Design and Development of Lung Disease and Damage Analyzer

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Abstract— Chest X-ray are generated in less time but report based on chest X-ray takes time which is not feasible during the pandemic situations like Covid-19 as delay in report can cause severe consequences. As a result, it is observed that ML can help in medical field to reduce the time to generate a report. With the help of ML and Computer Vision models can be built that can be used to predict Lungs Cancer as well as various diseases of Lungs and not only this several models have been created that are helping in predictions of various ailment as well as fractures. Using ML and Computer Vision can create models that once trained properly can give accurate predictions and that too in less time. In medical field time taken to generate report is very crucial as in some situations it becomes the matter of time for a patient to survive.

Keywords— Lungs Damage, Covid-19, Disease Classification, Lungs Cancer, Machine Learning, Computer Vision, Convolutional Neural Networks.

I. INTRODUCTION

During the pandemic situation it was observed that a lot of people were having difficulty in breathing and due to lot of rush at hospitals the reports of the chest X-rays were getting delayed. In such situation the consequences of delay in report can be dangerous and can lead to worse situation. As the no of cases were increasing it was becoming more challenging for the hospitals to generate reports on time which was creating chaos as till the report was generated and given to patients, it already came in contact with friends and family.

It is an android app in which user can provide a chest X-ray and they can get an analysis based on various factors. This will help the users who have been asked to remain Quarantine and have their chest X-ray but do not have its report. The app is based on ML and its main functionality is to do complete analysis of the chest X-ray for various diseases. Some similar systems have already been presented but the system proposed includes additional functions for the user interface and an improved implementation. For example, the user can provide their chest X-ray and they will get an analysis report along with indication about any disease detected.

The detection about any disease is done by Machine Learning as hardware requirement is less and just with the help of an app user can get a virtual report of its Chest X-ray. Machine Learning has an incredible ability to solve real life problems. Problems are mainly based on two factors, time and money. The problem encountered was the time taken by the hospitals to generate reports based on Xrays of chest as well as the increase in expenses of medical treatment. Year by year medical science is reaching new heights but expenses are not reduced to such level. As a result using ML can help reduce the expenses of many Costly machinery used by Hospitals. So to overcome the problems faced by doctors and patients we our using datasets containing a variety of chest X-rays which will help to create a model that will give more accurate predictions.

It is pretty difficult to visualize how any piece of interior will look in a room with lot of factors left to human imagination. The size, the color, and how well it integrates with the existing environment. Augmented reality, a technology that overlays computer graphics on the real world has its applications in the field of engineering and architecture and has been used to tackle real world problems.

Goals or Objectives

- To provide an app to user which can help by generating a report of the given Chest X-ray.
- To provide an app to user which can help by generating a report of the given Chest X-ray.
- To provide the user analysis of a Lungs based on its X-ray.
- To provide the user an immediate indication about any disease detected through X-ray analysis.
- To provide the user analysis about the amount of Lungs Damage through Chest X-ray.

I. LITERATURE SURVEY

A. A. Brindha et al. proposed a system to lung disease using image processing methods. The formed system can take any kind of medical picture in three options including CT, MRI and ultrasound images. The model proposed here was developed using the SVM algorithm used for PSO, genetic optimization and feature selection and classification. This paper produces feature extraction and feature selection results after extension and fragmentation of image processing using lung lung cancer detection. A system that inputs any of the three options, including MRI, CT, and ultrasound image, accepts the medical image. After the image is pre-processed, the Connie filter is used to mark the edge. This current work proposes a method of effectively detecting cancer cells from CT, MRI scans and ultrasound images. Super pixel partitioning was used for partitioning and Gabor filters were used for de-noise medical images. Simulation results are obtained for cancer detection systems using Matlab and comparisons are made between the three medical images. [1]

A. Asuntha et al proposed an interstitial lung disease (ILD) involves many abnormal imaging patterns seen on computed tomography (CT) images. Accurate classification of these models plays an important role in making accurate clinical decisions about the extent and nature of the disease. Therefore, it is important to develop automated pulmonary computerized identification systems. Traditionally, this work has relied on the manual identification of specialists in areas of interest (ROI) to diagnose potential diseases. This protocol is time consuming and prevents fully automated evaluation. In this paper, we demonstrate a new method for classifying ILD imaging patterns on CT images. The main difference is that the proposed algorithm uses the whole image as a mixed input. By overcoming the condition of manual input ROI, our problem setup is much more difficult than the previous task, but clinical workflows can be better solved. The qualitative and quantitative result using a publicly available ILD database demonstrates cutting-edge taxonomic accuracy under patch-based classification and the ability to estimate ILD type using a composite image. [2]

N. Panpaliya et al. proposed to explore a better image segmentation algorithm for medical images to avoid physician interpretation of computer tomography (CT) scan images. Modern medical imaging techniques produce large images that cannot be analyzed manually. The results of the partitioning algorithm depend on the accuracy and convergence time. At this point, it is very important to explore and apply new evolutionary algorithms to solve the problems associated with medical image segmentation. Lung and lung cancer are more common in men worldwide.

