

Deep Neural Network Oriented Multi Disease Detection and Predictions

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ABSTRACT: Chronic diseases such as heart disease, cancer, diabetes, stroke, and arthritis are the leading causes of disability and death in India and throughout the world. As compare to other diseases these types of diseases having high rate of deaths, so there is need of promising solution over chronic diseases. Medical data growth is in healthcare communities, accurate analysis of medical data benefit early disease detection, patient care and community services. However, the analysis of patients is depends on accuracy of diagnosis and then treatment as well. The wrong diagnosed patients lead to deaths in chronic type diseases. So the high risk of diagnosis there is need of accurate diagnosis aid for chronic diseases. So we are proposing diagnosis system based on machine learning for giving promising solution with high accuracy. The proposed system consists of many diseases such as lung cancer, brain tumor, heart disease detections and stages predictions. High rate of deaths due to chronic diseases such as heart disease, lung cancer, brain tumor need to develop proper diagnosis system which helps to doctors. The wrong diagnosis leads to human deaths so we need to work on accurate diagnosis of multiple diseases. Many works is already carried out for different diseases but there is not any promising solution found that gives accurate diagnosis for all in one. The proposed system consists of many diseases such as lung cancer, brain tumor, heart disease detections and stages predictions. We are trying to develop system for multi disease detection and stages predictions gives early detection and saves lots of life's by reducing death rate by chronic diseases.

KEYWORDS: Convolutional Neural Network, Computed Tomography, Support Vector Machine.

I. INTRODUCTION

Now day's heart diseases are growing rapidly by busy and stress full life. All type of age groups are under heart diseases so need of early detection of heart disease by using symptoms or reports. Due to large amount of smoking and air pollution around the world, lung cancer has become one of the most common and deadly disease in recent decades. It is one the most dangerous disease among men and women and early identification and treatment is the best available option for the infected people. Main objective behind to develop a system helps the doctors to cross verify their diagnosed results which gives promising solution over existing death rates. By using our proposed work try to invent unique platform and most promising solution for early diagnosis of multiple diseases. Existing work analysis accuracy is reduced when the quality of medical data is incomplete. Moreover, different regions exhibit unique characteristics of certain regional diseases, which may weaken the prediction of disease wrong. So we are giving more accurate solution by using machine learning and Convolutional neural network to detect diseases and make predictions. The proposed system consists of many diseases such as lung cancer, brain tumor, heart disease detections and stages predictions.

