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Research Article

Covid -19 Prevalence Prediction Using Resnet -50 Deep Learning Technique

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Abstract

Covid 19 is the life threatening disease which spreads widely and rapidly .It mainly affects the breathing organs of our body as a first feat and then it causes various related infections gradually. Right from the day to day activity of human to economic growth of the whole world are totally affected by this deadly virus. Covid-19 could be a communal transmissible disease, and one nation could prepare a COVID-19 antibody alert. Clinical assumptions about COVID-19 diseased patients have exposed that these types of patients are largely adulterated with lung disease after exposure to the disease. So early prediction of COVID 19 related infection is the need for the day. Chest x-ray (i.e., radiography) and chest CT is the utmost operative imaging modalities for spotting complications. Nevertheless, a big chest x-ray may be a lesser significance likened to a CT scan. In-depth interpretation is the most prolific process of machine learning, given that valued research to consider the large number of chest x-ray images that can have a substantial influence on Covid-19 testing. The proposed work examines the PA form of chest X-ray images of Covid 19 affected patients and healthy patients. Once after collection of data through augmentation, the classification is performed by ResNet 50 model with the Deep Belief Network (DBN).By the way the system identifies the patients affected by COVID 19.In this analysis ,chest X-ray samples were collected from the COVID –Xray-5k database.

Key Words: *COVID-19,Complications,Deep Learning, ResNet 50,Deep Belief Network*

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Introduction

Covid-19 is a pandemic that appearances down on people at the global level and has turned into life threatening. Analyzing covid-19 infected patients are the most important technical need of today's situation. Normally Pneumonia is a lung contamination that causes swelling in the tiny air sacs inside our lungs. People will be affected by pneumonia as weakness of viral infections such as COVID-19 or the flu, or may be due to common cold. So an early and accurate prediction on lung related issues are essential[1].

Basically the chest Computed Tomography (CT) is beneficial for spotting irregular discoveries of COVID-19 and pneumonia. It is categorized by basic level of infection distributed mainly around lungs. The CT extraction of COVID-19 could be effectively distinguished from pathological and bacteriological pneumonia. The normal patients also be in need of correct prediction in-order to avoid unnecessary complication of treatment, shortage of medical practitioners and also the expense.

The infected patients are in need of at most care and safety. So more severe strategies are necessary to handle the risk of Covid 19 patients. Nowadays government insists to take vaccine for COVID 19 as a major plan for protection .Apart from that ,there are other treatments suggested are plasma treatment, prior scanning and taking X-ray of lungs for further analysis. But delayed analysis and prediction of COVID 19 naturally increases the risk of reduced life span of people.

The multinational level spread of this COVID 19 ,totally collapsed the economy of the developed countries too. In the previous decade the diseases such as SARs,MERs ,Flu etc[2,3] have majorly disturbed the regular life of the people. Many of the machine learning and deep learning related analysis helped lot to derive the solutions in the form of early prediction and correct diagnosis. Similar way the pandemic of COVID 19 also to be handled and supported majorly by the advanced prediction and detection capabilities of Deep Learning Techniques.

Related work

In [4,5], the author proposed a Capsule Networks-based structural model to analyze Covid-19 disease (i.e., COVIDCAAPS) with the help of X-beam images. In this proposed project, a few layers of containers and containers are used to overcome the complexity problem of the section. In the experimental test, they showed a good demonstration of COVIDCAPS in a few teachable boundaries.

The authors referred the targeted model that is freely accessible on Github [6,7] for open access. Similarly, they hypothesized that the proposed model shows 95.7% accuracy, although the impact is as high as 90% and is known as 95.80% while using a few teachable parameters.

In [8-9], the author covers the details of initial spread of COVID 19 from Wuhan, China and discussed the multilayer deep learning framework for detecting the infection of COVID 19 using Chest X-ray images[10].They analyzed the report of MERS (Middle East Respiratory Syndrome) for the novel Covid 19 detection. The clinical trial of COVI19 detection with patients X-ray images also performed[11].

