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PREPROCESSING OF MULTIMODAL IMAGING DATA FOR COVID-19 DETECTION

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Abstract: Covid-19 is the global pandemic that is adversely affecting the human life in this scenario. World is running for the overcoming this pandemic and for finding better treatments for it. Detecting this disease is major task for medical practitioners now a days. In this study we are focusing on preprocessing stages of multimodal imaging datas, mainly x-rays for the detection of this disease. And this preprocessed images are very helpful for using it in transfer learning methods to detect covid-19. We propose this preprocessing stage for creating an image dataset, which is trustworthy for developing and testing deep learning models for the detection of this disease. Unwanted noise in the images is removed in this stage so that detection can be made using specific features from them. As well as x-ray ,other two multimodal image datasets can be used to preprocess.

***Index Terms* – Covid-19 detection, Image preprocessing, Multimodal imaging data**

I. INTRODUCTION

The current pandemic has impacted millions of human lives ,so many got infected and dead. Better management against this pandemic is early detection, isolation and treatment for the patients is the major way. This study aims to provide preprocessing framework for Covid-19detection through transfer learning using multimodal imaging data, mainly using x-rays. The preprocessing framework helps to improve quality of the image for deep learning based predictions. To slow the transmission of the disease covid-19, fast and affordable identification methodologies are required. Now, RT-qPCR (Reverse transcriptase quantitative polymerase chain reaction) is a identification methodology available as a golden standard. But it takes two days to get the results so it is time consuming.

Other methods for detecting the disease is image technology based approach is CT imaging [3], X-ray imaging [4], and ultrasound imaging [5]. CT based detection is time consuming and costly. X-ray is a cost effective, less time consuming and commonly used for lung infection detection. But the problem is early detection of the disease is not possible as disease progresses it shows abnormalities. Ultrasound imaging is another tool for the diagnosis and it has excellent ability of covid-19 detection.

In this paper preprocessing framework for balancing quality of the image is proposed. And this preprocessing framework allows models to train on lung features thus ignoring noise features.

II. RELATED WORKS

X-rays are used as radiation source in CT scans, compared to standard x-ray images they provide very high image resolution and contrast [2]. Currently x-ray is a reference diagnosis tool for pneumonia and sometimes CT outperforms X-Ray as a pneumonia diagnostic tool. Traditionally in the fields of cardiology and obstetrics ultrasound has been used as a diagnostic tool because technical advancement including deep learning has paved to determine useful information from low quality and signal-to-noise images [6]. For acute respiratory failure combination of ultrasound and machine learning was more valuable to provide faster and more accurate interpretation of lung ultrasound [7]. Because of poor contrast in X-ray images, distinguishing soft tissues is difficult, this leads some researchers to implement contrast enhancement as a preprocessing step in X-ray based diagnosis [8]. The important step in identification of lung nodules is lung segmentation of X-ray images and based on linear filtering / thresholding, rolling ball filters and CNNs various segmentation approaches are proposed [9]. Histogram equalization techniques mainly adaptive histogram equalization can improve contrast of CT images [10]. To enhance the quality of ultrasound images Contrast Limited Adaptive Histogram Equalizer (CLAHE) can be used [11].

III. PROPOSED PREPROCESSING SYSTEM

Large number of datasets are available in publicly accessible sources, the available datasets are may be normal, pneumonic, or Covid-19 images .Covid-19 X-ray, CT, Ultrasound images can be obtained from public sources . Here we use X-ray images as input for preprocessing and some of X-ray images are stored in a folder. Then the X-ray images in gray scale are read with directory names. Then the loaded images are cropped to remove unwanted part of the image so as to get the required part. The cropped images are recrop to find the centroid of the lungs. Loaded image is segmented using ostu's method and saved as segmented features. We notice that ground glass feature of the image is very faint in terms of intensity and blends into same category as the intensity of lungs on the histogram. Therefore we will move onto using another method named clustering. The intensity of lung tissue, ground glass feature and others are set different for clustering so that we'll get the segmented features clearly. Fig1 below shows the block diagram of preprocessing system .

Read the image → Cropping → Centroid calculation → Segmentation

Fig 1 . Block diagram of proposed system

IV.RESULTS

Loaded 12 different patient's X-ray images into the directory is shown in the Fig 2 below. Then the output of the images after cropping, thresholding, and clustering is shown in Fig 3 and Fig 4 .

