and VAP (ventilator-relatedpneumonia) primarily based on distinct infections, among which CAP money owed for a larger part due to the distinct variety of pathogens, HAP is less complicated to broaden resistance to diverse antibiotics, making treatment extra difficult. Pneumonia kills more than 800,000 kids underneath five in line with year, with around 2200 deaths each day. There are more than 1400 children infected with pneumonia per 100,000 youngsters. the worldwide Burden of disease examine pronounced that decrease respiratory tract infections, such as pneumonia, had been the second biggest cause of dying in 2013. In Europe, nearly 35% of patients in hospital are inflamed with pneumococcal disorder and international, the share is 27.3 %. In India, the latest file of John Hopkins Bloomberg faculty of Public fitness has said that India suffers the maximum pneumonia deaths and in 2015, there had been approximately 2.97 lakh pneumonia and diarrhea deaths in youngsters elderly less than five years old.

LITERATURE REVIEW

[1]. DIAGNOSIS OF PNEUMONIA FROM CHEST X-RAY IMAGES USING DEEP LEARNING. [IEEE 2019]

This paper this compares two CNN network's performance on the diagnosis of pneumonia disease. While training model they used from transfer learning and fine-tuning. After the training phase, we compared two network test results. The test results showed that VGG16 network outperforms Xception network by accuracy 0.87 %, specificity 0.91%, pneumonia precision 0.91% and pneumonia f1 score 0.90%. Whereas Xception network outperforms VGG16 network by sensitivity 0.85%, normal precision 0.86% and pneumonia recall 0.94%. According to the experimental results and confusion matrices in every network has own detection capability on the dataset. Xception network is more successful for detecting pneumonia cases than VGG16 network. At the same time VGG16 network is more successful at detecting normal cases. In the future work we will ensemble of two networks. In this way we will combine strengths of two networks and will achieve more successful results on diagnosing of pneumonia from chest X-ray images

[1].[2]. A DEEP FEATURE LEARNING MODEL FOR PNEUMONIA DETECTION APPLYING A COMBINATIONOF MRMR FEATURE SELECTION AND MACHINE LEARNING MODELS [ELSEVIER MASSON SAS 2019]

This paper is focused on improving the classification accuracy of the pneumonia. The dataset consisting of X-ray images was separated into two different classes as normal or pneumonia. This paper utilized existing AlexNet, VGG-16, and VGG-19 CNN

models as a feature extractor. For this specific task, we used the last fully-connected layer of the CNN models, and these deep features were used to feed DT, kNN, LDA, LR, and SVM machine learning models. The classification task was carried out withoutapplying any pre-processing procedure to pneumonia images. To balance the distribution of the samples over the classes, the image augmentation techniques were applied to only normal classes. Then, the most relevant features were selected by applying the mRMR method. The most efficient results were obtained by combining all features provided by mRMR. Finally, the combinationof LDA and mRMR methods provided the best performance with an accuracy of 99.41%, sensitivity of 99.61% and specificity of 99.22% on the pneumonia dataset. The results of this study point out that the deep features provided robust and consistent features for pneumonia detection, and the mRMR method increased the efficiency of the classification. The classification performance of this proposed approach is superior to the previously attempted techniques on the same dataset.

METHODOLOGY

The proposed system is used to evaluate X-ray images to determine whether the patient has Pneumonia. The proposed system uses a web-based interface where the user provides X-ray image, processes the image using Convolution Neural Network (CNN) based models.

After the process completed the extracted features passed to the artificial neural network. The output is estimated with actual

$$\text{accuracy} = \frac{TP + TN}{TP + TN + FP + FN}$$

$$\text{precision} = \frac{TP}{TP + FP}$$

$$\text{recall} = \frac{TP}{FP + FN}$$

$$F1 = 2 \times \frac{\text{precision}}{\text{precision} + \text{recall}}$$

value and then again the network values updated and passed back. This will continue until the optimized solution is obtained.Before passing the data for training to a neural network we have to normalize the image to improve brightness and contrast using an image processing technique called median filter.Then the filtered image is passed on to the CNN. The proposed system implements a sequential CNN model. A sequential model is the CNN model which is appropriate for a plain stack of layers where each layer has exactly one input tensor and one output tensor.The model uses two Convolutional Layers which are applied on image to extract features from it, two Max Pooling Layers which is a type of Pooling used to reduce the size of image, three Dropout Layers as they prevent overfitting on the training data, one Flatten Layer which converts multi-dimensional matrix to single dimensional matrix and two Dense Layers which used to classify image based on output from convolutional layers which predicts whether the person is infected with pneumonia or not.Our proposed project is a deep learning CNN model which aims to automate the process of identifying whether the person is having pneumonia or not, which reduces the slower and inaccurate method of identifying pneumonia which is done manually. Initially the images of X-rays would be taken from the user through Front End. The image will undergo to image processing where the median filter is used to remove the noise in image. Then the model applies the different layers of CNN to the image. After execution of CNN model, the result would be displayed out in the display along with the accuracy of the model, confusion-matrix.

The proposed model uses a modified depth wise separable convolutional layer.The following steps are followed:

1. Collection of data-set: The datasets used for the proposed system has 5,863 X-ray images which is of size 2.47GB. This dataset is taken from Mendeley Data which is a secure cloud-based repository for research data. This data was published by University of California San Diego.
2. Data Pre-Processing: Image enhancement method are used to improve the quality of the image before it is inputted into the Convolution Neural Network (CNN) model.
3. Training Process:

Classification evaluation metrics:

Accuracy, Precision, Recall and F1 score are described. According to the outputs of model, four indices, True Positive, True Negative, False Positive, False Negative, are used to analyze and identify the performance of model.TP, TN, FP and FN mentioned in the above equation are True Positive, True Negative, False Positive, and False Negative, respectively. Among the four metrics, the precision rate was always used to estimate how much the number of images that are pneumonia positive are accounted for in the total number examples, which are classified as positive for pneumonia.

4. Neural Network: A Convolution Neural Network method is used to extract the features of chest X-ray images and usethose features to detect if patient suffers from Pneumonia or not.

RESULTS

This proposed model is a CNN-based model aiming to diagnose pneumonia on a chest X-ray data set. The contributions in this paper are listed as follows. First, we utilized the Dynamic Histogram Equalization (DHE) method to beautify the image. This technique has the capability to enhance image evaluation without washing out appearance or inflicting issues like checkerboard outcomes. Then, we designed a simple seven layered CNN based totally version to extract the capabilities from authentic pictures or preceding characteristic maps, which contained simplest six layers combining ReLU activation function, drop operation, and max-pooling layers. The consequences of the obtained accuracy fee of 95.80%, indicates that our proposed model plays well in assessment to state of the art CNN version architectures. to illustrate the performance of our proposed model, several comparisons of various input shapes and loss features had been supplied. in the destiny, we can preserve the studies to discover more correct type architectures to diagnose varieties of pneumonia, viruses, and micro organism. in keeping with the outline discussed above,

the CNN primarily based version is a promising technique to diagnose the sickness through X-rays.

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