In addition, they used this model in a compiled X-ray and CT imaging database to obtain improved results. dosage is needed to treat patients infected with Coronavirus. In [12], the creators discussed a piece of etiology in Wuhan, China. So they came up with an idea for some reason. In this study, they tested the flow (by business or air) of Coronavirus.

In [13], the authors used the transfer learning process for image recognition. They used Local Binary Pattern (LBP) to make lung image mines .There are many other hybrid classification deep learning techniques like M-ANFIS (Modified Adaptive Neuro Fuzzy Inference System) and Deep Belief Network(DBN) for effective classification of healthcare data[15,16].

In the proposed discovery model, the creators used multi-scale separation by removing the shrinkage of the chest images to distinguish areas of abnormal lungs. In addition, this change has been applied to the difference in the surface to get more cover blocks. Finally, the creators used a free limit (with Edge identification) to trace the entire region of infection in an unusual part.

Materials and Methods

A. Dataset Description

The dataset is selected from the COVID-Xray-5k database. The dataset includes 2084 training and 3100 testing images. The below Figure 1 and 2, shows sample images from the COVID-Xray-5k database. Here the first and second lines show that the sample images belong to the affected Corona category and the non-receiving (General) category in ChexPert is shown in Figure 1 and Figure 2. The dataset includes images of both X-ray and CT scan. Initially there are only 250 X-ray images of COID 19 patients. Out of which nearly 203 images were internal and tilted. Then the databases is getting updated regularly which additionally contains meta-data of individual patients like age ,gender, BMI level etc.

Figure 1: Sample Images-COVID -19 Images[COVID-Xray-5k dataset]

Figure 2: Sample Images-Normal Category [COVID-Xray-5k dataset]

B. Proposed Framework

The framework of the proposed Chest image analysis model is shown in Figure 3 .The plan consists of data processing and image editing and outcome verification during training and testing.

Data Pre-processing and Augmentation

Pre-preparation processes can be used to enhance image data for an independent eye or to use it as a statistical entry. Right from the bat, the data tests are resized to 200 × 200 pixels and adjusted to blur the images. Each image is then converted into 4 diverts that bring up the size of 200 × 200 × 6 information state. In addition, the data is made of the same type using Z or standardization. Familiarity, in AI calculations, helps to solve the model as it accelerates preparation. The following image enhancement technique is used to create data size. Includes pivot, zoom and translate as the length and width of the image. The available data was then divided into 80:10 scale measures such as training, validation and test sets.

ResNet 50 – DBN(Deep Belief Network) Classification

The proposed ResNet 50 model for the analysis of Covid 19 X-Ray consists of four processing stages. The input size of a pre-trained set is 200 × 200 × 3. The network is optimized with ResNet 50 modified parameters as shown in Figure 3.

