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Chronic Obstructive Pulmonary Disease Pneumonia from CT Lung Image

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ABSTRACT: The disease Pneumonia spreads quickly. The poses a serious risk to the health and well-being of its victims. The lack of available experts and tools hinders the accurate biomedical diagnosis of pneumonia, which is necessitated by the use of a variety of diagnostic tools and clinical features. According to the research presented here, a mobile app that uses machine learning techniques to classify whether or not a patient has pneumonia is being developed. The aim of this study was to develop a prototype mobile app for the detection of pneumonia through neural networks. Using a high-level tool like Create ML facilitates this process and eliminates problems like the number of layers in a neural network, initializing the model parameters, or which algorithms to use. The template is now accessible to everyone, everywhere, through a mobile app. The dataset of more than 5000 live images was used to form an image classification model using Create ML, a tool with a GUI, and there was no need for specialized knowledge. Pneumonia is a life-threatening illness manifested in the lungs by a bacterial or viral infection. It can be life-threatening if not implemented in a timely manner and, as a result, early diagnosis of pneumonia is vital. The purpose of this document is to automatically detect bacterial and viral pneumonia by means of digital radiographic images.

KEYWORDS: CT, MatLab, Python, Pneumonia, Viral and Bacterial infection

I. INTRODUCTION

Pneumonia is a viral or bacterial disease found in the lungs. It primarily affects the small air sacs known as Alveoli and dry cough, chest pain, fever, and difficulty breathing are symptoms of pneumonia. To identify the disease, the patient undergoes the diagnosis test like chest X-rays (CXR), blood tests and culture of sputum to confirm presence or absence of disease. The risk factors of the pneumonia include cystic fibrosis, chronic obstructive pulmonary disease (COPD), sickle cell disease, asthma, diabetes, heart failure, finally, a weak immune system. Researchers invented vaccines which prevent certain types of pneumonia disease. In general, bacterial pneumonia is treated with antibiotics. If the patient affected too hard, then he/she would undergo oxygen therapy which gives additional support to breath. The concept of machine learning evolves from machine learning. The machine learning was first introduced by Donald Hebb on his book titled The Organization of Behaviour. From then, the implementation of machine learning algorithms took place. Besides researchers had undergone numerous implementations and build steps for future through their success. Through machine learning, researchers had outputs which have various benefits in real world. There is no particular area which is dedicated for implementing this domain. At present, each and every industry adopting machine learning and machine learning technologies into their products, which turns out user friendly. Every invention should reach common man and main motto of the researcher or scientists was the same. Particularly, in medical industry introduced machine learning products in their practices and overcame plethora of complex challenges in daily life. For treating with detection, decision, analyses, and in future scope processes, machine learning shows its output with maximum accuracy. From these technologies, diseases could be detected as fast as possible and can make better decisions. Pneumonia is one of the diseases that would affect our breathing system and even could cause death if it is in outburst stage. For detection of this disease, the doctors would take time for identification. The output of this disease would threaten entire world and grab the entire medicine researcher's sight. The deaths, children who are under 5, because of pneumonia were outbroken around

800,000 in 2017 and this continuous for future years. Even though there were diagnosis processes for this disease, the deaths are recording at peak. For treating pneumonia is different for children and adults because of their different symptoms. Moreover, the children are so sensitive to treat. The Antibiotics, antivirals, antifungals, analgesics, cough suppressants will be used in medication for pneumonia prevention. If it reaches to beast mode, then the patient undergoes oxygen therapy. Moreover, the patient should take self-care like taking rest, drink plenty of liquids, and do not overstrain body. To overcome from pneumonia a patient should undergo for these treatments.

