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Detection of Covid-19 Cases from Chest X-Ray Images using CNN

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Abstract: - The occurrence of COVID-19 has brought the worldwide threat to the living society. The severity of the unwellness is often understood by the huge variety of deaths and affected patients globally. If the identification is fast, the illnesses are often controlled in a very higher manner. The factitious intelligence researcher's square measure focusing their experience data to develop mathematical models for analyzing this epidemic scenario mistreatment nationwide shared information. To contribute towards the well-being of living society, during this project, Deep learning algorithmic program are going to be wont to determine the COVID infected patients through chest X-Ray pictures. By using, Convolutional Neural Network and Deep Neural Network, the chest X-Ray pictures are going to be analyzed to observe, whether or not the actual patient has the signatures of COVID-19 viruses or not. The performance of each the model is going to be compared on the experimental basis and deliver the simplest model to the clinical and health care domain.

Keywords: COVID-19, deep learning, pneumonia, radiological imaging, chest X-ray

I. INTRODUCTION

In the year 2019, and within the month of December a replacement virus was born in China and unfold apace everywhere the globe at intervals a span of two months[1]. This natural event had its begin as a scourge in urban center, China, these days it's severely affected multiple countries round the world as an outbreak. World Health Organization has termed this with the name COVID-19 and declared this as an outbreak within the month of Gregorian calendar month. As per the reports until these days around 20.1 Million individuals tested positive for covid-19[2], with the USA within the top position of the worst affected country within the world with 8.19 Million cases and India in the second place of the worst affected country

with 7.50 million cases. The fatality rate all over the world is around 2-3% at present. As this virus is spreading at a very fast rate, all government officials are trying to isolate the patients of covid- 19[3]. In order to reduce the spread, many countries are going through a complete lockdown by not allowing anyone on the roads. Cough, fever, breathing problems, high fever for a long duration is the symptoms of the covid-19 pandemic novel corona virus[4]. Even though there are zero symptoms of Covid- 19, some individuals getting tested positive for covid-19 by looking at the chest scan reports.

Besides Positive horrific testing, chest X-rays also are also being employed to diagnose the corona virus disease[5][6]. A crucial step within the fight against COVID-19 is that the effective screening of infected patients, specified those infected will receive immediate treatment and care, still as be isolated to mitigate the unfold of the virus[7]. A recent epidemic of a replacement Corona virus Disease has had an excellent impact on the nations worldwide.

II. TYPE STYLE AND FONTS

A. Artificial Intelligence Applied to Chest X-Ray Images for the Automatic Detection of COVID-19.

A Thoughtful Evaluation Approach. (2020) The combined analysis aims to scale back the many range of false negatives of those tests and supply complementary proof concerning the presence and severity of the illness. However, the procedure isn't freed from errors[8], and also the interpretation of the chest X-Ray is merely restricted to radiologists due to its complexness. With the long-run goal to supply new proof for the identification,

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this paper presents associate degree analysis of various strategies supported a deep neural network. These area unit the primary steps to develop associate degree automatic COVID-19[9] identification tool victimization chest X-Ray pictures to differentiate between controls, pneumonia, or COVID-19 teams. B. Deep Convolutional Approaches for the Analysis of

B. COVID-19 Using Chest X-Ray Images from Portable Devices. (2020)

The novel totally automatic approaches specifically tailored for the classification of chest X-ray pictures nonheritable by transportable equipment into three totally different clinical categories: traditional, pathological, and COVID-19[10]. For this purpose, three complementary deep learning approaches supported a densely convolutional specification square measure herein conferred. The joint response of all the approaches permits to reinforce the differentiation between patients infected with COVID-19, patients with alternative diseases that manifest characteristics just like to COVID-19 and normal cases[11].

C. Robust Technique to Detect COVID-19 using Chest X-Ray Images. (2020)

In this state of affairs of COVID-19 pandemic, there's a desire of streaming identification supported retrospective study of laboratory information in variety[12] of chest X-rays victimization deep learning. This paper planned a clarify technique to observe COVID-19 victimization collecting medical pictures with the assistance of deep nets. The study shows promising results with accuracy of ninety-one. 67% for identification of COVID-19 and 100% accuracy in proving the survival quantitative relation [13].