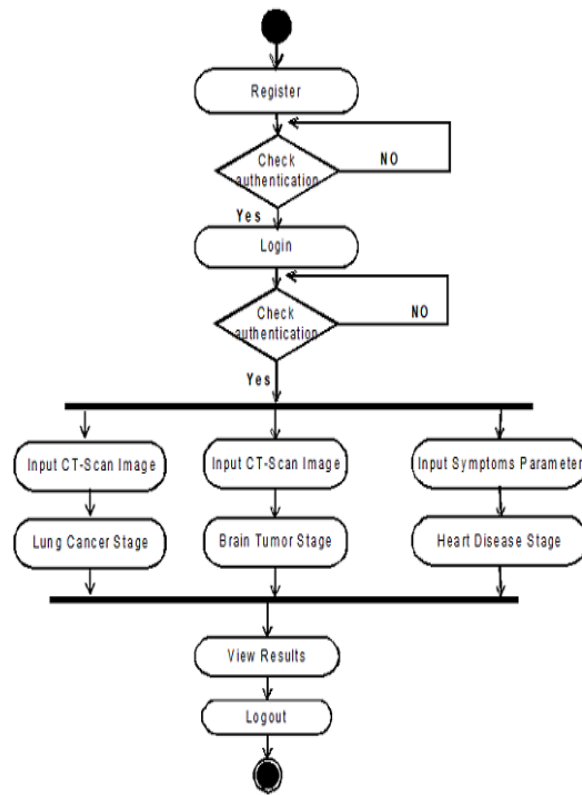


Fig. 1 Flow of proposed work

Above figure shows internal working of multiple diseases detection and stages prediction system. In which we have used NSCLC Radiogenomics lung cancer CT image dataset, heart disease dataset and brain tumor MRI images. After getting this DICOM medical formatted images those converted by DICOM converter to PNG format. Image acquisition contains image reading by using opencv- python for process it. After getting image of lung cancer it transfer into noise reduction for removing noise from it. Then image processing techniques applied on it like binary image conversion and gray image conversion followed by segmentation. The image features get collected and drafted into machine model in training phase of machine learning for future prediction of multiple diseases and stages evaluations. We have worked on supervised dataset and used deep Convolutional neural network for achieving high accuracy.

II. OBJECTIVE & GOALS

- To reduce death rate by chronic diseases in the world.
- To give unique solution for multiple diseases.
- To provide higher accuracy over previous research.
- To give most promising tool that can acceptable by all the doctors.
- Detection of multiple types of Diseases.
- By using deep learning approach trying to achieve higher accuracy.
- Provide diagnosis for:
 1. Lung Cancer
 2. Brain Tumour
 3. Heart Disease
- By improving proper diagnosis increase rate of saving life's.

III. LITERATURE SURVEY

Animesh Hazra et al. [1] proposed Heart diseases when irritated winding path out of hand. Heart diseases are convoluted and remove loads of lives each year. When the early side effects of heart diseases are overlooked, the patient may wind up with uncommon outcomes in a short length of time. Stationary way of life and over the top worry in this day and age has exacerbated the circumstance. On the off chance that the diseases are distinguished early, at that point it very well may be monitored. Be that as it may, it is constantly prudent to practice every day and dispose of undesirable propensities at the soonest. Tobacco utilization and undesirable weight control plans increment the odds of stroke and heart illnesses. Eating in any event 5 helpings of products of the soil multi day is a decent practice. For coronary illness patients, it is prudent to confine the admission of salt to one teaspoon every day.

Anuradha S. Deshpande et.al[2] states among every other sort of malignant growth, Lung Cancer is one of the most widely recognized reasons for death all through the world. It is important to get legitimate treatment on schedule, to diminish demise pace of individuals on the planet.. In the Lung malignant growth discovery framework, we have recognized different phases of malignant growth by utilizing Support vector machine classifier (SVM). The watershed division is utilized in this framework which is the best division procedure. Utilizing MATLAB programming, we have User Interface UI (GUI) and it is utilized to play out every one of the procedures of the framework. We will probably get increasingly exact and exact consequences of the various phases of disease by utilizing different techniques. We have played out the combination of CT and MRI examining. This method improves the nature of the information. In this manner, we get the suitable stage.

Abbas Khosrav et.al [3] proposed Characterization of lung disease utilizing a low populace, high dimensional dataset is trying because of lacking tests to become familiar with an exact mapping among highlights and class marks. Current writing more often than not handles this errand through high quality component creation and determination. Latelyprofound learning is observed to have the option to recognize the fundamental structure of information using auto encoders and different procedures. In this work, a profound auto encoder grouping system is proposed which initially adapts profound highlights and after that prepares a fake neural system with these educated highlights. Exploratory outcomes demonstrate the profound educated classifier outflanks every single other classifier at the point when prepared with all properties and same preparing tests. It is likewise exhibited that the presentation improvement is factually huge.

Ali M. Hasan et.al[4] introducing Mind tumor division in magnetic resonance imaging (MRI) is viewed as a complex methodology in light of the inconstancy of tumor shapes and the intricacy of deciding the tumor area, size, and surface. Brain tumor division is a tedious assignment profoundly inclined to human mistake. Henceforth, this examination proposes a mechanized strategy that can recognize tumor cuts and portion the tumor overall picture cuts in volumetric MRI mind filters. Initial, a lot of calculations in the pre-preparing stage are utilized to clean and institutionalize the gathered information. An altered dim level co-event lattice and Analysis of Variance (ANOVA) are utilized for highlight extraction and include choice, individually. A multi-layer perceptron neural system is received as a classifier, and a bouncing 3D-box-based hereditary calculation is utilized to distinguish the area of obsessive tissues in the MRI cuts. At long last, the 3D dynamic shape without edge is connected to portion the cerebrum tumors in volumetric MRI checks.

