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Cardiovascular Diseases Prediction and Detection using Image Processing Techniques

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ABSTRACT: Cardiac diseases are one which needs most attention to cure .This project is focused on finding if the heart is affected with a disease or it is normal and give the percentage of affected rate in case of diseased one. The main function is to capture the images of the heart of person and compare it with healthy heart images using CNN and find if it is affected. The result obtained would state if it is healthy or affected with percentage of affected heart.

Cardiac imaging is essential in the battle against cardiovascular disease. It can help accomplish early and exact diagnosis and determine the best interventions. Along with imaging the heart, it is fundamental to obtain valuable and exhaustive clinical data in a brief timeframe. As choices in cardiology progressively depend on non-invasive techniques, quick and exact image analysis devices have become critical. Particularly when managing complex cardiovascular issues, for example, valvular coronary illness, progressive imaging techniques can potentially improve treatment results and reduce system hazards and associated costs. . This chapter examines Deep learning (ML) procedures in cardiovascular multimodal imaging to improve the precision of computerized image examination. In particular, it proposes the use of convolution neural network (CNN) models to examine new portrayal types of images and feature the correspondences between CT images information. This can be achieved by targeting the disease places, with the appropriate quantity and concentration of patient by estimating disease severity using image processing technique. In this project K nearest neighbor classifier method has been used to segment the image into three images based on color. Among these images unaffected Heart regions and disease affected regions are used to calculated percentage of affected pixels. Using Equilibrium distance in K nearest neighbor method, percentage of affected pixels disease severity can be observed which leads to take appropriate measure for treatment.

KEYWORDS: Cardiac imaging, Deep Learning, Convolutional Neural Network, K nearest Neighbor classifier method.

I. INTRODUCTION

Nowadays, the cardiac disease is one of the most critical problems relating to human safety. The treatment of heart problems has recently been stated in a study that has received huge attention in the medical system worldwide. Cardiac diseases are one of the most principal causes of death worldwide. On median, 17.7 million deaths result from heart disease which counts for about 31% throughout the world in 2019, according to World Health Organization (WHO). The cardiac cases number, as the focus of this study, shows that 82% of the cases are from low and middle countries, 17 million are under 70 years of age and prone to noninfectious diseases, 6.7 million are affected by stroke, and 7.4 million people are suffering from heart disease (WHO, 2019). In the US and other developed countries, about half of all deaths are caused by heart disease; also, one-third of all people's deaths worldwide are related to heart disease. Cardiac disease affects not just people's health but the economies and costs of countries as well. The most common cardiac disorders are those of microvascular origin, primarily cardiac disorders and stroke. After several years of exposure to unhealthy lifestyles, cardiovascular disease clinically presents itself in early stages of life, as well as at an old age. The main cardiac medical conditions include overweight, diabetes, family history, smoking, and high cholesterol.

To examine the cardiac disease mischance, the particular issues which need to be discussed are those related to the behaviors. Furthermore, patients will undergo extensive examinations, such as blood pressure, glucose, vital signs,

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chest pain, electrocardiograms, maximum heart rate, and elevated levels of sugar, but the bright side may be that successful treatment is feasible if the disease is easily and early detected and anticipated, but treatment for all of these cardiac patients is depending on clinical studies, the patient history, and the responses to questions by the patient. All of these techniques (history analysis, physical examination research, and medical professional evaluates) often cause inaccurate diagnosis and mechanical failure besides delaying the diagnosis tests. In addition, it is also more expensive and computation intensive, and it takes a lot of time for evaluations to be carried out.

II. RELATED WORKS

The correct prediction of heart disease can prevent life threats, and incorrect prediction can prove to be fatal at the same time. In this paper different machine learning algorithms and deep learning are applied to compare the results and analysis of the UCI Machine Learning Heart Disease dataset. The dataset consists of 14 main attributes used for performing the analysis. Various promising results are achieved and are validated using accuracy and confusion matrix. The dataset consists of some irrelevant features which are handled using Isolation Forest, and data are also normalized for getting better results. And how this study can be combined with some multimedia technology like mobile devices is also discussed.