III. DATA COLLECTION

The dataset used in this study is compiled using two publicly available datasets. The dataset is imported from GitHub[14] and there are a total of 2295 chest X-rays images out of which 1811 are training dataset. These images are collected and extracted from different sites and publications. The rest of 484 images we used is test dataset for better performance. 80% images are used for training and 20% of images are used for testing the system.

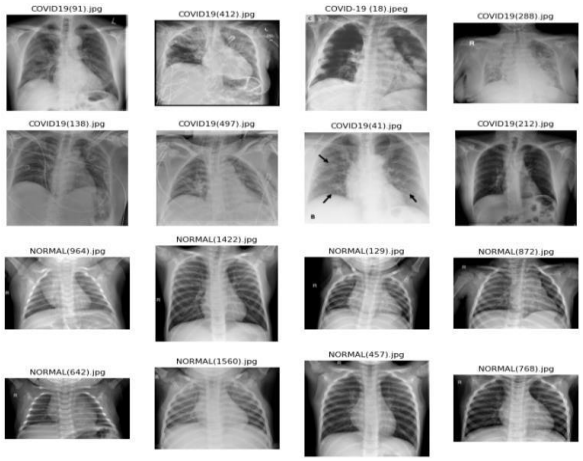


Fig. 1. Dataset of Covid-19 and Normal X-Rays.

IV. METHODOLOGY

The main methodology of this study is depicted in Figure 2. The coronavirus (COVID-2019), quickly spread around the world and became a pandemic[15]. COVID-19 pandemic has rapidly become one of the biggest health world challenges in recent years. The disease spreads at a fast pace: the reproduction number of COVID-19 ranged from 2.24 to 3.58 during the first months of the pandemic, meaning that, on average, associate degree infected person transmitted the unwellness to a pair or a lot of individuals[16]. Deep Learning automatically detects and extract the important features without any human supervision to achieve superhuman accuracy. Proposed system is also computationally efficient. It has the flexibility to figure with incomplete data. It tends to be a more powerful and accurate way of solving classification problems[17]. Chest X-Ray dataset is directly

cloned from GitHub for doing the analysis. In this project, Deep learning algorithms of convolution neural network and Deep neural network are applied on the chest X-Ray images to detect the covid infected patients. The performance of the algorithms is compared in terms of accuracy. The efficient model may assist healthcare practitioners for the diagnosis of covid positive cases[18].

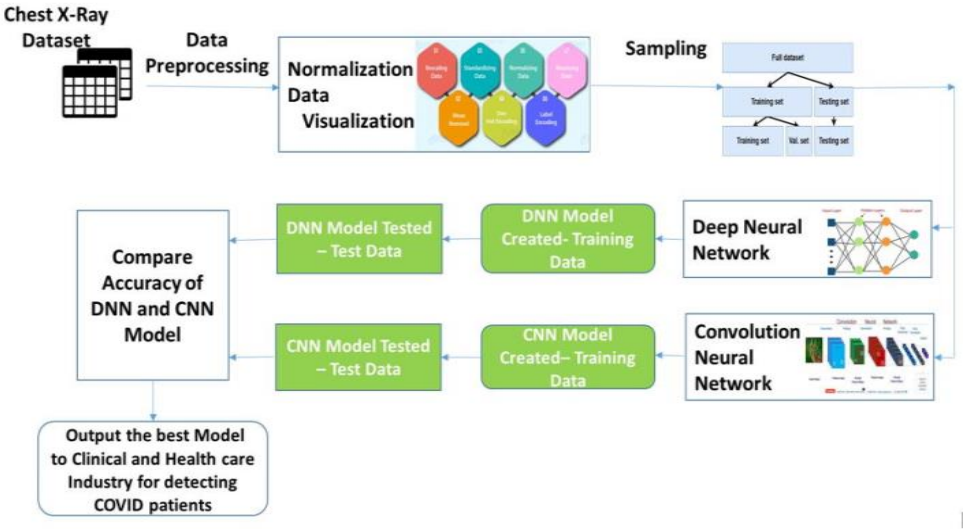


Fig. 2. Architecture Diagram

A. Data flow Level 0

Data have to be imported in to Google Colab environment for analysis. The input chest X-Ray dataset is loaded from GitHub repository and set the path for the main directory and the subdirectories of training and testing dataset[19]. Both the training and testing dataset is having the combination of normal and covid infected patient's chest X-Ray. Libraries necessary for Convolution Neural Network and Deep Neural Network have to be imported into the environment.