II. LITERATURE SURVEY

1. In this paper, the work was done by Convolutional Neural Network (CNN), which is the machine learning method and tries extract each and every feature init. The dataset used was from Kaggle, online open-source platform to machine learning. Here, the data are in the form X-ray image of pneumonia lungs. They have implemented this training phase on four CNN models and these models were differentiated by dropout layers which are introduced in between them. While in training phase, pooling, forward and backward propagation methods were used in models. In this work, they had obtained better results. In model1 the accuracy was 89.74% followed by model2 with accuracy of 85.26%. Next model3 achieves an accuracy of 92.31% and finally the model4 obtained accuracy of 91.67%. Here, in model3 and model4 the dropout layers were introduced. Amit Kumar Jaiswal et al.

2. shows research work on implementation of Mask-RCNN, a deep neural network. In this research data was taken from GitHub, which is the online platform of data collection, and type of data is Chest X-rays (CXRs) images. The unique feature of this work was to introduce a neural network which differentiate the global and local extracted features. While implementation had done on two algorithms, which are, ResNet50 and ResNet101. In addition, they had implemented data augmentation technique to acquire better accuracy. They carried out with training and got 30% by ResNet50 and 97% through ResNet101. Besides they tried to create an ensemble model, combination of above two models, and got accuracy of 21.8%. D.H. Kim et al.

3. this area of work refers to the bone fracture. The model which had used was deep convolution neural network and involves the transfer learning methodology. The name of model was Inception v3 and was trained on the bone fracture data. The dataset was in form of radiographs and these were split in to 80:10:10, i.e., Training data, Validation data, Testing data. The data, which are radiographs, had undergone through some data preprocessing. The accuracy they obtained through this model was 95.4%. The accuracy does consist of conditions. They took the accuracy value when the sensitivity and specificity was maximum, i.e., 0.9 and 0.88. Jonathan Rubin et al

4. did research on implementation of Dual Convolutional Neural Networks. The Dual Net Architecture copies routine clinical practice by at the same time preparing both frontal and horizontal (lateral) CXR pictures acquired from a radiological test. In this model the required dataset was MIMIC-CXR dataset is the biggest delivered chest x-beam, which was taken from Kaggle. They train profound convolutional neural networks to perceive different basic chest dis-facilitates on the so far biggest assortment of chest radiographs – the MIMIC-CXR dataset. And then they depict and assess CNN models for preparing frontal, just as parallel chest x-beams, which have gotten less consideration from past examination endeavours. Besides, they create different models for anteroposterior (AP) and poster anterior (PA) frontal view types. Finally, the DualNet design acknowledges a couple of frontals (PA or AP) and horizontal information pictures. Two convolutional neural networks are prepared in equal for each information also, their yields are linked together before a last completely associated layer makes a multi-label expectation. They carried out the accuracies are 62.5% using Dual Net PA + Lateral and 59.3% by using Dual Net AP+Lateral. Taufik Rahmat et al

5. shows research work on implementation of Faster R-CNN. This model is all about the headway of CNN dependent on Regional paradigm to handle the object detection and classification. They start with a model called Regional-CNN (R-CNN) (Girshick, Donahue, Darrell, and Malik, 2014) followed with Fast R-CNN (Girshick, 2015) and Faster R-CNN (Ren, He, Girshick, and Sun, 2017). Regional paradigm means to improve the exactness of object detection, while Fast and Faster focuses to improve the presentation of the whole models. A couple of works have been done that applied R-CNN and Faster RCNN in medical area. The required dataset MIMIC-CXR dataset was taken from Kaggle. From R-

CNN model, they observe that this model is facing problems like slow performance. So, Fast R-CNN was proposed to overcome the above-mentioned challenges. The method is improved by adding two key features like amalgamate all models into one model (consists of feature extraction, classification, and detection) and the need of running CNN per region is reduced to only once per image.

III. EXISTING SOLUTION

It is detected during an interview or physical exam, where the doctor listens to the lungs using a stethoscope to identify cracks. Examinations such as chest X-ray, pleural fluid culture, pulse oximetry, blood oxygenation, and bronchoscopy are recommended to make an accurate diagnosis. The disadvantage of this existing solution are less accurate on diagnosis and High cost.

