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PNEUMONIA & COVID19 DETECTION USING MACHINE & DEEP LEARNING ALGORITHMS

Mr.Devavarapu Sreenivasarao, Assistant Professor, MTech(Ph.d), Department of CSE, sreenivasaraod@sreenidhi.edu.in

Ch.Ram Teja, BTech,Department of CSE,ramtejachittuluri@gmail.com

Radha Krishna Devarkonda,Department of CSE,radhakrishna2023m@gmail.com

N.Nikhil,Department of CSE,nikhilnasam7@gmail.com

ABSTRACT: The World Health Organization (WHO) recognized COVID-19 as the cause of a global pandemic in 2019. COVID-19 is caused by SARS-CoV-2, which was identified in China in late December 2019 and is indeed referred to as the severe acute respiratory syndrome coronavirus-2. The whole globe was hit within several months. As millions of individuals around the world are infected with COVID-19, it has become a global health concern. The disease is usually contagious, and those who are infected can quickly pass it on to others with whom they come into contact. As a result, monitoring is an effective way to stop the virus from spreading further. Another disease caused by a virus similar to COVID-19 is pneumonia. The severity of pneumonia can range from minor to life-threatening. This is particularly hazardous for children, people over 65 years of age, and those with health problems or immune systems that are affected. In this project we are using various machine learning and deep learning algorithms to detect covid 19, Pneumonia disease from chest X-RAY. The classification accuracy was used to measure performance to a great extent.

Keywords: *SARS-CoV-2, COVID-19, machine learning and deep learning.*

1. INTRODUCTION

Pneumonia (lung infection) is an acute pulmonary disease. It is an inflammatory condition typically induced by pathogens, physicochemical causes, immunological injuries, and other pharmacological agents.)ere are many prominent approaches to classifying pneumonia. Contagious as well as noninfectious pneumonia is categorized as infectious based on different pathogens, in which case pneumonia is then categorized as being caused by bacteria, viruses, mycoplasmas, chlamydial pneumonia, and so forth. Noninfectious pneumonia and aspiration pneumonia caused by physical, chemical, and radiation pneumonia are categorized as innate immunity pneumonia. Pneumonia is categorized as CAPs based on several diseases, of which CAP is a greater proportion (community-acquired pneumonia), HAP (hospital-acquired pneumonia), and VAPs (ventilator-associated pneumonia).)e diverse range of infections makes HAP more resistant to various antibiotics and easier to grow, which makes therapy harder [1]. On the other hand, on December 31, 2019, the World Health Organization received a report of a group of unidentified pneumonia cases in Wuhan, Hubei Province, China. An unknown new virus has been

detected in January 2020 [2, 3]. A very regrettable coronavirus pandemic (COVID-19) appears to be the second wave that is more hazardous than the first wave.

