

# Heart Disease Prediction through IRIS and Machine Learning Algorithms

T. Sony Kanaka Deepti, Asst.Professor, Sir C.R.Reddy College of Engineering, Eluru, India.

deepthitumaty19@gmail.com

V. Jyothi Priyadarsini, Asst.Professor, Sir C.R.Reddy College of Engineering, Eluru, India,

vjyothipriyadarsini@gmail.com

Dr. Ajaykumar Dharmireddy, Assoc.Professor, Sir C.R.Reddy College of Engineering, Eluru, India.

ajaykumardharmireddy@sircrrengg.ac.in

## Abstract-

Heart attack is a severe disorder that many individuals worldwide suffer from. Quick and precise identification of cardiac disorders is crucial in the medical world, especially in cardiology. Addition to inheritance from parents, heart disease is the cause of unhealthy habits, inactivity, and using tobacco products. As scientific experts and affiliated organizations recommended, ensuring early cardiovascular disease detection allows non-invasive treatment. Occasionally, the patient is unaware of the possibility that he has cardiovascular issues. As a result, this research suggests a technique called the Iridology approach that can identify cardiac anomalies. The method's iris identification and categorisation outcomes are automatically generated. However, based on our observations, there is currently no clinically viable option that might be reasonable and targeted for early diagnosis. As a result, the majority of people are becoming more and more susceptible to death. The additional causes of this disaster include the ineffectiveness, difficulties, and lengthy assessments of the current methods. This investigation suggests the unique IFB (Iris Features Based) technique to diagnose untimely and the beginning of cardiac disease. An approach to machine learning that is relatively new, deep neural networks are showing promising results in the classification of cardiovascular pictures and heartbeat information.

**Keywords** — Heart Attack, Non-Invasive Treatment, Iris Features Based, Iridology, Deep Neural Network

## I. INTRODUCTION

Millions of people worldwide have been impacted by heart disease (HD), a severe medical condition [1]. Prominent symptoms of HD include swollen feet, physical body weakness, and dyspnea [2]. Because current heart disease diagnosis methods are poor in early detection for several reasons, including accuracy and execution time, researchers are developing an efficient method for identifying heart ailments [3]. It is tough to diagnose and treat heart disease when modern technology and medical professionals are not available [4]. With the correct diagnosis and care, many lives can be saved [5].



Fig.1: Basic Abnormal IRIS diagram

According to the European Society of Cardiology, there are around 26 million people of European ancestry. Heart

disease affects the vast majority of Americans[6]. HD is diagnosed by a doctor based on the patient's medical history, physical examination results, and study of any troubling symptoms. Fig.1 shows basic abnormal IRIS. Nevertheless, the results of this diagnostic approach are insufficient for identifying HD patients. Moreover, analysis is computationally complex and expensive [7]. A machine learning classifier-based non-invasive diagnosis system is being developed to overcome these challenges. An expert decision-making system that uses artificial intelligence and machine learning classifiers The death ratio has dropped due to fuzzy logic's successful HD diagnosis.

A different area of natural medicine called iridology diagnoses patients by looking at changes in the iris's fibre patterns, textures, and colour changes to ascertain their current state of health. Because each point of the iris reacts differently to different impulses from a specific organ, the alterations vary depending on the point's position. The low survival rate is caused by surgical complications that result in severe chest infections, strokes, and kidney failure. A third of survivors are at risk of being readmitted to the

hospital within 30 days after their release. Furthermore, the primary cause of death for all released patients within five years is a neurohormonal imbalance that allows the illness to worsen. This study presents an IFB method incorporating image and pattern recognition processes into iris features to determine benign or malignant abnormalities/broken issues that infer heart status according to iridology. This approach was motivated by the shortcomings of the existing methods and aims to have a computer-aided early-stage heart disease diagnostic tool. The applied picture processes use Iris segmentation, h-region localization, enhancement, tensor-based gradient, and Gabor filters. However, pattern recognition procedures use textural analysis techniques, the SURF algorithm to extract features, and K-SVM and MCO-SVM classifiers to classify the data.