Shadab Adam Pattekari and Asma Parveen [5] states Choice Support in Heart Disease Prediction Framework is created utilizing Naive Bayesian Characterization strategy. The framework separates concealed learning from an authentic coronary illness database. This is the best model to anticipate patients with coronary illness. This model could answer complex questions, each with its very own quality without breaking a sweat of model elucidation, get to to nitty gritty data and exactness. HDPS can be further improved and extended. For, instance it can fuse other therapeutic qualities other than the above rundown. It can likewise fuse other information mining systems. Ceaseless information can be utilized rather than simply straight out information.

S.Florence et.al. [6] introducing The medicinal services condition is an ever increasing number of information advanced, yet the measure of learning getting from those information is less, on the grounds that absence of information investigation apparatuses. We have to get the concealed connections from the information. In the human services framework to foresee the heart assault consummately, there are a few methods which are now being used. There is some absence of exactness in the accessible methods like Naïve Bayes. Here, this paper proposes the framework which employments neural system and Decision tree (ID3) to foresee the heart assaults. Here the dataset

with 6 credits is utilized to analyze the heart assaults. The dataset utilized is part of heart assault dataset given by UCI AI store. The consequences of the expectation give more exact yield than different procedures.

IV. METHODOLOGY USED IN EXISTING SYSTEM

Reliable identification and classification of chronic diseases requires pathological test, namely, needle biopsy specimen and analysis by experienced pathologists as it involves human judgment of several factors and a combination of experiences, a decision support system is desirable in this case. After diagnosis of manual judgments the rate of saving life of patients is not much good. The techniques used in existing work are unable to give Nobel solution over chronic diseases and accuracy is very poor. Algorithm using structured and unstructured data from hospital. To the best of our knowledge, none of the existing work focused on both data types in the area of medical big data analytics. Reducing death rate by wrong diagnosis using giving accurate diagnosis. Existing system does not provide diagnosis system which helps to doctors.

V. METHODOLOGY USED IN PROPOSED SYSTEM

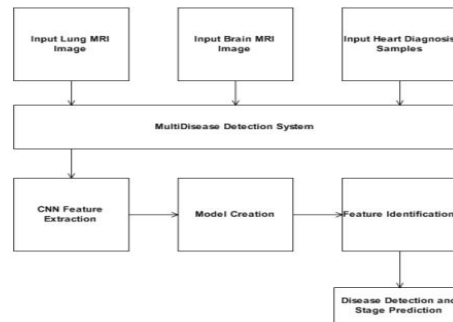


Fig.2 System Architecture

A) Modules:

- 1) Lung Cancer Detection
- 2) Heart Disease Identification
- 3) Brain Tumor Detection

B) Features:

- 1.Lung cancer type detections according to CT-Scan Images.
- 2.Heart disease identification according to different features
- 3.Brain Tumor detections according to MRI Images.
- 4.Display Precaution list to avoid the various disease.

In a proposed system, we are proposing experiment on chronic diseases like lung cancer, brain tumor and heart disease with limited set of supervised data.

We proposed a new Convolutional neural network based multimodal disease risk prediction model for limited chronic diseases with higher accuracy. We are going to solve accuracy issue in diagnosis of lung cancer with accurate stage predictions. We also work on brain tumors detections by machine evaluations depends on tumor sizes in mm.Heart disease detection depends on diagnosed dataset such as symptoms of heart reports. In proposed system consist mainly 3 modules Lung Cancer Detection, Heart Disease Identification, Brain Tumor Detection. Admin and users are two modules include in our system. Admin first gather the information about multiple diseases in the form of text as well as in the form of images. After gathering of information like preprocessing on the data, training of the data, model generation according to the features of the data. User insert the MRI image for checking brain tumor or lung cancer and enter text symptoms for detection of heart disease. Using our proposed system, we predict the disease according to different type of stages. System also provide precaution list to the user for prevent form disease. We are trying to develop system for multi disease detection and stages predictions gives early detection and saves lots of life's by reducing death rate by chronic diseases. We propose a novel Lung detection and Stage prediction mechanism is proposed which first learns deep features and then trains an artificial neural network with these learned features.