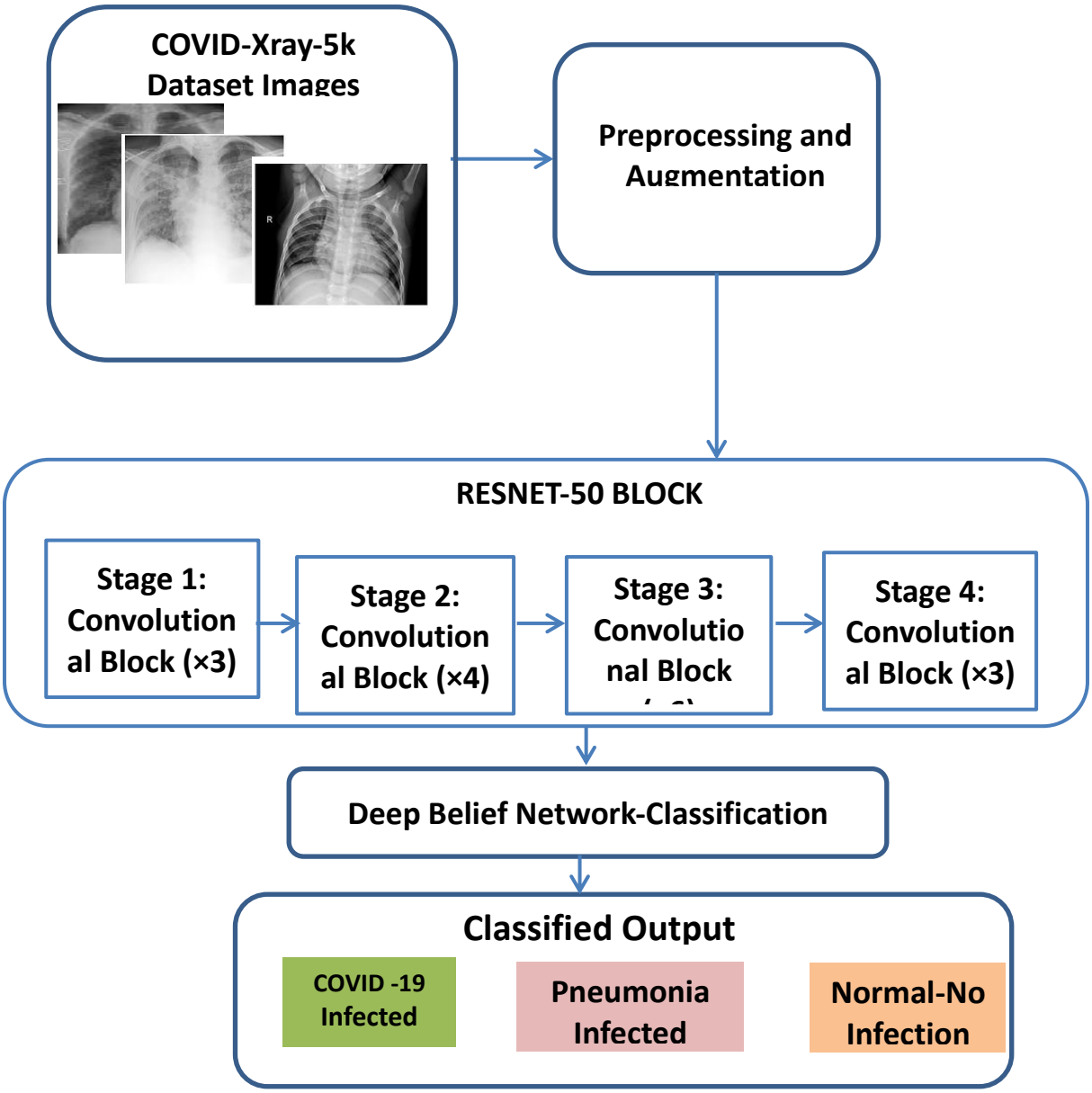

Figure 3: Architecture of ResNet 50 for COVID 19 prediction

Immediately after the Deep Belief Network adjustment process X-ray image editing process is applied. Deep Beliefs Networks RBM Accumulated (Blocked Boltzman Machine) Deep belief networks are used to automatically extract data feature data. Unlike other in-depth learning

strategies, DBNs can use features to retrieve original data. Therefore, DBN scan ensures the accuracy of the extracted features.

Restricted Boltzmann Machine is a model, based on energy and a number of Boltzmann's binding machines are considered DBN. The Boltzmann block is a bipartite painting that consists of a transparent layer and a secret layer. Two layers are associated with loads. The virtual layer moves as the layout for the layout details and the private layer moves as the finders. The formation of RBMs has a virtual layer v and included a layer h and a set of loads W. The neurons in RBMs are programmed to produce yield as indicated by the given opportunities. Encryption neurons will generally highlight the models and models that occur in the information and may be ready to demonstrate shared information transmission. The proposed model directs pre-rendered X-beam images in three phases. Like the contaminated cases of COVID 19, pneumonia cases have affected common cases and cases.

