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Deep Learning Based Pneumonia Detection

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Abstract

Pneumonia is a fatal disease that immensely affects the elderly and may prove to be life threatening. Early diagnosis of Pneumonia gains a primary importance for saving many human lives. This work aims at the detection and classification of patients affected by Pneumonia based on their chest X-rays.Unlike other deep learning classification tasks with sufficient image repository, it is difficult to obtain a large amount of pneumonia dataset for this classification task; therefore, we deployed several data augmentation algorithms to improve the validation and classification accuracy of the CNN model. Deep Learning models automate the process and ensure speedy, adroit, and adept results when provided with X-rays of patients. The accuracy should increases as the model trains and decreases the loss simultaneously. Overfitting is may be prevented by implementing data augmentation before fitting the model. This model could help attenuate the reliability and comprehensibility challenges often faced when dealing with medical imagery.

Keywords- *Convolutional Neural Network, Image Processing, Machine Learning, Pneumonia*

I. INTRODUCTION

Pneumonia is a form of an acute respiratory infection that affects the lungs. The lungs are made up of small sacs called alveoli, which fill with air when a healthy person breathes. When an individual has pneumonia, the alveoli are filled with pus and fluid, which makes breathing painful and limits oxygen intake. The risk of pneumonia is immense for many, especially in developing nations where billions face energy poverty and rely on polluting forms of energy. Over 150 million people get infected with pneumonia on an annual basis especially children under 5 years old.Medical X-rays are images which are generally used to diagnose some sensitive human body parts such as chest. Medical experts have used this technique for several decades to explore and visualize fractures or abnormalities in body organs. Several research works have been carried out on the diagnosis of chest diseases using artificial intelligence methodologies. Deep neural network (DNN) models have conventionally been designed, and experiments were performed upon them by human experts.

II. LITERATURE SURVEY

Latest improvements in deep learning models and the availability of huge datasets have assisted algorithms to outperform medical personnel in numerous medical imaging tasks.. Currently, the modern deep learning models in computer vision use convolutional neural networks (CNNs). These

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layers make the explicit assumption that any input to them is an image. When working on a similar computer vision problem, we can use those pre-trained models, instead of going through the long process of training models from scratch. This method of transferring learning from one predefined and trained model to some new domain by reusing the network layer weights is called transfer learning . Transfer learning is a very useful technique and has achieved significant results in computer vision. Lot of academicians and corporate houses have taken interest in employing or testing Neural networks for different datasets for the benefit of the masses. Like Inthis paper of liang g zheng, an automated diagnostic tool is presented that classifies children's chest X-ray images into normal and pneumonia. In order to learn the effective texture characteristics of lung tissue, we designed novel network architecture with residual structures. The network consists of 49 convolutional layers and the ReLU activation, followed by only one global average pooling layer and two dense layers.In addition, we use transfer learning to accelerate neural network training and overcome the problem of insufficient data. Like in This paper of AmyarA presents an automatic classification segmentation tool for helping screening COVID-19 pneumonia using chest CT imaging. This work proposes a new multitask deep learning model to jointly identify COVID-19 patient and segment COVID-19 lesion from chest CT images.The architecture is composed of a common encoder disentangled feature representation with three tasks, and two decoders and a multi-layer perceptron for reconstruction, segmentation and classification respectively. The architecture is composed of a common encoder.