Experimental results show the deep learned classifier outperforms all other classifiers when trained with all attributes and same training samples. It is also demonstrated that the performance improvement is statistically significant. Classification of lung cancer using a low population, high dimensional data-set is challenging due to insufficient samples to learn an accurate mapping among features and class labels. Current literature usually handles this task through handcrafted feature creation and selection. Deep learning is found to be able to identify the underlying structure of data through the use of CNN and other techniques.

Advantages

1. This shows that application of machine learning has the potential to significantly detect and classify with almost high accuracy for the low population..
2. High dimensional lung cancer data-set without requiring any hand-crafted, case specific features.
3. High processing speed enhanced CNN classifier model.

A. IMAGE PROCESSING :-

An image is made up of RGB colours. Pre-processing unit consists of noise removal, grey scale conversion, binary conversion of images followed by feature extraction. In future extraction five steps followed in which fingertips searches by eccentricity. Next elongations of images are measured by considering pixel segmentation as well as rotation of images.

B. IMAGE FILTERING :-

Filtering is a technique to modify or enhance the image, i.e. to highlight certain features or remove other features. It includes smoothing, sharpening, and edge enhancement. Image filtering algorithms generate an output pixel by observing the neighbourhood of the input pixel in an image. Image filtering algorithms are used to remove different types of noise from the image.

C. FEATURE EXTRACTION:-

In feature extraction, algorithmic study used to find the feature vectors of systematic results combines K curvature and convex hull algorithms. In present work “K convex hull” algorithm which is used to detect fingertip with greater accuracy. In our system, CNN is used for future recognition in which we having the input unit of training data set of images.

D. SEGMENTATION :-

Image segmentation is the way toward apportioning an advanced picture into various portions (sets of pixels). All pixels in an area share a typical property. Least complex property that pixel can share power. The objective is to disentangle and change the portrayal of the picture into something that is increasingly important and less demanding to break down.

E. EDGE DETECTION :-

Edge defines the boundaries between regions in an image which helps in object detection. There are many edge detection operators and algorithms available. Edge Detection Operators and Algorithms used in our research like Convex hull method.

F. FEATURE RECOGNITION:-

Brain-inspired systems used to replicate how humans learn. Consist of input, hidden and output layers that transform the input into something that the output layer can use. Excellent for finding patterns which is complex to human for extract and teach the machine to recognize. CNN gathers their knowledge by detecting the patterns and relationships in data and learns (or is trained) through experience, not from programming.

VI. RESULTS AND DISCUSSION

In multi disease detection and stage prediction system we have been implemented highly trained model that can accurately recognize multiple diseases. In this system we used Gaussian blur for gray scale conversion, Otsu’s method for binary conversion of images after that we used convex hull for edge detection.

G. GRAY SCALE CONVERSION

In gray scale conversion colour image is converted into a gray form using Gaussian blur. Colour image containing noise and unwanted background which is removed or blurred by using this method.

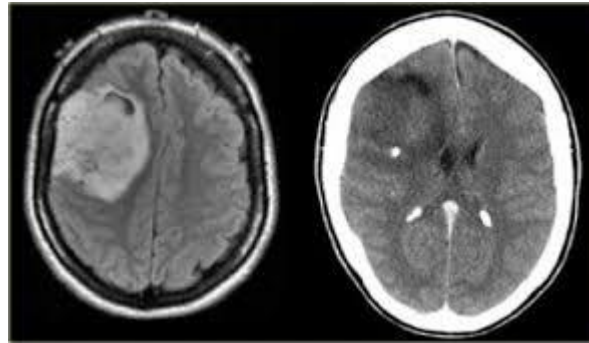


Fig.3 Gray Image

H. BINARY CONVERSION

Gray scale image is given to input for Otsu's method for binary conversion. In Binary form of images converted in 0 and 1 form means black and white.