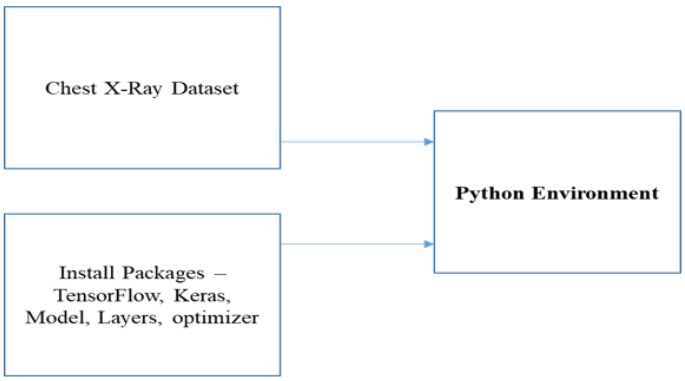


Fig. 3. Data Importing DFD

B. Data flow Level 1

Preprocessed training data and validation data are passed on to the CNN algorithm to create the model. This model will generate the accuracy and loss with respect to the training data and it can be visualized. Using test data, CNN model can be evaluated[20].

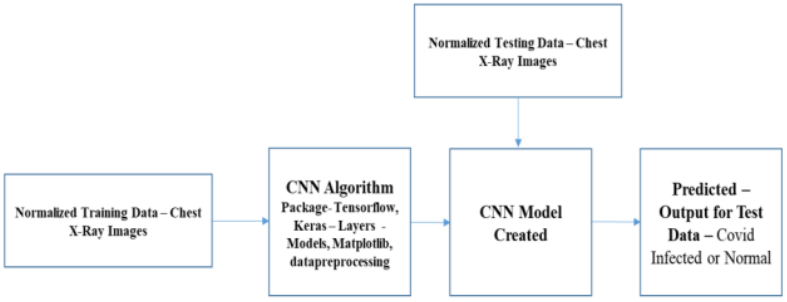


Fig. 4. CNN Algorithm DFD

C. Data flow Level 2

Pre-processed training data and validation data are passed on to the DNN algorithm to create the model. This model will generate the accuracy and loss with respect to the training data and it can be visualized. Using test data model can be evaluated[21].

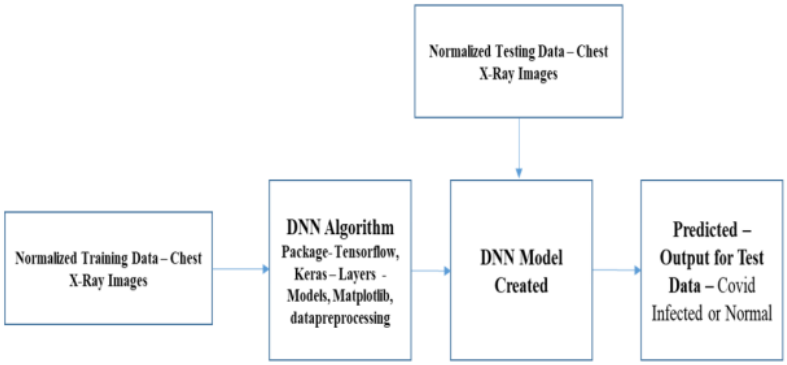


Fig. 5. DNN Algorithm DFD

D. Data flow Level 3

The performance of CNN and DNN algorithm is compared using the accuracy and loss of the classification model. Convolution neural network and Deep neural network is used to classify the chest x-ray images, whether the patients are infected with COVID or normal. Chest x-ray dataset is taken from GitHub for doing this analysis. The performance of both CNN and DNN Algorithms have compared in terms of accuracy. Convolution neural network detected the covid patients from the chest X-Ray images with the accuracy[22] of 96% and Deep Neural Network with the accuracy of 90%. Performance of the CNN is more accurate when compared to DNN. SO, CNN algorithm model diagnosis recommender system will be used for examining lung images can assist the doctors and reduce the burden over them.