III. METHODOLOGY

In our work, as discussed in the project title, Convolutional Neural Network for Image Classification, more specifically binary image classification.CNNs are used for image classification and recognition because of its high accuracy.First step in Image Classification using CNN is always data collection or acquisition.While doing so, it is carefully monitored that the images in training dataset should not be present in the validation and testing dataset. We have used data augmentation technique in which Keras deep learning neural network library provides the capability to fit models using image data augmentation via the Image Data Generator class. It provides the ability to use data augmentation automatically when training a model. The Image Data Generator accepts the original data, randomly transforms it, and returns only the new, transformed data. The various steps performed in data augmenatation are importing tensorflow, creating directories for data, test, and val, Creating images train, test and validation using Image Data Generator. For creating the CNN model, we defined the layers which are pooling layer, a convolutional layer, fully connected layer, access the model and Train and Predict the model. Our Input layer of CNN model has 32 layers of kernel size(3,3) and it has the image size 224.The CNN model is trained for 20 epochs and 16 as batch size is used. For Model Tuning. We have used SGD (Stochastic gradient descent optimizer) optimizer as it has numerous advantages over other optimizers. A confusion matrix is used to describe the performance of our model on a set of test data for which the true values are known.

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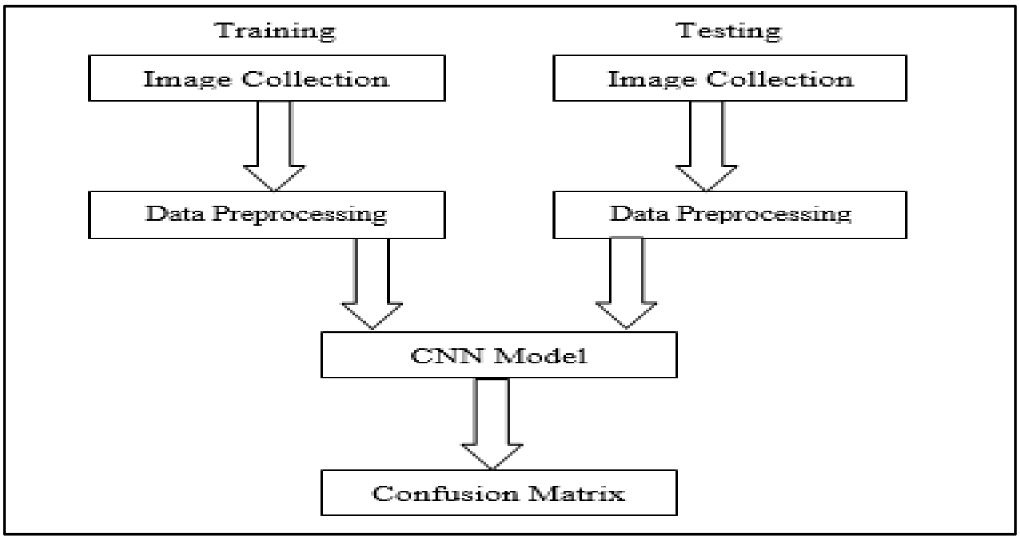

