iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** VI **Month of publication:** June 2021

DOI: https://doi.org/10.22214/ijraset.2021.35507

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue VI Jun 2021- Available at www.ijraset.com

Respiratory Diseases Detection using Machine Learning

Shubham Shitole[1], Nayan Shitole[2], Prashant Gite[3], Yogendra Lokhande[4]
Computer Engineering, Sinhgad Academy of Engineering

***Abstract**: Prediction of the Respiratory diseases in the earlier stage can be very useful specially to improve the survival rate of that patient. CT scan images are used to detect various lung diseases .These CT scan reports are sent to pathologists for further process. Pathologists analyze CT scan report and predict the infected tissues which are the main cause of the particular disease. This is lengthy process and to avoid this steps and increase the accuracy of the prediction Machine learning plays an important role . The system proposes to build "Predictive Diagnostic System" of infectious lung by using the concept of image processing in conjunction with machine learning. Proposed system will detect the disease from CT scan images and use preprocessing technique that will remove the noise and disturbance in image. Feature extraction process is applied to extract the useful features of underlying image, and feature selection technique will further optimize the top ranking features. CNN algorithm is then applied to classify the images for detection of Respiratory disease. After detection of disease, report will be generated and submitted to patient.*
***Keywords: CNN, Machine Learning, Image Processing, Feature Extraction**.*

I. INTRODUCTION

Respiratory Disease is a noteworthy reason for Mortality in the western world as exhibited by the striking factual numbers distributed consistently by the American Respiratory Disease Society. The motive behind the system is to detect various types of Respiratory diseases such as lung cancer, hanta virus, bronchietasis, and pneumonia with the help of machine learning. This can be helpful in reducing the time required for the whole disease detection process and will also increase the accuracy of the disease detection. The input images provided to the system are CT scan images. The image is further passed through various phases in the system. These phases help in image denoising so that the image is in the computer readable format. These phases includes image acquisition , preprocessing , segmentation , feature extraction. The region of interest (ROI) is acquired after all these phases. These ROI is processed by neural network to identify irregularities in lung nodules. The ordinary ones are the sign of normal patient. The irregular ones incorporate the type of lung tumor. We will utilise a typical arrangement technique specifically CNN & neural systems to determine the type of disease. Thus the report with the identified lung disease is generated. Further this report with detailed information is mailed to the patient. With the help of machine learning algorithm, proposed system determines four types of Respiratory diseases as hanta virus, pneumonia, lung cancer and bronchietasis. System helps to build up effective infection treatment and it also improves accuracy.

A. Techniques Used in lung disease Prediction

1) *Image Processing:* Image processing techniques involves manipulation of pictures/images using computer. Now a days this technique used in medical field to produce high quality and clear images for various medical and scientific results which ultimately helps doctor to diagnose disease faster. Image processing is basically used to denoise images. In machine learning various libraries are there for image processing like OpenCV, Pillow/PIL, etc. Using Image processing algorithms, we can increase accuracy and efficiency of the system up to certain level. We have used the algorithms like Gray scale, Thresholding and Edge detection in the preprocessing stage to denoise the image.
2) *Convolutional Neural Network (CNN):* Convolutional neural network (CNN) is a deep learning algorithm. This neural network is inspired by the biological processes in which connectivity of neuron resemble visual cortex's organization in animals. Convolutional neural network i.e. CNN has input layer, hidden layers and then the output layer. CNN has applications in image classification, recommendation systems, image and video recognition, etc. This algorithm has four layers as follows:
   - Convolutional layer
   - Relu layer
   - Pooling layer
   - Fully connected layer

3) *Image Processing Algorithms used:*

a) *Gray Scale:* Conversion of the colored image into Gray Scale:

First take the RGB value of the pixel.
Now, we have to find mean RGB value of pixel as shown below:

$$\text{Average} = (R+G+B)/3$$

Now, replace the R, G and B value of the pixel with mean value.

b) *Thresholding:* This algorithm divides an entire image into different segments based upon the pixel attributes.

c) *Edge Detection:* It is the image processing technique to find boundaries of objects within the image. In our case, boundaries of lung tissues.