Early detection of lung cancer can lead to antipsychotic treatment to save human lives. CT is one of the smallest medical imaging procedures to diagnose lung lung cancer. In the present study, five optimization algorithms work to extract tumors from migraine clustering, K-median clustering, particle swarm optimization, interleaved particle swarm optimization and guaranteed conversion particle swarm optimization (GCPSO). Implemented and analyzed. The performance of the intermediate, adaptive median and median filter was compared during the processing phase and the adaptive mean filter proved to be well suited for Medical City images. [3]

X-ray Interpretation for Medical Use- This app is an attempt to give the reader a guidance of how to read and handle a chest X-ray and how to use chest X-ray in medical purpose. It gives rather an instruction set on Chest X-ray which can be useful for medical students. The instructions are detailed and up to the mark to handle a Chest X-ray as there are several features that are to be observed in an X-ray which needs training. [4]

Chest Radiology- This app provides easily accessible guide to the imaging of acute and chronic chest conditions. The app helps to create the Chronic and Acute imaging of a Chest X-ray as well as it helps to visualize minute points to be observed during working on a Chest Xray. Detailed examining requires acute measures and this feature is provided in this app. The app is available on playstore and this app is also beneficial for medical students. In the medical field imagining the human body along with its minute details is essential and new technologies and devices are making this possible.[5]

Real Time Survey:

1. LOCATION: Crims Hospital
   (Dr. Ashok Abot), Nagpur
   PROBLEMS:
   a. Patients faced delay in the Covid-19 report based on their Chest X-ray.
   b. Patients have to wait in a long queue to get their Chest Report.
   c. By the time patients received their report and got Covid-19 positive, they had spread it to whole family.

II. IMPLEMENTED WORK

The intent of our project is that the users should be able to get an Elemental Report based on its Chest X-ray which can be used for general idea.

The principle of the application is started with taking Chest X-ray as image from the user and then generating the elemental report based on the two features of app. The features are: a. Covid-19 Prediction, b. Disease Classification.