IV. PROPOSED SYSTEM

- This is the area within machine learning that brings together a set of algorithms and techniques. This method uses examples to learn and pick patterns from large amounts of data.
- In this technique, an artificial neural network is composed of several layers of processing in a hierarchical manner, each from a lower level of abstraction to a higher level of abstraction (inspired by the biological behaviour of the brain by the interconnections between neurones) and each of them with a task. In particular, different architectures arrange connections from different layers to determine the direction and propagation of data.
- Notably, convolutional networks have rapidly become a preferred methodology for image analysis.

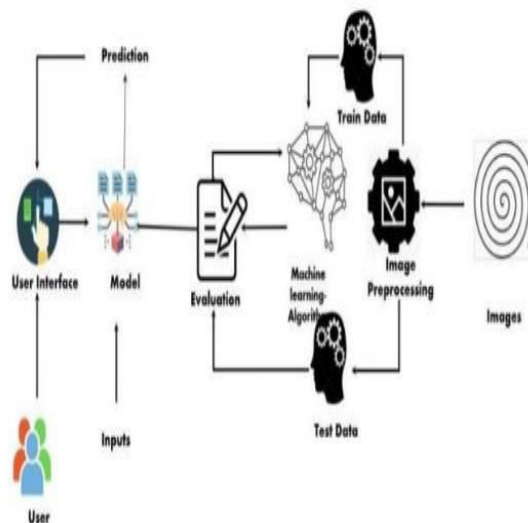


fig:1 block diagram of pneumonia image analysis

V. FLOW CHART

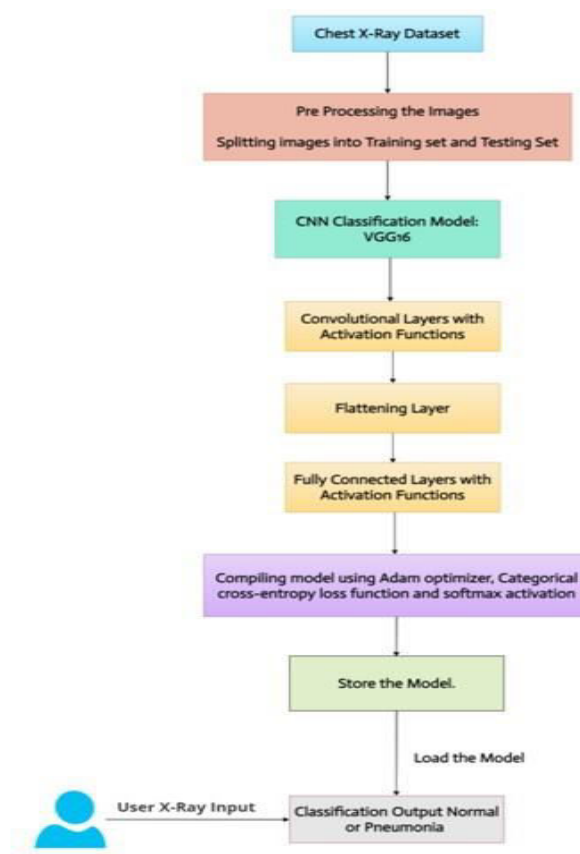


fig:2 flow chart of pneumonia image analysis using machine learning

VI. RESULT

Our proposed model is designed and developed to detect and classify Pneumonia from Chest X-ray Images. It contains both image processing and a Convolutional Neural Network. We developed a model The algorithm begins by transforming Chest X-ray Images into sizes smaller than the original. The next step involves the identification and classification of images by the convolutional neural network framework, which extracts features from the images and classify them. This work has presented the X-Ray images for Pneumonia detection based on CNN.