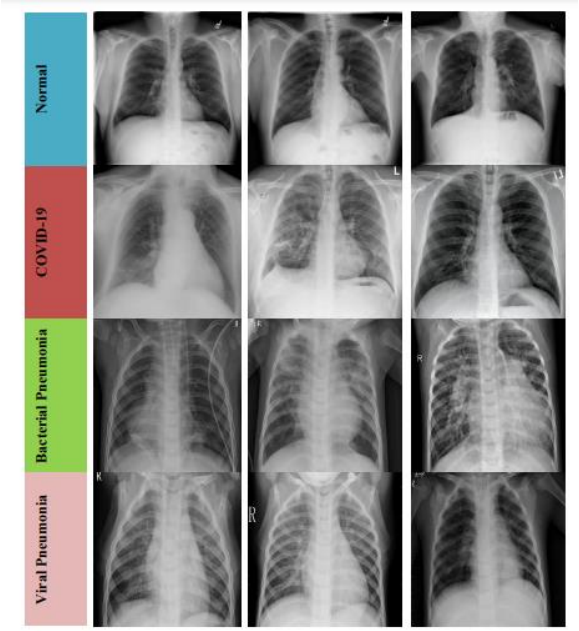

Fig.1: Example figure

)e number of affected individuals was 360,960 in India on April 26, 2021, and is quickly growing [4]. For Bangladesh, this is concerning because of its near geographic position, and the Indian variant is more hazardous than other variations around the world.)e virus is increasingly growing and therefore can be caught at any age, leading to severe diseases. Both pneumonia and COVID-19 are deadly to human beings. Over 800,000 children under five per year are killed by pneumonia, and around 2,200 die every day. Over 1,400 children per 100,000 children are afflicted with pneumonia [5].)e latest study found that the foremost cause of mortality was lower respiratory tract illness, particularly pneumonia, in 2013. In Indian countries, the most pneumonia fatalities in India were reported in the current John Hopkins Bloomberg School of Public Health, and in 2015, there were something like 0.297 million pneumonia deaths and deaths from dysentery in children under the age of 5. In 2015, pneumonia was also the world's number one killer of children under age 5 [6]. Besides pneumonia, the infection rate of COVID-19 is pretty high. COVID-19 is a very infectious viral illness caused by SARS-CoV-2 and is the largest pandemic throughout the globe since the 1918 influenza outbreak that killed more than 2.9 million people worldwide.)e risk of SARS-CoV-2 infection should be increased for those over 60, including those with health issues. One problem that has been determined is that both pneumonia and coronavirus have adverse impacts on the health of the lungs. Hence, doctors encourage patients to use an oxygen analyzer to keep track of their oxygen consumption in order to discover and correct any irregularities as soon as feasible. CNNs are suitable to address this sort of problem.

2. EXISTING SYSTEM

The identification of pneumonia and COVID-19 with X-ray images is still an enormous job, even for skilled and experienced clinicians, as X-ray photos provide comparable location features for other illnesses, including lung disease. Another test is PCR, also known as a polymerase chain reaction, which is impossible due to the rapid increase in the number of instances. Alternate diagnostics are thus necessary to swiftly identify, quarantine, or separate sick people. By far, deep transfer learning techniques for the identification of viruses have indeed been employed. The outcomes of such deep learning approaches, though, will not be enough to address the medical diagnostic procedure.

Disadvantages of existing system:

1. Not detected accurately

2. still facing problems

3. PROPOSED SYSTEM

In this project we are using various machine learning and deep learning algorithms to detect covid 19, Pneumonia disease from chest X-RAY.)e initial idea included research on COVID-19 detection as well as research on the prediction of the number of individuals affected in the next couple of days.)e investigation showed that almost all of the models currently available are inadequate and partial. In order to stimulate more specific detection and modelling techniques, analysis data on COVID-19 should be made available to the public.

Advantages of proposed system:

1. High accuracy.

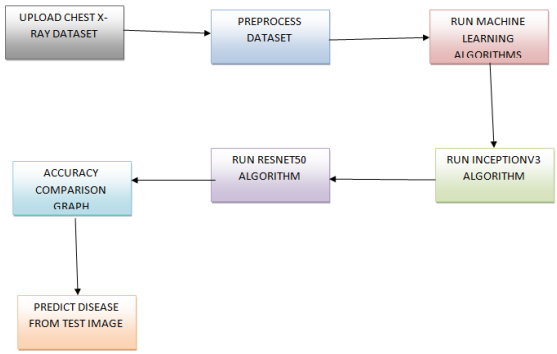

Fig.2: System architecture

MODULES:

In this project we are using various machine learning and deep learning algorithms to detect covid 19, Pneumonia disease from chest X-RAY. To build this project we have designed following modules

1) Upload Chest X-Ray Dataset: Using this module we can upload X-RAY dataset to application
2) Preprocess Dataset: using this module we will apply some preprocessing technique such as resizing and reshaping images which can be accept by all algorithms. Preprocessed data will be splitted into train and test part where application used 80% dataset size for training and 20% for testing and this test data prediction values can be used to calculate various metrics such as accuracy, precision, recall and FSCORE
3) Run Machine Learning Algorithms: Using this module we will train 7 machine learning algorithms with above processed dataset and this algorithms are SVM, logistic regression, Random Forest, Decision Tree, KNN, Naïve Bayes and ANN.
4) Run InceptionV3 Algorithm: Using this module we will train InceptionV3 with above dataset and then perform prediction on test data and then calculate accuracy.
5) Run Resnet50 Algorithm: Using this module we will train Resnet50 with above dataset and then perform prediction on test data and then calculate accuracy.
6) Accuracy Comparison Graph: using this module we will plot all algorithms performance graph
7) Predict Disease from Test Image: using this module we can upload test X-RAY image and then classifier will predict whether image contains covid19 or pneumonia or normal.