III. PROPOSED WORK

In practical application high accurate results are generated using neural network. The proposed system increases the classification accuracy. The dataset is divided into the testing data and training dataset. The training dataset was given to the neural network. Neural networks are set of algorithms that are used to recognize patterns. The layers in the neural network are made up of activation function. The training features are provided to the network through the input layer. The features are given to hidden layer where actual dataset. The dataset does not have any null values. But many outliers needed to be handled properly, and also the dataset is not properly distributed. Two approaches were used. One without outliers and feature selection process and directly applying the data to the machine learning algorithms, and the results which were achieved were not promising. But after using the normal distribution of dataset for overcoming the overfitting problem and then applying Isolation Forest for the outlier's detection, the results achieved are quite promising. Various plotting techniques were used for checking the skewness of the data, outlier detection, and the distribution of the data. All these preprocessing techniques play an important role when passing the data for classification or prediction purposes.

IV. PROPOSED ALGORITHM

The proposed system mainly comprises four modules, namely Preprocessing, segmentation using Contribution-based Clustering Algorithm, extraction of features, and classification of diseases. The first step that is pre-processing is the step in which the noisy images and also input defects are removed. The images are shapes and the edges are sharpened. This includes a median noise removal filter. The extraction feature is the process in which the cluster is extracted, which shows the predicted image of the tumor. The extracted cluster shall be assigned to the threshold process. The human brain is modeled on the design and implementation of the neural network. Based on their interconnections the neural network is split into three groups. Three types of neural networks are input, feed forward and recurrent networks. The Feed Forward Neural network is further divided into a single layer network and a multi-layer network. The hidden layer is not shown on a single layer network. But it only contains the input and output layer. The multilayer, however, consists of the input layer, the hidden layer and the output layer. The closed loop dependent input network is named the standard neural network as recurrent networking, and picture cannot be scaled. But image can be scalable in convolution neural network, i.e. it will take 2D input volume to 2D output volume (length, width, height). The network convolution layer consists of convolution layer, max-pooling layer, flattening layer, dense layer.

Using this algorithm we have compared the image obtained with a total 976 images of which 561 are Disease affected sample images and 415 images of healthy unaffected heart sample images. With these as Data input CNN classifies the

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given image and process it further with the classification and sends the output as affected or not and with the percentage of affected if in case the heart was affected or it just tells the heart is healthy and unaffected. In this way the algorithm provided the image comparison is much accurate as the amount of sample images are lot and fine tuning is the major function here .This in turn gives the most accurate result with limited chances of not finding a diseased heart. The data obtained of diseased and healthy heart are those satisfies various aspects and hence the image comparison results are more reliable one. In this way this system stands high on performance. As a result we would obtain the most reliable data on the diseased/healthy heart of the patient.

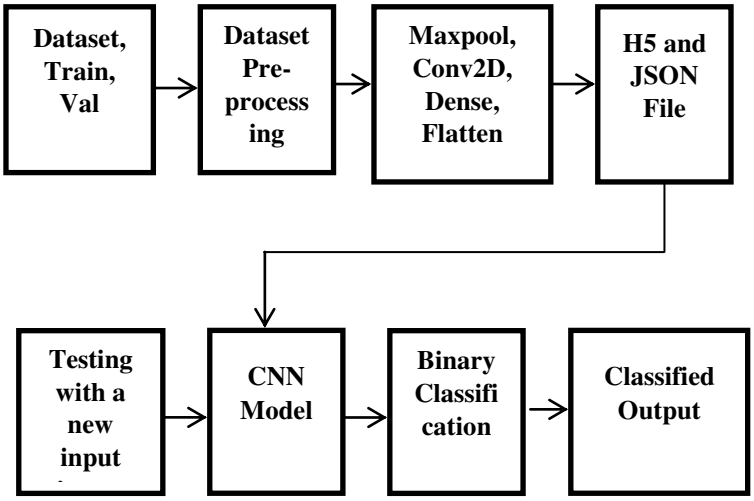

Fig.1.Proposed Block Diagram

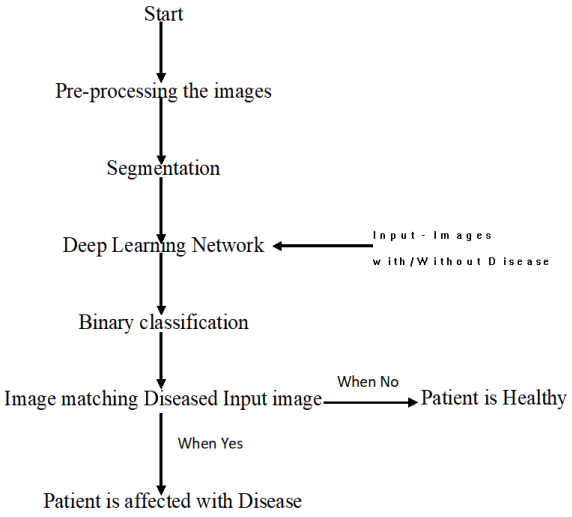

Fig.2.Flow Chart of proposed method

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ADVANTAGE

- Better analysis within short time.
- High Accuracy.
- Classifies Accurately.