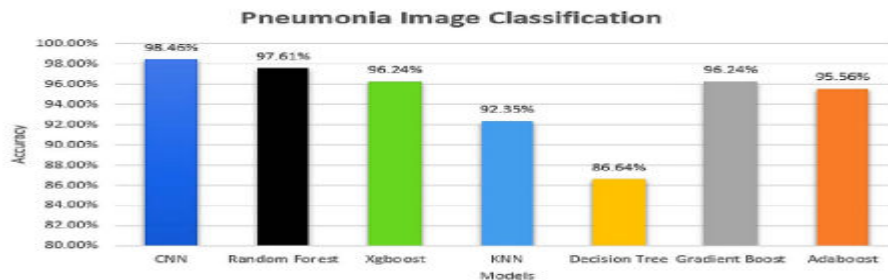


Fig. 9. Accuracy of Pneumonia Image Classification

fig:3 accuracy rate of pneumonia image classification

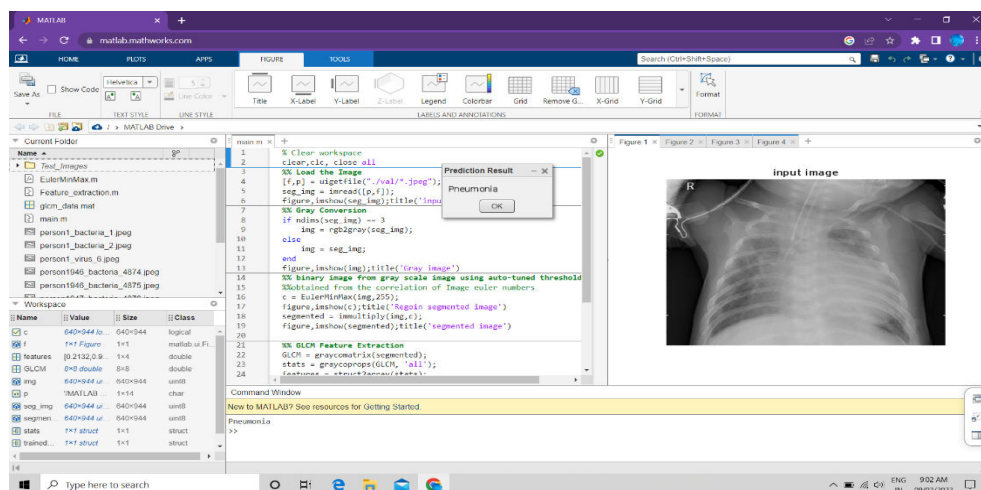


fig:4 stimulation output of ct image for pneumonia affected patient

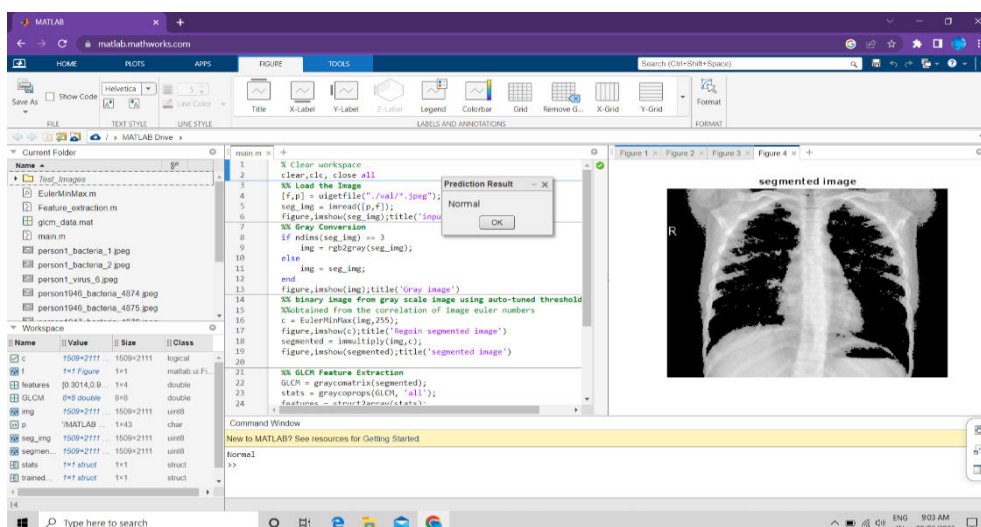


fig:5 stimulation output of segmented image for normal person not affected by pneumonia

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