II. PROPOSED SYSTEM

The proposed system helps to detect the various lung diseases like Pneumonia, Hanta virus , Lung cancer etc. using machine learning algorithms. The system saves the time required and provides the accurate and precise results. The system saves the efforts of analyzing the ct scan images of pathologist. Following figure shows the system architecture of our proposed system:

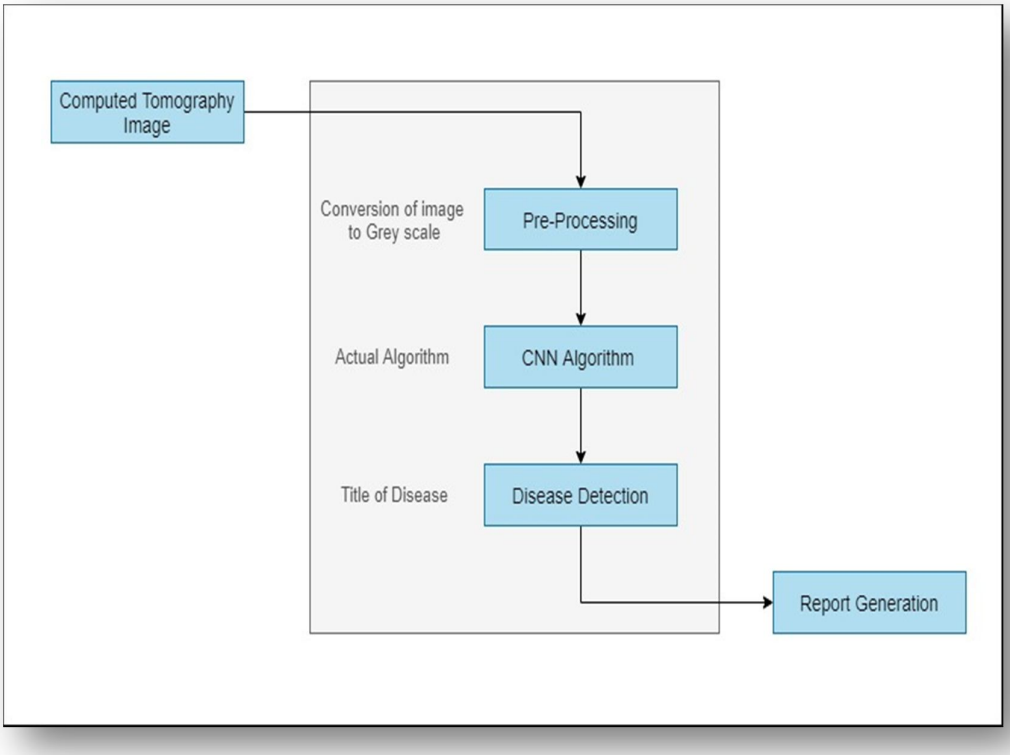


Figure 1: System Architecture

A. Pre-Processing

Pre-processing is the step in which image denoising algorithms like gray scale, thresholding and edge detection are applied on the images. Conversion of the colored image into Gray Scale:

1) First take the RGB value of the pixel. e.g. R=200, G=200, B=200

2) Now, we have to find mean RGB value of pixel as shown below:

Average= (R+G+B)/3

Average=(200+200+200)/3

= 200

3) Now, replace the R, G and B value of the pixel with mean value.

In the next step we are doing feature extraction by using ML algorithm in which we focus only on the specific region of interest i.e. tissue of lungs which we need for detection of the any abnormal behavioral.

B. Convolutional Neural Network (CNN)

In Convolutional neural network i.e. CNN, neuron in one layer will be connected to the neurons in small region of layer in neural network before it, instead of all the neurons before it, as present in fully connected network. The Convolutional neural network algorithm takes the processed images as an input to the first layer of Convolutional neural network and then it passes this image through all four layers of Convolutional neural network algorithm which are explained below:

1) *Convolutional Layer:* Convolutional neural network uses small pieces of the blocks which are known as patterns and all those blocks then compared with the test image. Then, we are comparing these pattern on the input image and check

whether it is matching or not. Afterwards, we are multiplying all pixel values of the pattern and the test image block to get resultant output matrix.

2) *ReLU layer:* Known as Rectified Linear Unit layer. Our main aim of using the relu layer is to discard all the negative values from the output matrix which we have got from previous convolutional layer. In this layer we are replacing all those negative values with the 0. A node is activated in Rectified Linear Unit function if input value is above a certain threshold, So if input is less than zero then at that time the output is zero. Whenever there i input value goes above a certain threshold value, then their exists a linear relationship with dependent variables.
3) *Pooling Layer:* In the next step of Convolutional neural network (CNN) algorithm we are reducing the size of the image matrix.
4) *Fully Connected Layer:* In this step actual classification of diseases is carried out. Here, we are converting the output of the pooling layer into a single list.

III.LITERATURE SURVEY

(Ashitosh Tilve et al. 2020) This paper focuses on the surveying the detection of lung disease like pneumonia. Various computer aided techniques are studied. The techniques which are used to convert raw X-ray images into the standard format are studied for analyzing and detection purpose. Also algorithms like DENSENET, ANN, KNN, CNN, RESNET are used because they play important role in detection of pneumonia.