V. COMPARISON

Existing Model	Proposed Model
UCI Method is used here as primary method.	CNN method is used as Primary method.
Proposes a method of classification with large time to analyze.	Proposes a method of classification with less time to analyze.
Indicates only when the disease is quite visible with shape.	Indicates only when the disease is at Initial phase.

VI. INPUTS

The following are some of the sample images form the dataset given to the system. Here we have about 8 sample images that indicate Healthy and Disease affected heart images each.

a) Unaffected/Healthy heart Images

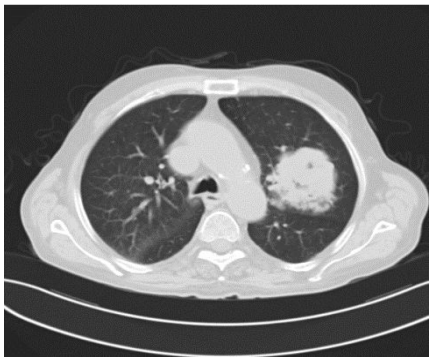

Fig.1.Sample of Healthy Heart [a]

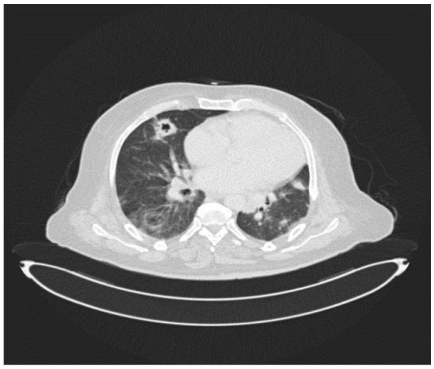

Fig.2.Sample of Healthy Heart [a]

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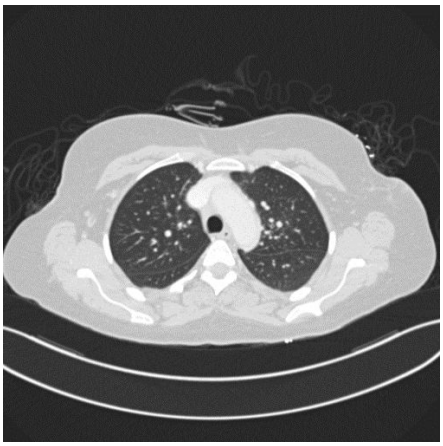

Fig.3.Sample of Healthy Heart [a]

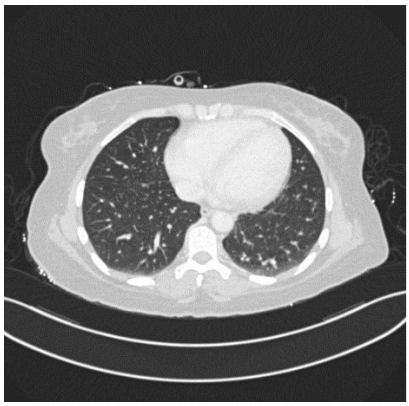

Fig.4.Sample of Healthy Heart [a]

b) Affected Heart Images

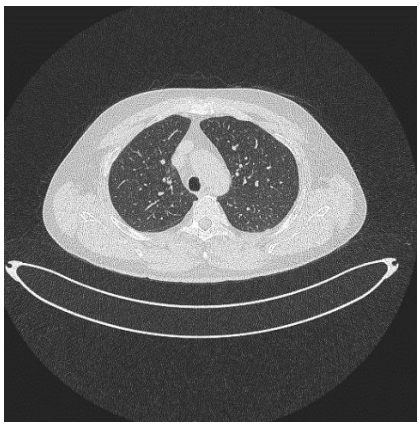

Fig.1.Sample of Disease Affected Heart [b]

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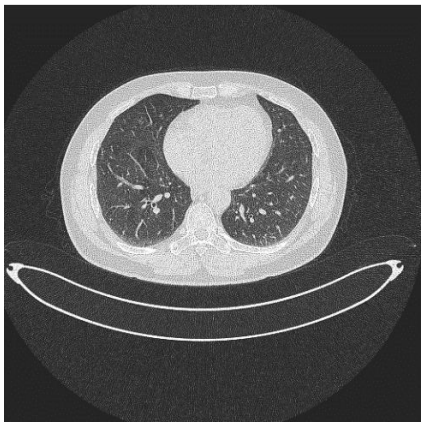