4. RELATED WORK

4.1 Pneumonia detection using deep learning approaches

Artificial intelligence has found its use in various fields during the course of its development, especially in recent years with the enormous increase in available data. Its main task is to assist making better, faster and more reliable decisions. Artificial intelligence and machine learning are increasingly finding their application in medicine. This is especially true for medical fields that utilize various types of biomedical images and where diagnostic procedures rely on collecting and processing a large number of digital images. The application of machine learning in processing of medical images helps with consistency and boosts accuracy in reporting. This paper describes the use of machine learning algorithms to process chest X-ray images in order to support the decision-making process in determining the correct diagnosis. Specifically, the research is focused on the use of deep learning algorithm based on convolutional neural network in order to build a processing model. This model has the task to help with a classification problem that is detecting whether a chest X-ray shows changes consistent with pneumonia or not, and classifying the X-ray images in two groups depending on the detection results. Index Terms-artificial intelligence; convolutional neural network; deep learning; image processing, machine learning; pneumonia detection.

4.2 Deep learning based diagnosis recommendation for COVID-19 using chest X-Rays images

A novel coronavirus spillover event has emerged as a pandemic affecting public health globally. Screening of large numbers of individuals is the need of the hour to curb the spread of disease in the community. Real- time PCR is a standard diagnostic tool being used for pathological testing. But the increasing number of false test results has opened the path for exploration of alternative testing tools. Chest X-Rays of COVID-19 patients have proved to be an important alternative indicator in COVID-19 screening. But again, accuracy depends upon radiological expertise. A diagnosis recommender system that can assist the doctor to examine the lung images of the patients will reduce the diagnostic burden of the doctor. Deep Learning techniques specifically Convolutional Neural Networks (CNN) have proven successful in medical imaging classification. Four different deep CNN architectures were investigated on images of chest X-Rays for diagnosis of COVID-19. These models have been pre-trained on the ImageNet database thereby reducing the need for large training sets as they have pre-trained weights. It was observed that CNN based architectures have the potential for diagnosis of COVID-19 disease.

4.3 XGBoost model for chronic kidney disease diagnosis,

Chronic Kidney Disease (CKD) is a menace that is affecting 10 percent of the world population and 15 percent of the South African population. The early and cheap diagnosis of this disease with accuracy and reliability will save 20,000 lives in South Africa per year. Scientists are developing smart solutions with Artificial Intelligence (AI). In this paper, several typical and recent AI algorithms are studied in the

context of CKD and the extreme gradient boosting (XGBoost) is chosen as our base model for its high performance. Then, the model is optimized and the optimal full model trained on all the features achieves a testing accuracy, sensitivity, and specificity of 1.000, 1.000, and 1.000, respectively. Note that, to cover the widest range of people, the time and monetary costs of CKD diagnosis have to be minimized with fewest patient tests. Thus, the reduced model using fewer features is desirable while it should still maintain high performance. To this end, the set-theory based rule is presented which combines a few feature selection methods with their collective strengths. The reduced model using about a half of the original full features performs better than the models based on individual feature selection methods and achieves accuracy, sensitivity and specificity, of 1.000, 1.000, and 1.000, respectively..

4.4 Deep learning framework for alzheimer's disease diagnosis via 3D-CNN and FSBi-lstm

Alzheimer's disease (AD) is an irreversible progressive neurodegenerative disorder. Mild cognitive impairment (MCI) is the prodromal state of AD, which is further classified into a progressive state (i.e., pMCI) and a stable state (i.e., sMCI). With the development of deep learning, the convolutional neural networks (CNNs) have made great progress in image recognition using magnetic resonance imaging (MRI) and positron emission tomography (PET) for AD diagnosis. However, due to the limited availability of these imaging data, it is still challenging to effectively use CNNs for AD diagnosis. Toward this end, we design a novel deep learning framework. Specifically, the virtues of 3D-CNN and fully stacked bidirectional long short-term memory (FSBi-LSTM) are exploited in our framework. First, we design a 3D-CNN architecture to derive deep feature representation from both MRI and PET. Then, we apply FSBi-LSTM on the hidden spatial information from deep feature maps to further improve its performance. Finally, we validate our method on the AD neuroimaging initiative (ADNI) dataset. Our method achieves average accuracies of 94.82%, 86.36%, and 65.35% for differentiating AD from normal control (NC), pMCI from NC, and sMCI from NC, respectively, and outperforms the related algorithms in the literature.

5. IMPLEMENTATION

MACHINE LEARNING ALGORITHM:

A machine learning algorithm is the method by which the AI system conducts its task, generally predicting output values from given input data. The two main processes of machine learning algorithms are classification and regression. There are four types of machine learning algorithms: supervised, semi-supervised, unsupervised and reinforcement.

- Linear regression.
- Logistic regression.
- Decision tree.
- SVM algorithm.
- Naive Bayes algorithm.
- KNN algorithm.
- K-means.
- Random forest algorithm.

