Convolutional Neural Network Based Lungs Disease Prediction

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Disease Recognition Systems have played a vital role in history all over world and is widely found in today's time. Various re- searchers have worked on different diseases using different algorithms such as skin diseases, breast diseases, blood issues, cancers, tumors, etc. Research efforts on lungs related diseases such as lung cancer, pneumonia and covid-19. This research intends to bring a system which can recognize lungs diseases. Methods based on CNN classifier are exercised for Lung Diseases Recognition. Experiments are carried out on datasets using different kinds of features and their fusion. Dataset of total 6000 images is used for the same.

Keywords: Lung Cancer, Covid-19, Pneumonia, Normal, Convolutional Neural Network.

1 Introduction

The research is based on Lungs Disease Recognition. As we know, there are many diseases related to lungs. Using prediction error results are reported, which is inverted classification Accuracy. The coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is one of the highly destructive infectious diseases after ages. This new type of diseases was announced in late December, 2019 and World Health Organization (WHO) declared it as a pandemic, affecting countries worldwide. Numerous studies have shown great results in identifying Covid-19 using X-ray images. Furthermore, most of the previous work was evaluated on a limited number of COVID19 chest x-ray scans [10]. According to the report of 2015, 920.000 toddlers were killed due to pneumonia. The symptoms identified are fever, chills, breathing difficulty, and cough with pus also air sacs filled with pus or fluid maybe in one or both lungs [12]. The most dangerous diseases and the higher rate of death are occurred by lung cancer. This disease has uncontrollable cell growth in lung tissues. 88% of lung cancer is caused due to long term smoking. And rest is due to asthma, asbestos, or radon gas. To check the presence of lung cancer CT-scan or X-rays can be helpful. In this work we show how local phase chest x-ray features based image enhancement improves the accuracy of CNN architectures for COVID19, pneumonia and lung cancer diagnosis. Also, CT-scans for lung cancer.

Specifically, we exact different features of Chest X-ray combined with multi-feature image. CNN architecture will be used for processing multi-feature chest x-ray data. Our proposed methods will evaluate disease on large scale based on X-ray images obtained from healthy subjects as well as subjects who are diagnosed with community acquired lung cancer, pneumonia and COVID-19. Quantitative results show the usefulness of local phase image features for improved diagnosis of COVID-19 disease from CXR scans.

Fig. 1. X-Ray image of lungs

2 Literature Survey

This section contains the review of the previous work carried out. We will get to know the existing work taken place on the different types of images for diagnosing lungs related disease. Nayyar et al. [5], states that swelling of tissues in one or both lungs and the diseases which can be viral, bacterial or fungal is Pneumonia. Due to human errors the diseases can't be predicted appropriately which leads to death of the patient. Using Mask RCNN object detector infected regions can be identified and diagnosed using this system. 0.155 is the IoU score obtained. Arellano et al. [2] found that the diseases having the current highest rate of deaths in Covid-19. CNN is the algorithm used by the system to detect the disease. Ouyang et al. [6] focuses on Covid-

19 from pneumonia using Dual Sampling. From approximately 8 hospitals the data is being collected of different age groups. In training stage 5-fold cross validation is applied. Vrbancic et al. [11], dataset holding 842 X-ray images of chest. The algorithm used is grey wolf optimizer with CNN for optimizing hyper-parameter values. Accuracy obtained is 94.76%. In [10] Sharma et al. states, the traditional methods are pretty time consuming. To identify the patient is attacked by pneumonia a system is designed using CNN algorithm. Dataset holds original as well as augmented images. Nadkarni et al.[4] proposed, cancer detection using SVM algorithm on the CT-scan images. Here for preprocessing median filtering is used while for segmentation mathematical morphological operation is used. In [8] Roy et al., Covid detection is done using SVM combined with saliency enhancement. DICOM format dataset is being used for the same. Li et al.[3] for detecting Pneumonia 10784 images of chest X-ray dataset is used with PNet deep learning-based framework. Potghan et al. [7] used KNN with Multi-layer perceptron algorithm for prediction Covid-19.