Result and Discussion

The model is fine-tuned 50 times .The batch size is selected at 15.ADAMAX optimizer is used to increase the loss function with a reading level of 0.0001. All images are subject to sample. The model is tested based on sensitivity, specificity and precision.Where sensitivity is defined as,

Sensitivity = Number of images correctly classified (Covid 19-Infected) /Total Number of Covid Images

$$\text{Sensitivity} = TP /(TP+ FN)$$

Specificity = Number of images correctly classified(Non Covid 19-Infected) /Total Number of Non Covid Images

$$\text{Specificity} = TN/(TN+FP)$$

Then the accuracy is calculated based on

$$\% \text{ of Accuracy} = ((TN+TP)/(TN+TP+FN+FP)) \times 100$$

As suggested above, sensitivity is part of the real benefits identified by diagnostic testing. It shows how good the test is in diagnosing the disease. What is clear is the equality of the true values correctly identified by the diagnostic test. It suggests how good the test is in detecting a normal (negative) situation. Accuracy is a measure of true results, whether positive or negative, in humans.

It measures the true level of diagnostic testing in the condition.

Covid 19 Infected	4	23	299
Pneumonia Infected	2	24	0
Normal	3	2	2665

Figure 4: Confusion matrix for Res Net 50 Model

The above Figure 4 shows the confusion matrix of obtained prediction.The accuracy of prediction is compared between the training and testing process.

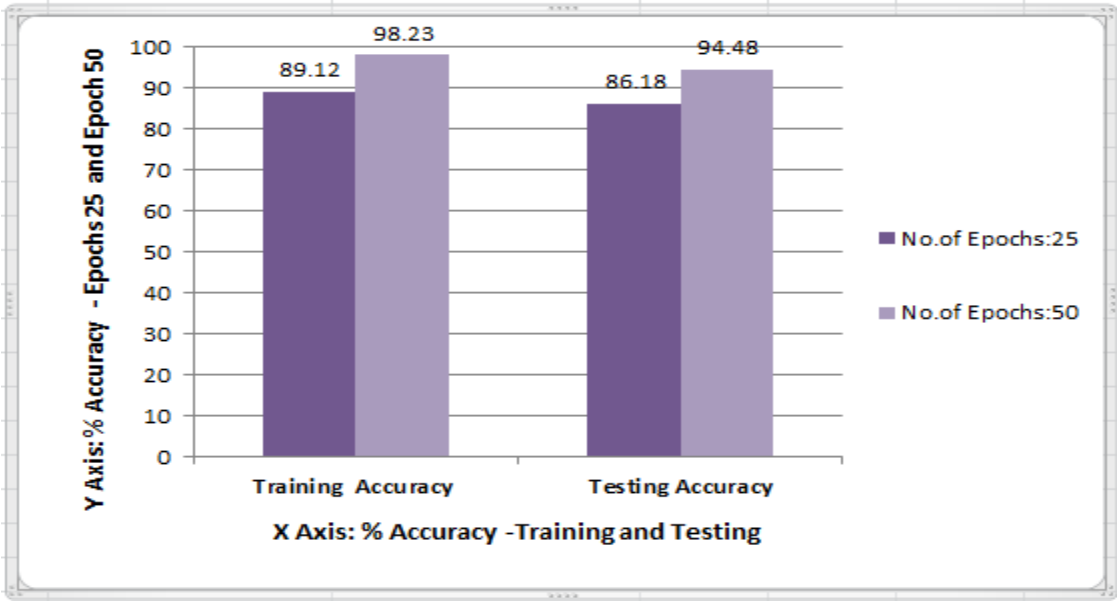

Figure 5: Comparative result of Training and Testing Accuracy

The proposed Resnet 50 based Deep Belief network of Chest X-ray image classification model achieved 98.23% accuracy during training and 94.48% during testing as shown in Figure 5.

Conclusion and Future Work

The Covid -19 epidemics is keep on growing day by day firely. So an advanced prediction on prevalence's of Covid 19 is essential. The ever increasing count can be reduced or moderated only by early prediction and creating alert and awareness among the population. The proposed Resnet 50 with Deep Belief Network classification model, effectively classifies the input X-ray images

into Covid-19 infected images, Pneumonia infected images and normal images which shows no infection. The proposed model performs the diagnostic task in accurate way and obtained training and testing accuracy as 94.48%.As part of future extension the model will be enhanced to gain accuracy above 98% with large volume of patient's X-ray images. Also the system will be enhanced to exhibit various other breathing related issues ,which boost the complication level of Covid-19 using advanced Deep Learning techniques.

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