Machine learning (ML) is a type of artificial intelligence (AI) that allows software applications to become more accurate at predicting outcomes without being explicitly programmed to do so.

Machine learning algorithms use historical data as input to predict new output values.

INCEPTIONV3:

The Inception V3 is a deep learning model based on Convolutional Neural Networks, which is used for image classification. The inception V3 is a superior version of the basic model Inception V1 which was introduced as GoogLeNet in 2014. As the name suggests it was developed by a team at Google. Inception v3 is a convolutional neural network for assisting in image analysis and object detection, and got its start as a module for Googlenet. It is the third edition of Google's Inception Convolutional Neural Network, originally introduced during the ImageNet Recognition Challenge. Inception v3 is an image recognition model that has been shown to attain greater than 78.1% accuracy on the ImageNet dataset. The model is the culmination of many ideas developed by multiple researchers over the years.

RESNET50:

ResNet-50 is a convolutional neural network that is 50 layers deep. You can load a pretrained version of the network trained on more than a million images from the ImageNet database [1]. The pretrained network can classify images into 1000 object categories, such as keyboard, mouse, pencil, and many animals. ResNet, short for Residual Networks is a classic neural network used as a backbone for many computer vision tasks. This model was the winner of ImageNet challenge in 2015. The fundamental breakthrough with ResNet was it allowed us to train extremely deep neural networks with 150+layers successfully.

ResNets are being implemented in almost all of AI's new tech to create state-of-the-art systems. The principle on which ResNets work is to build a deeper networks compared to other plain networks and simultaneously find a optimised number of layers to negate the vanishing gradient problem.