Table 1. Literature Survey

Work Reference	Year	Technique	Result (%)
Anand Nayyar et al.	2020	Resnet 50	94%
Matias Cam Arellano et al.	2020	CNN	94.79%
Xi Ouyang et al.	2020	Dual Sampling Strategy	87.5%
Grega Vrbancic et al.	2020	CNN with optimized tuning	94%
Harsh Sharma et al.	2020	CNN	90%
Nidhi S. Nadkarni et al.	2019	SVM	92%
Kvamelia Roy et al.	2019	SVM	94.5%
Zhong liang Li et al.	2019	PNet	92.79%
Sneha Potghan et al.	2018	KNN, MLP	98.30%, 98.31%

3 Existing System

The main objective of the project was to find an efficient algorithm for feature extraction with reduced length of feature vectors as well as which can increase the accuracy of recognition of X-ray images. For doctors it is very easy to recognize or read x-rays as human beings do not recognize things on the basis of extract structure of pattern of any entity. We have the ability to derive the common patterns very quickly through the intelligence gifted by God. But to write such an intelligent program for computer to show such characteristics like humans is a difficult and a tedious job because computer works on comparison if the two entities are exactly the same it can identify otherwise it will not. To make the computer intelligence it is necessary to first analyze and detect the procedure following which human gets able to remind or recall or identify things i.e., the uniqueness among them which is referred as feature vector. Then the next task is to make the computer learn it to be able to make judgments by adjusting the values.

4 System Architecture

We have proposed an end-to-end trainable deep CNN. Using Chest X-ray images great extent of work has already been done for recognition diseases with different CNN algorithms. This is one of the biggest challenges with traditional CNN algorithm because a programmer needs to tell the computer in advance what features should be taken care of so that to get an accurate decision percentage to recognize the diseases based on the X-rays and CT-Scan. Normally Disease recognition using CNN is divided into six phases which are acquisition, pre-processing,

segmentation, feature extraction, classification and post processing. Feature Extraction plays an important role in getting the result of a model. The purpose behind CNN is to identify and analyze a document image by dividing it into disease. These diseases are further compared with image pattern to predict the probable disease. With the advent of highest computing power and deep learning, applications of computer vision like disease recognition took a little relief because deep learning models are responsible for what features to look upon without explicitly guided Convolutional Neural Network.
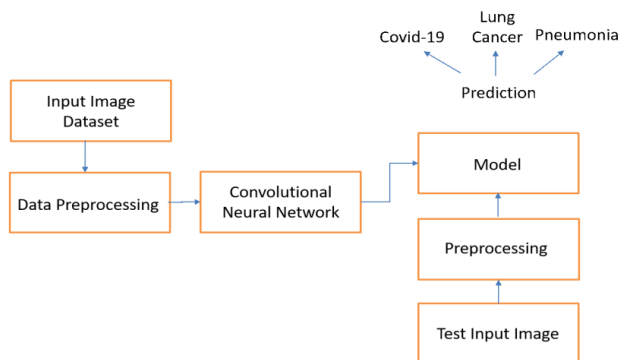
Fig. 2. System Architecture

5   Conclusion

The diseases like; cancer, Covid and pneumonia have affected people largely and the death rate due to these diseases in increasing day by day [1]. In this work, we proposed the recognition of diseases related to lungs using convolutional neural network on large dataset of X-ray images of chest. To take care that the model shouldn't lead to over fitting the images were sent through the various steps of augmentation and preprocessing. This model will be helpful in the medical sec-tor to diagnose the disease at earlier stage and take necessary steps accordingly to save one's life. The obtained accuracy is 93%.

Future Scope: The model is only limited for lung cancer, Pneumonia and Covid diagnosis. This can be further extended by adding more diseases. Also, the dataset can be increased in the current model to get more accuracy. Secondly, this model contains only X-ray images so it can be changed to CT-Scan as CT-scan has more clarity compared to X-ray. Moreover, the algorithm used here is Convolutional Neural Network so it can be combined with transfer tuning, VGG and many other for better performance and accuracy. Therefore, the scope of this project is immense in health care and medical by using such various similar deep learning algorithms.

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