A. Flow Chart

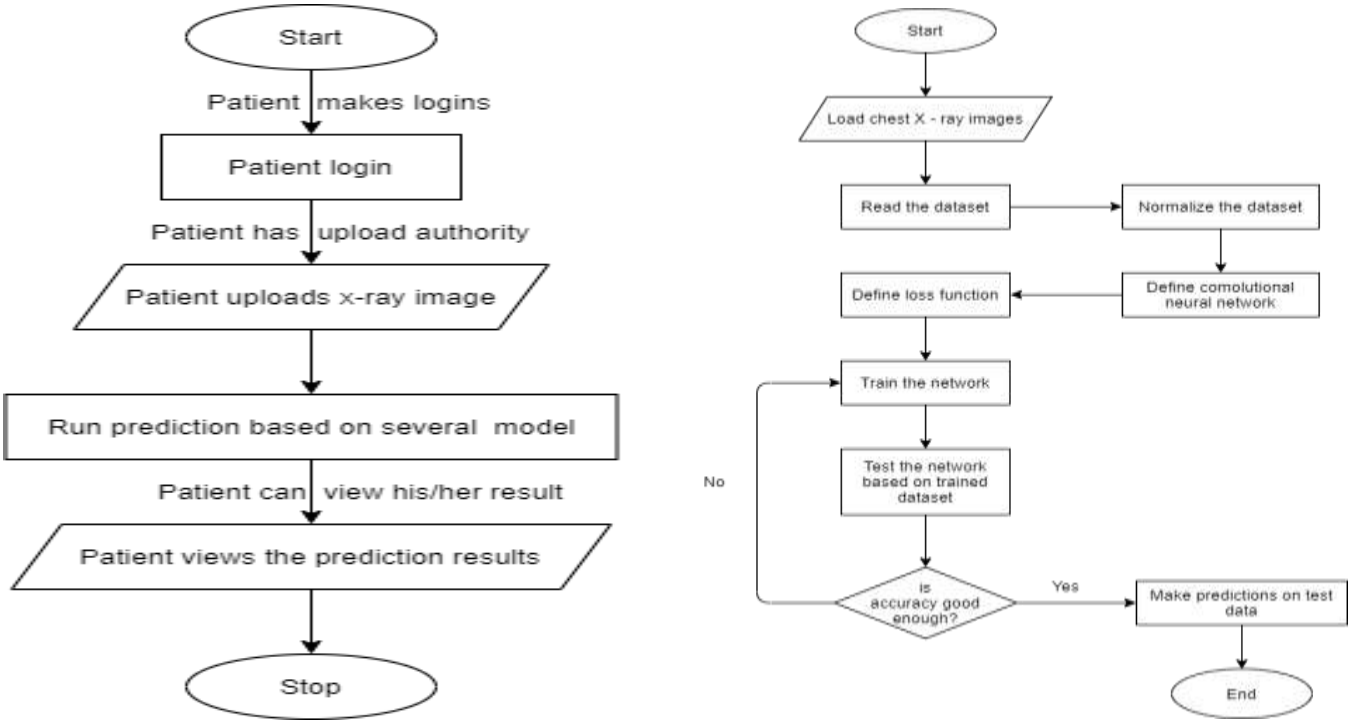

Fig. 1 Flow Chart

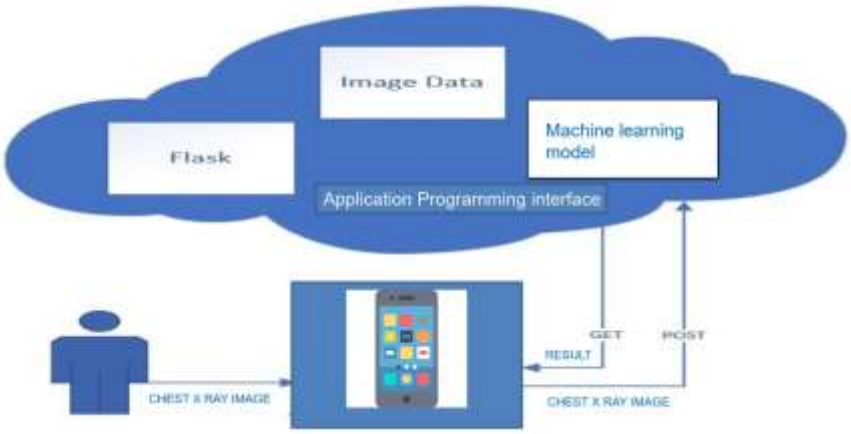

Fig. 2 System Architecture

Fig. 3 Home Page

Fig.4 Covid result

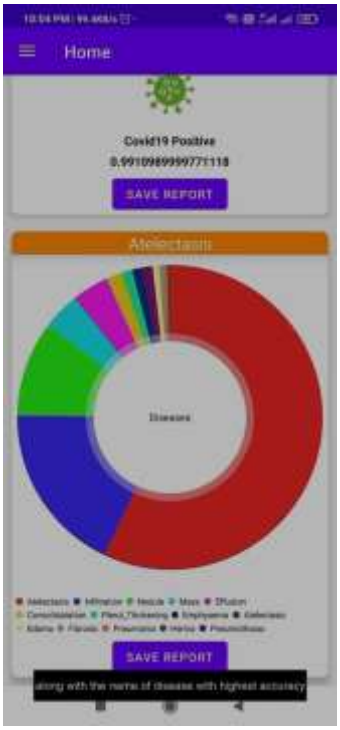

Fig.5 Classification result

B. Flow of the System:

- There will be no login section as we are only taking an image as an input from the user.
- We have designed an android application for our project.
- User needs to open the app and then the Home page will appear.
- At Home page user has the feature to upload Chest X-ray image.
- After uploading the Chest X-ray image user can choose for Covid-19 prediction or Disease Classification.
- After choosing for Covid-19 or Disease Classification the app will take few seconds to display result.
- Once the result is displayed the user can save the report for future reference and can use Exit button to close app.

C. Modules:

Module 1: - Covid-19 Prediction.

This module consists of a ML model which does the prediction on the Chest X-ray image provided as an input from the user and then the app displays the prediction result to the user in the form of elemental report.

Module 2: - Disease Classification.

This module consists of a ML model which predicts the possibility of 14 Lungs Disease based on the Chest X-ray provided as an input by the user, the result is displayed to the user in app in a form of pie chart which can be downloaded for future reference.

D. Applications:

- Patients that are home quarantined and have their chest X-ray they can get an elemental report.
- Individuals that are alone and couldn't visit Hospital/Lab to collect reports can use this app.
- App can be used by Labs/Hospital to generate reports in less time if needed.

E. Advantages:

- The waiting time for generation of report can be reduced.
- The time duration that passes away in communication between hospitals and the patient can be avoided.
- It will save the time of the doctors to identify whether the patient is having COVID-19 or any other lungs based disease.
- With the help of CNN, patterns in images are automatically determined.

III. CONCLUSION

In this project, we designed a mobile application which helps to generate an elemental report of Chest X-ray. It would help the user to know the possibility of various Lungs Diseases as well as if he/she needs to take a covid-19 test or not which solves the major problem of waiting time required for the report generation at the labs which cause serious situations for Covid-19 positive people. Machine Learning and Computer Vision were used to create models that make predictions based on the Chest X-ray. Using these concepts we observed that using ML in medical practices can reduce time required for report generation and can improve accuracy of tests and researches which iin future would lead to better medical facility all over world.

IV. AKNCOWLEDGEMENT

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