(Xin Lie et al.,2020) Improved CNN method for detection of Pneumonia using deep learning approach is studied in this paper. They have fixed the image size in original dataset and suitable batch size is used for the input to the network. The layers like Convolutional layer and Pooling layer of the CNN i.e. Convolutional neural network are applied on the images. Feature integration layer is also used.

(Mohammed Aledhari et al., 2019) X-ray images are used in diagnosis of Pneumonia in this paper. Deep learning approach is used which uses CNN i.e. Convolutional neural network to identify and classify the diseases using X-ray images. Various lung segmentation techniques have been implemented in this Paper which results in increasing accuracy and thus by reducing the cost of diagnosis.

(Matko sari et al., 2019) CNN i.e. Convolutional neural network has now became a better way in the field of medical science and research for analysis of images. For diagnosis of lung disease, methods which proposed so far are based on the radiology technique. The features that are related to survival of the patients are taken from the CT Scan images by setting some fixed size to detect the diseases.

(Thomas george et al., 2019). To discard some diagnostic errors by manual inspection of the tissues tends to be extremely difficult, complex and inaccurate and requires a skilled person. In this research, the local binary pattern provides much good result and performance rather than the basic textural patterns.

(Tiantian Fang et al., 2018) Among all the researches Tiantian proposed the system which is precise, fast, and well balanced based on the deep learning algorithms which can help in diagnosis the lung cancer in minimum time. A Convolutional neural network (CNN) structure similar to that of the GoogLeNet was developed using a transfer learning approach in this research paper by tiantian fang.

(Twinkle et al.,2018) In year 1960, L.B. stated that the analysis and detection of the normal and abnormal images of the lung can be carried out automatically. So the analysis of images in the medical research area with the help of computers was initiated. Afterwards, Dr. Manjunath, J.Senthilkumar introduced a project which is based on the gabor filters and watershed segmentation algorithms to detect the various lung diseases. The proposed system includes, prediction and detection of lung diseases which gives accurate and precise results. SVM algorithm is used to classify the textural features which are taken out from the differentiated ROI's.

(Janee alam et al.,2018) This paper focuses on the techniques of the identification of lung diseases by breath. The whole motive of the breath detection system is that it helped the various physicians in quickly screening of the lung diseases. KNN and SVM algorithms are used to analyze the disease.

(De-ming wong et al.,2018) To detect the malignant the EDM machine learning algorithm which contains the vectorized histogram features are used to detect the SCLC.

(Amita Desai et al.,2017) By doing analysis of various human lung images at different stages, lung cancer can be detected early by the system which is proposed by development of the CAD system.

IV.CONCLUSIONS

In these difficult covid times, we have understood that health is the topmost priority and after all if we are able to detect the diseases at the earliest as possible then it can be cured easily instead when we find it at the later stages which becomes difficult

for the patient to recover. Hence, We were able to achieve the system which could detect the diseases at the early stages with more accuracy using CNN machine learning algorithm. We have also processed the images using various techniques which helped to denoise the images. Furthermore, We can conclude that the system detects the disease at the early stages and thus increase the chances of a patient recovering.In future, We can work on increasing the accuracy of the system by researching more as there are always new innovations as time passes by.

REFERENCES

[1] Ashitosh tilve, Shailendra aswale ,"Pneumonia detection using Deep learning approaches", 2020 International Conference on Emerging Trends in Information Technology and Engineering (ic-ETITE) 2020.

[2] Xin Li, Fan chen ,"A Pneumonia detection method based on improved convolutional neural network", IEEE 4th Information Technology,Networking,Electronic and Automation Control Conference (ITNEC 2020).

[3] Mohammed Aledhari, Shelby Joji, “Optimized CNN based diagnoses system to detect the Pneumonia from chest radiographs”, IEEE International Conference on Bioinformatics and Biomedicine (BIBM), 2019.

[4] Sanjukta Rani Jena , Thomas George , Narain Ponraj, “Texture Analysis Based Feature Extraction and Classification of lung cancer”, in [IEEE International Conference on Electrical, Computer and Communication Technologies (ICECCT),2019.

[5] Tiantian Fang , “A Novel Computer-Aided Lung Cancer Detection Method Based on Transfer Learning from GoogLeNet and Median Intensity Projections” , in IEEE International Conference on Computer and Communication Engineering Technology (CCET), 2018.