Fig.2.Sample of Disease Affected Heart [b]

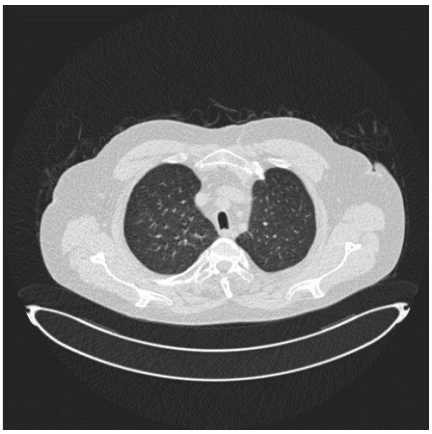

Fig.3.Sample of Disease Affected Heart [b]

Fig.4.Sample of Disease Affected Heart [b]

VII. RESULTS

We have explored a couple of neural techniques that are astoundingly profitable for distinguishing the coronary illness. From the above existing structure we have separated an extensive variety of coronary illness end. In this investigation paper we are joining convolutional network architecture image processing procedures and the artificial neural network to envision the coronary illness in patient. The image processing will help us with removing the more features which

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help us with accomplishing more exactness in result. The artificial neural network contribute high ampleness and get high precision differentiate than the past systems with predict the ailment as in feature extractionorganize the inputs are particularly decided. This will help us with boosting up the adequacy of artificial neural network. Finally our project diagnosis the heart disease and also predict how much percentage affected in heart region.In this technique

We have compared the image obtained with a total 976 images of which 561 are Disease affected sample images and 415 images of healthy unaffected heart sample images. Giving these as Data input to compare the CNN classifies the given image is affected or not and with the percentage of affected if in case the heart was affected or it just tells the heart is healthy and unaffected. The Result obtained on our analysis was that one which was affected and it had 39 percentage of affected area.

VIII. SIMULATION RESULTS

The following Simulation resultsdenotes that the heart is been affected with Coronary Artery Disease. It shows the level of disease infected in the heart is about 39 and 83 percentagerespectively. The output obtained from the simulation is direct ~~one~~where the data pre given is processed internally and compared within the system and only the final output is provided as end result of the system.

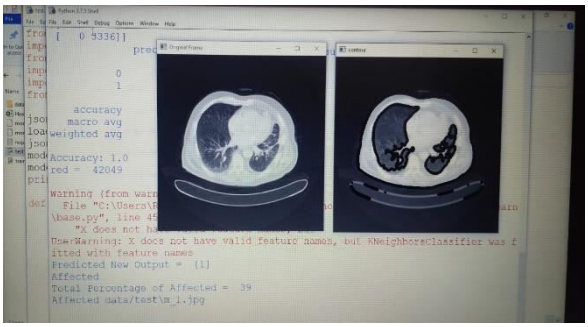

Fig.1.Coronary Artery Affected Heart Image with 39 percentage

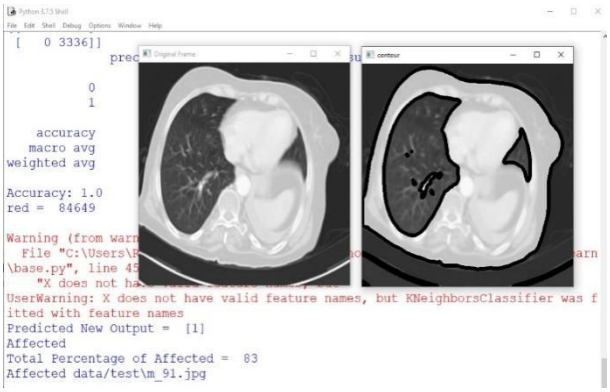

Fig.2.Coronary Artery Affected Heart Image with 83 percentage

IX. CONCLUSION

Heart disease is one of the corners for society. In this paper we developed a self-operating diagnosis model for cardiac disorder disease detection using deep neural network. The experimental result concludes that the proposed system improves standard of prediction during prognosis process. This work will be useful for identifying the patients who suffers from heart disease. When a patient is predicted with positive result their reports and data can be closely analyzed. Genetic algorithm can be used in future for more accuracy. Family history of heart disease is also a reason for

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developing heart disease; hence this information of the patient can also be included in the dataset which improves the accuracy of the model.

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