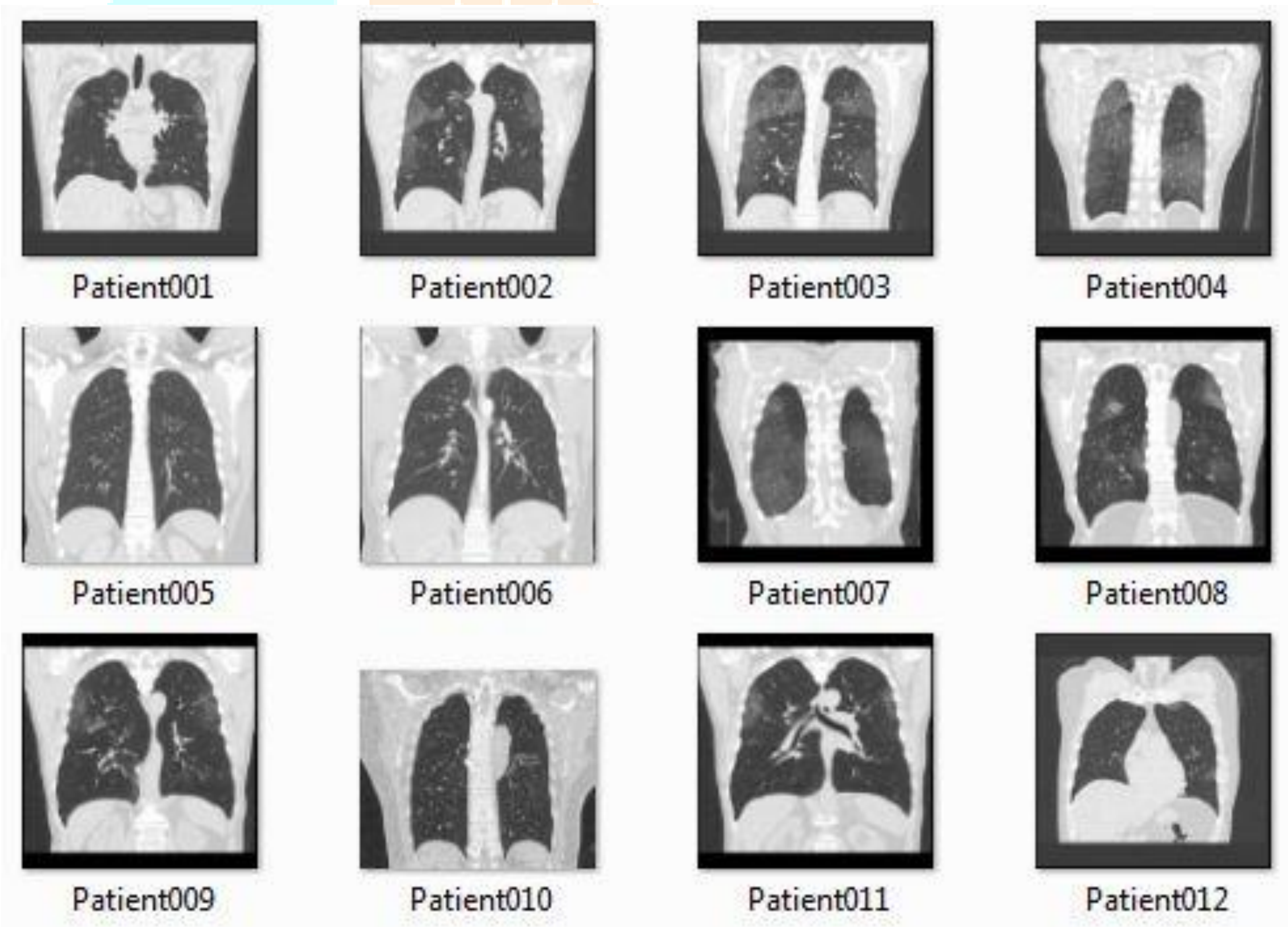

Fig 2.X-ray images taken as input

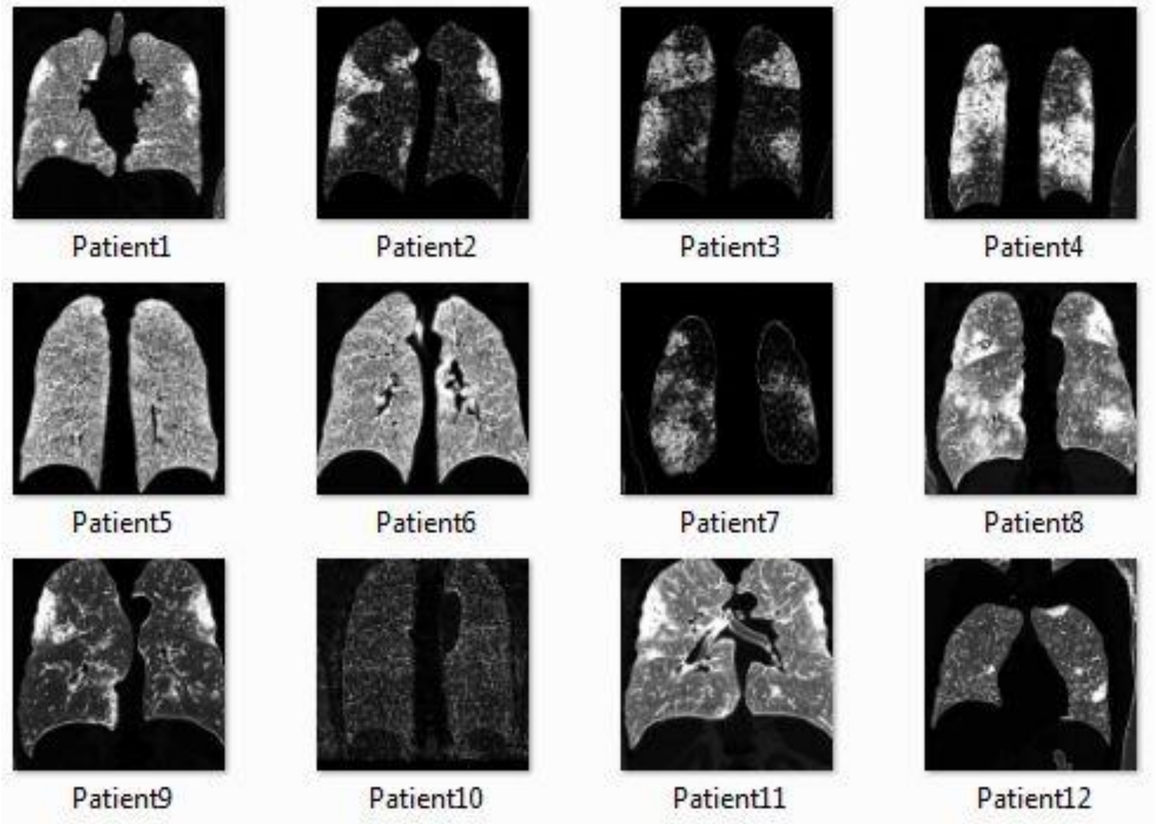

Fig 3. Segmented features of X-ray image

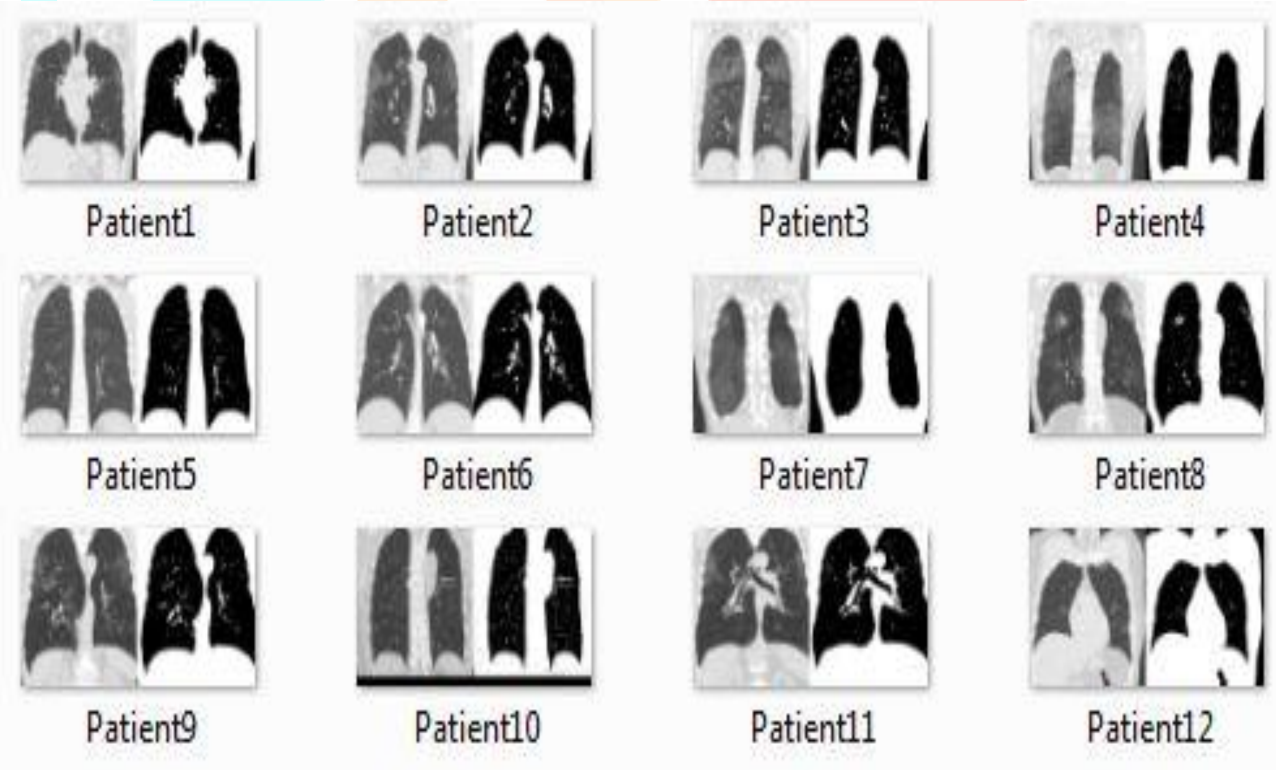

Fig 4. Segmented lung tissue of X-ray image

V.CONCLUSION

In this paper ,a preprocessing system for covid-19 detection is proposed. Some previous works based on this field is reviewed. Different steps present in this system is discussed and the result of the system using X-ray image is also discussed above. This proposed system is implemented using MATLAB. Classification of the multimodal images can be done using CNN like VGG-19 by taking this proposed system as a preprocessing stage for the detection of Covid-19.

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