Fig. 1 Proposed System Model

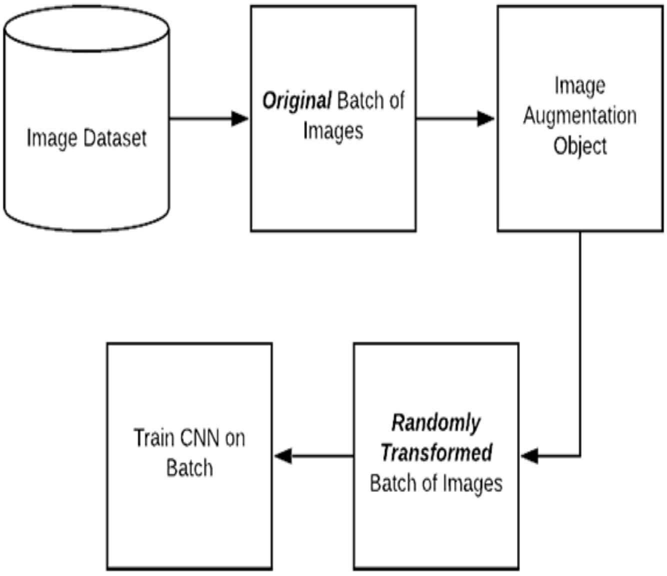

Fig. 2 System Block diagram

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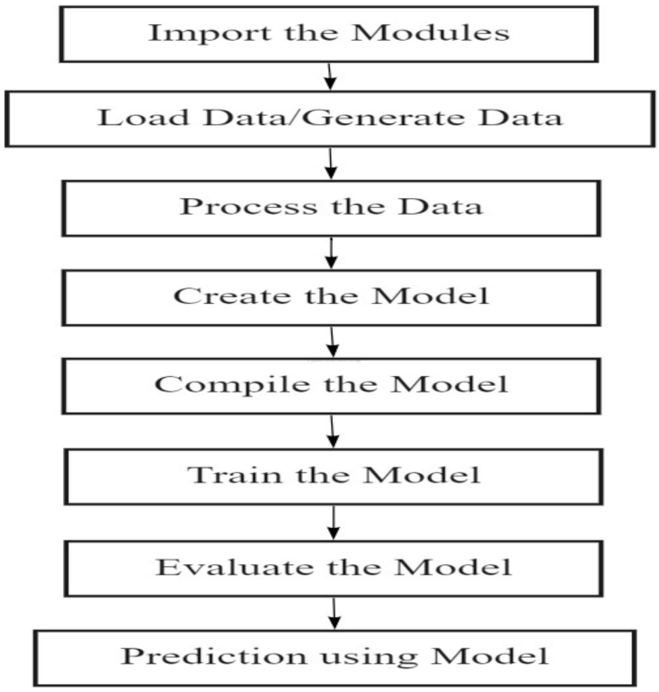

Fig. 3 flowchart

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IV. EXPERIMENTATION AND RESULT

Show the prediction using our proposed model. As it can be seen in figure an unknown image was given as input to our CNN model. It has correctly predicted that the input x-ray image is "NORMAL.

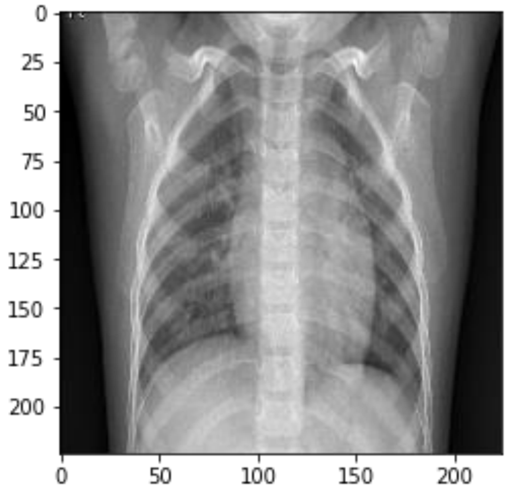

Fig. 4 prediction: NORMAL Input Image to model

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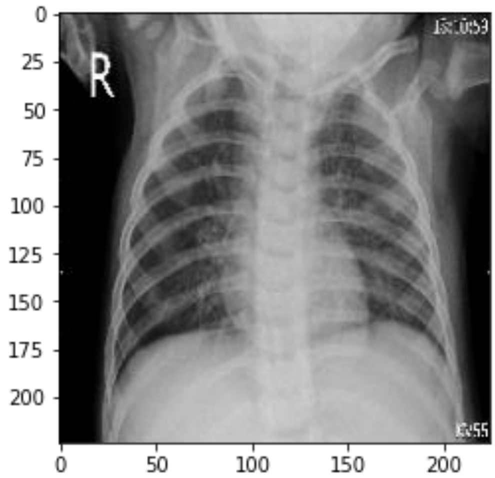

Fig. 5 prediction: NORMAL Output image obtained from mode

V. CONCLUSION

We have demonstrated how to classify positive and negative pneumonia data from a collection of imges.We understood that Data Augmentation is a technique used to increase dataset by applying various transformations on images. We understood that there are various steps in implementing our own CNN model. We also understood that there are various tools used to build CNN model.

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