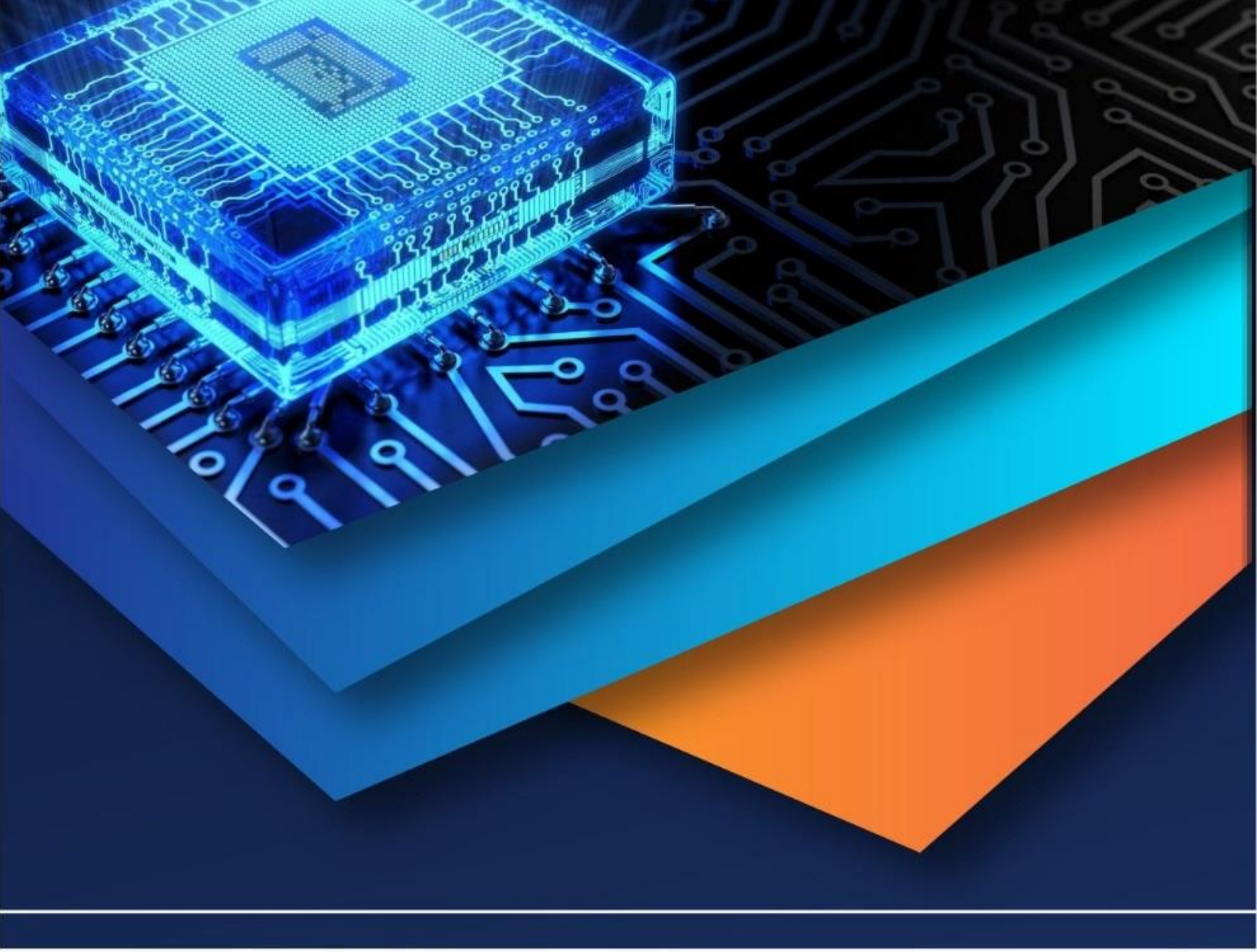
[6] Ms. Twinkal Patel, Asst. Professor Mr. Vimal Nayak, “Hybrid Approach For Feature Extraction of Lung Cancer Detection”, in Second International Conference on Inventive Communication and Computational Technologies (ICICCT), 2018.

[7] Janee Alam , Sabrina Alam , Alamgir Hossan, “Multi-Stage Lung Cancer Detection and Prediction Using Multi-class SVM Classifie”, in International Conference on Computer, Communication, Chemical, Material and Electronic Engineering (IC4ME2) , 2018.

[8] Qing Wu and Wenbing Zhao, “Small-Cell Lung Cancer Detection Using a Supervised Machine Learning Algorithm” , in International Symposium on Computer Science and Intelligent Controls (ISCSIC) ,2017.

[9] De-Ming Wong , Chen-Yu Fang, Li-Ying Chen , Chen-I Chiu , Ting-I Chou , Cheng-Chun Wu , Shih-Wen Chiu , Kea-Tiong Tang , “Development of a breath detection method based Enose system for lung cancer identification”, in IEEE International Conference on Applied System Invention (ICASI), 2018.

[10] Moffy Vas1 , Amita Dessai, “Lung cancer detection system using lung CT image processing” in International Conference on Computing, Communication, Control and Automation (ICCUBEA), 2017.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)