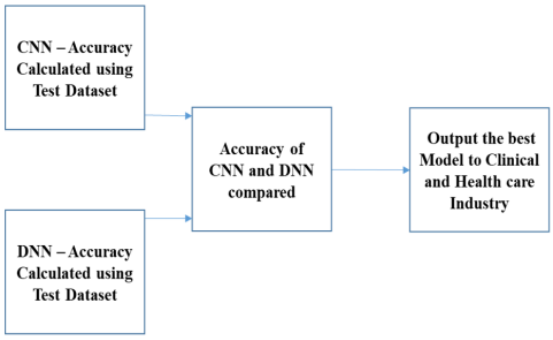


Fig. 6. Performance Comparison of CNN and DNN

V. RESULT AND DISCUSSION

The fig. 7 shows the data visualization of the COVID-19, X-Ray. After the process, the result of the image processing and feature analyzing of COVID-19 accuracy[23] graph are show in Fig. 8 which implies CNN model and DNN model is also depicted in Fig. 9. The finally, we further classified the percentage of accuracy for which we accomplish the accuracy of 96.49% for CNN model in Fig. 10 and also 90.5% accuracy for DNN model in fig. 11. At last, we deliver the best outcome result to the client for the best result.

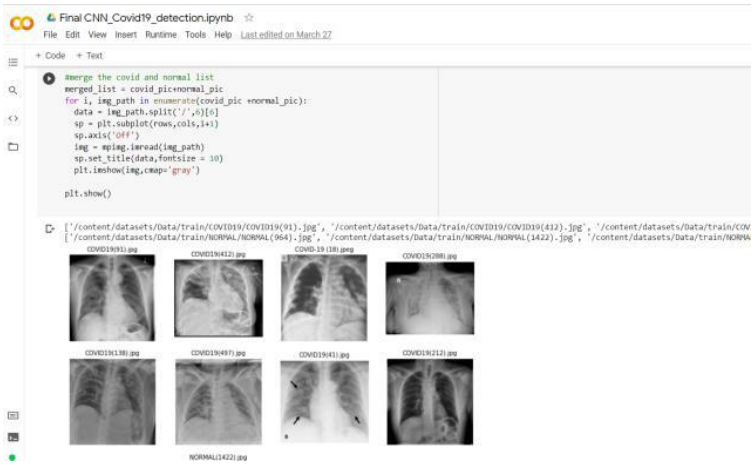


Fig. 7. Data Visualization

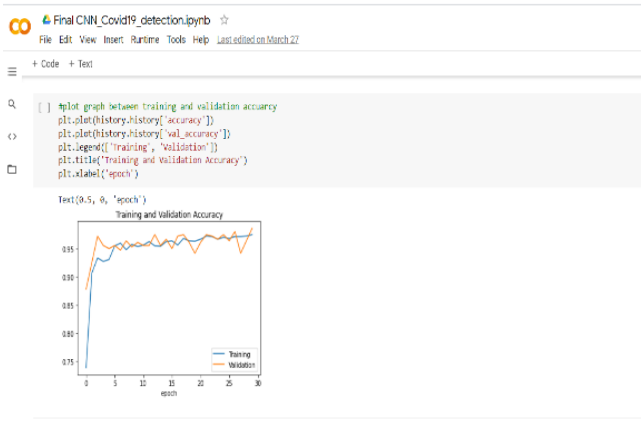


Fig. 8. CNN Model – Training and Validation Accuracy

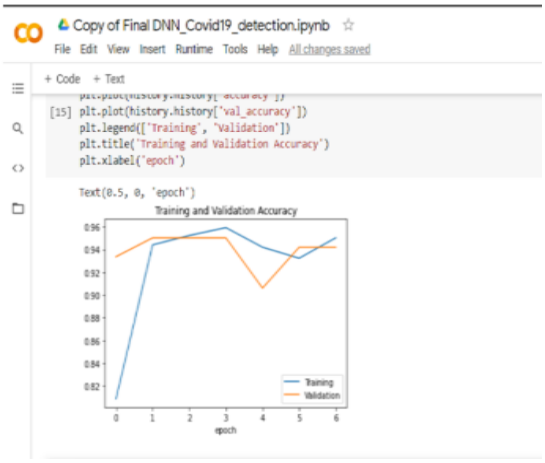


Fig. 9. DNN Model – Training and Validation Accuracy

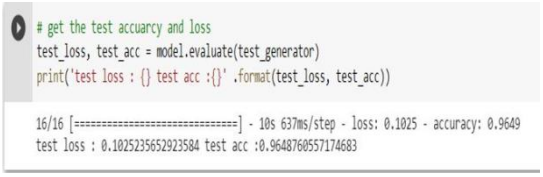


Fig. 10. Performance of CNN

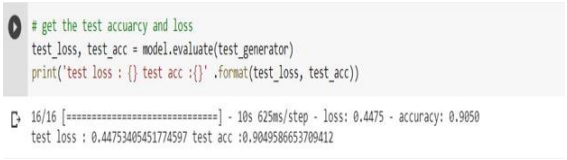


Fig. 11. Performance of DNN

VI. CONCLUSION AND FUTURE ENHANCEMENT

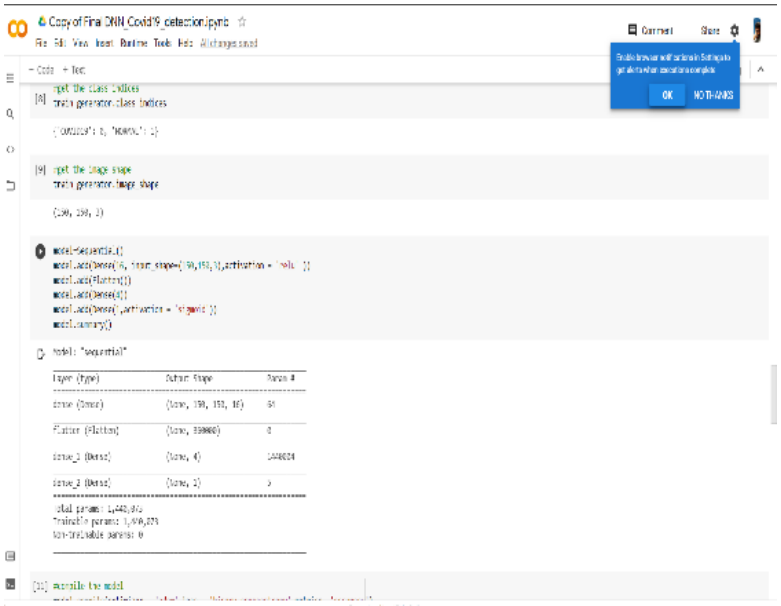
Early diagnosis of COIVD infection is essential both for early intervention to the patient and to prevent the risk of transmission. For this purpose, chest x-ray images obtained from Covid-19 and nonCovid-19 patient were used. The performance of Deep learning algorithms like CNN and DNN Algorithms have compared in terms of accuracy. As a result of the experiments, classification[24] accuracy of Convolution Neural Network is 96% and Deep Neural network with the accuracy of 90%. This better performing and highly accurate convolution neural network model will be used in clinical and health care industry to predict the pneumonia present X-Ray image of the lungs. This can guide doctors, radiologist to perform more accurate diagnosis on patients to save time and improve on consistency of treatment. It can also be used in situations where the possibilities are insufficient- RT-PCR test, doctor, and radiologist. The future enhancement might include, some more data science algorithms and deep learning algorithms. Along with Convolutions neural network and Deep neural network, the dataset can be tested with auto encoders or ResNet50 and the performance of the algorithm is evaluated and once the best algorithm has been found, that algorithm will be used to predict whether the particular patient is infected with Covid or not.

VII. APPENDIX

Setting the path and display of the images is show below.

CNN Model Creation Using Training Data

DNN Model Creation Using Training Data



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