6. EXPERIMENTAL RESULTS

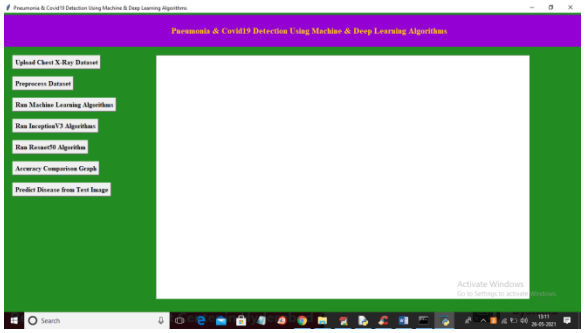

Fig.4: Home screen

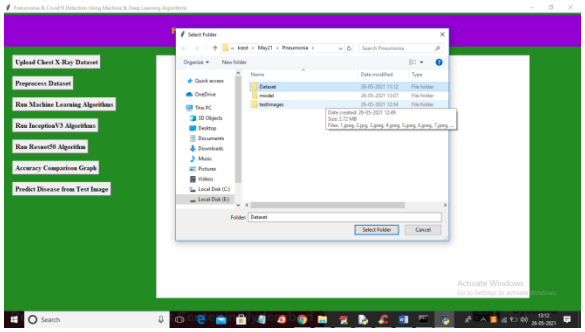

Fig.5: Upload chest X-ray dataset

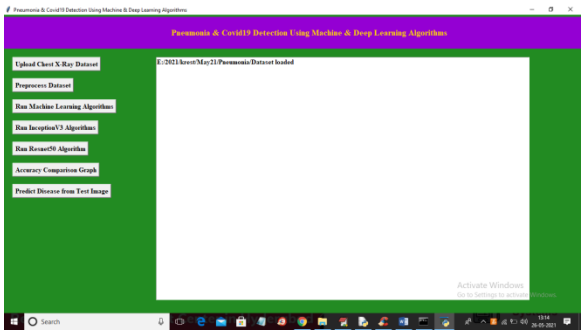

Fig.6: Dataset loaded

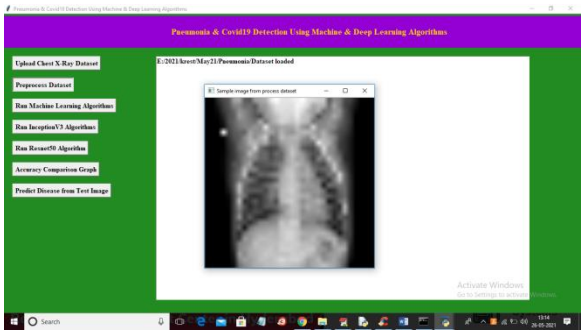

Fig.7: Preprocess dataset

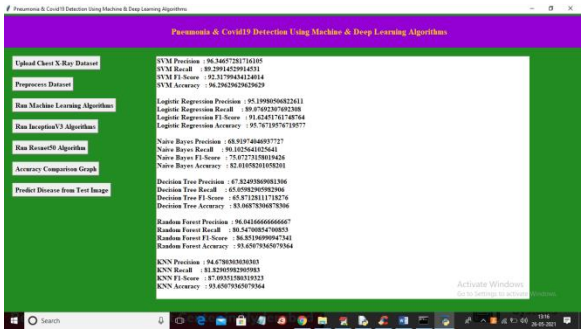

Fig.8:Run ML algorithms

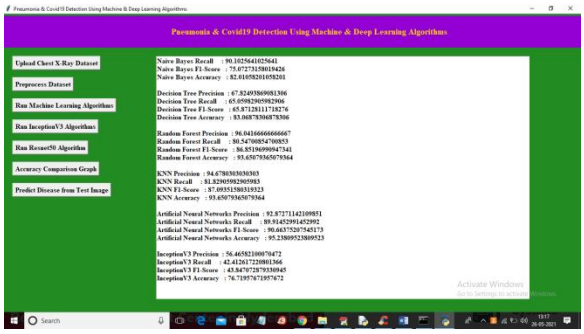

Fig.9: InceptionV3 algorithm

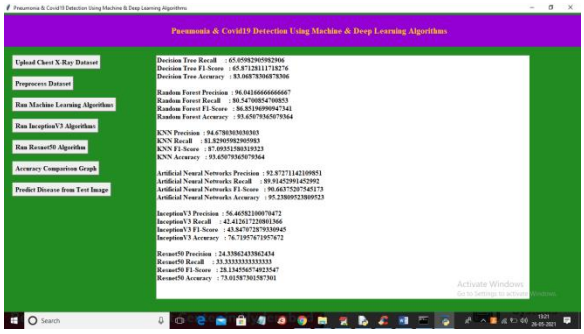

Fig.10: Resenet50 algorithm

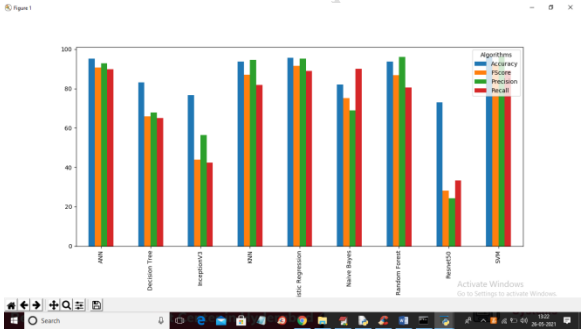

Fig.11: Accuracy graph

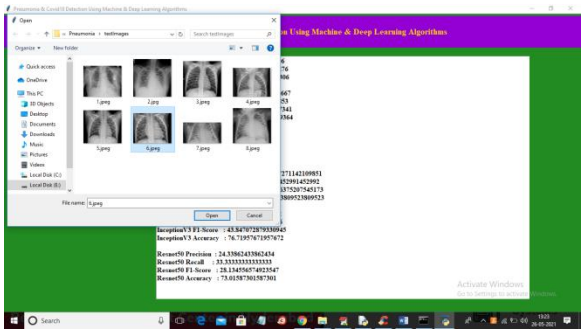

Fig.12: Test data uploading

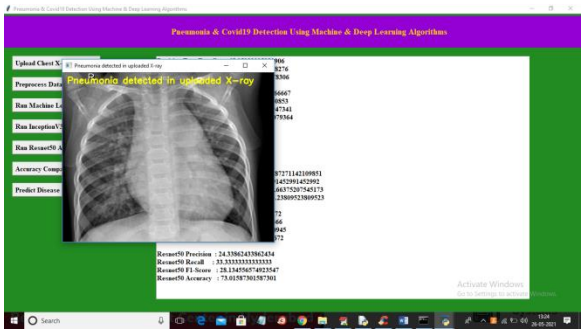

Fig.13: Prediction result

7. CONCLUSION

In this study, machine learning & deep learning models were given, one of which was fully customized. The deep learning models Inceptionv3 and resnet50, are pretrained and adjusted. Models in this category and the correctness of the paper were

nearly identical. There are 1,142 COVID-19 and 4,237 pneumonia chest X-ray pictures in the collection. The pretrained model has a 98% accuracy rate, while the customized deep transfer learning model has a 97% accuracy rate. Research on a larger data set and with additional pretrained models will be conducted in the future.

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