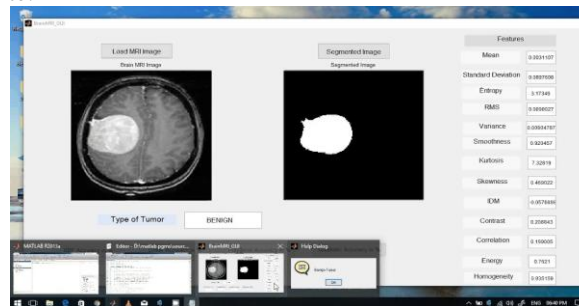


Fig.4 Binary Image

I. EDGE DETECTION

In Edge detection binary image get dimensions by counters using convex hull algorithm. In which eccentricity finding drawing edges around white portion of binary image.

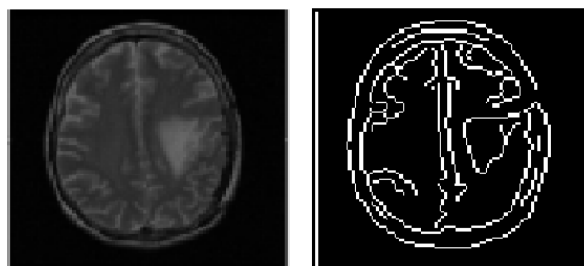


Fig.5 Edge Detection Image

J. TRAINING MODEL

In our system we are using tensor flow for extracting feature's of training dataset. In which 12000 image samples are trained by using training model. Finally plot files generated as an output of our trained model.

K. TESTING MODEL

In final phase of data testing in which brain tumor MRI, Heart dataset and lung cancer CT images were matched by our training model with higher percent of accuracy.

After matching all type of disease images respective results of stage and cancer cell detection display on console and stored in text file as well.

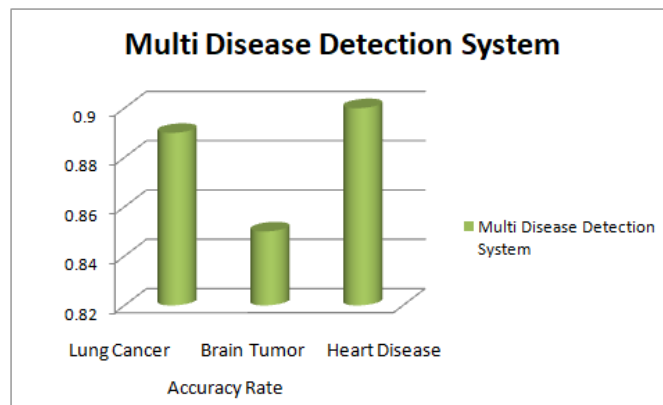
TABLE I

In our experimental setup, In table 1 describe our system modules and respective generated output.

Disease Name	Accuracy	Time Taken(sec)
1 Lung Cancer	87	609
2 Brain Tumor	85	740
3 Heart Disease	89	910

Table 1 Lung cancer stage evaluation criteria

L. *COMPARATIVE STUDY GRAPH*



Graph 1: Average Accuracy Rate

M. *ACCURACY RATE OF SYSTEM*

All lung cancer image samples were trained by our trained model using deep neural network. The same procedure followed by our heart and brain tumor model.

VII. CONCLUSION

Thus we implemented multi disease detection system over machine learning and CNN techniques which solves existing accuracy problem as well as reduce death rates by chronic type diseases like lung cancer detection, brain tumor detection and heart disease. After detection of disease inform to users that how to prevent from a disease.

For future work, we will implement this technique on some more chronic diseases with rich dataset. Increasing the number of diseases and dataset used for the process, will improve the accuracy.

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