This effort positively affects lowering the death rate and securing medical costs. Furthermore, the approach is resilient to random faults and practically and computationally non-contact. Additionally, the study hopes to assist iridology practitioners and other medical specialists by offering a basic diagnostic tool for identifying any indication of cardiac irregularity, even in individuals who do not exhibit any physical symptoms. Globally, coronary heart disease is the leading cause of death. Data from the World Health Organization (WHO) indicates that coronary heart disease kills 17 million people worldwide. With a mortality rate of 12.9% in 2014, coronary heart disease is the leading cause of death in Indonesia, second only to stroke. Tobacco use causes 1.9 million deaths from coronary heart disease each year. The leading causes of coronary heart disease include a sedentary lifestyle and a lack of physical activity. The elderly population has a higher death rate. Obesity and carbohydrate-rich diets will cause the heart's blood arteries to narrow. Several researchers took advantage of the Cleveland heart disease data collection to address the HD identification issue. The authors first select a suitable subset of features using pre-processing techniques and standard state-of-the-art four-feature selection algorithms, such as Relief, mRMR, LASSO, and LLBFS. They then use these features for efficient classifier training and testing to identify which feature selection algorithm and classifier provide the best accuracy and computation time results

## II. LITERATURE SURVAY

This research paper outlines several machine learning-based diagnostic tools that are now in use to shed light on the importance of the proposed work. Using machine learning classification approaches, Detrano et al. [8] developed the HD classification system, which had a 77 per cent accuracy rate. The feature selection method and the global evolutionary methodology were used for the Cleveland dataset. Using multi-layer Perceptron and

support vector machine (SVM) algorithms, Gudadhe et al. [9] created a diagnosis system for HD categorization that achieved an accuracy of 80.41 per cent. A neural network with fuzzy logic integration was used by Humar et al. [10] to develop an HD categorization system. The accuracy of the classification system was 87.4%. With an accuracy of 89.01 per cent, a sensitivity of 80.09 per cent, and a specificity of 95.91 per cent, Resul et al. [11] developed an ANN ensemble-based diagnosis technique for HD using the statistical measurement system enterprise Miner (5.2). Therefore, low accuracy and lengthy computation durations are significant challenges in previous methods, possibly related to unnecessary dataset features. New techniques for accurately identifying HD are needed to address these problems. Improving prediction accuracy is a significant problem that requires further study.

L. A. Allen, L. W. Stevenson, K. L. Grady, N. E. Goldstein [12]"The contribution of invasive coronary interventions vs public health to the reduction of coronary heart disease mortality, "Nowadays, coronary heart disease is one of the deadliest diseases in the world. According to the system simulation results, the Gaussian kernel may be used with a 91% accuracy rate to classify iris conditions, followed by the polynomial kernel with an accuracy of 89% and the linear kernel with an accuracy of 87%. By distinguishing between normal and abnormal iris, this study has successfully used the iris to diagnose cardiac problems. In "Occluded iris classification and segmentation using self-customized artificial intelligence models and iterative randomized Hough transform," I.A. Qasmieh describe systems with high performance and high confidence. The system is divided into multiple steps employing local image attributes and is based on an empirical examination of the iris picture. A dataset of 240 iris data samples with varying contrast quality was used to test and deploy the system. It examines how the categorization rate compares to the well-known techniques. "A Tutorial on Support Vector Machines for Pattern Recognition," by A. Kurnar [13].

## III. METHODOLOGY

### A. CNN Model

The suggested convolutional neural network (CNN) has a feed-forward design that operates sequentially in a single-input, single-output manner, Fig.2 shows the proposed design. We expect individuals with CHD to be categorized as "1" in binary classification experiments, whereas those without CHD will be classified as "0." A multi-class classification experiment is also conducted; this will be covered later. As previously stated, the majority vote procedure yielded 14 active CHD traits (phenotypes). Assuming that there are N training samples, the input layer illustrated in Figure 1 has a dimension of  $RN \times 14$ . Before the nonlinear transformation, which is carried out by the

proposed CNN architecture, this layer efficiently normalizes different variable types.

*B. Collection of Data*

The Cleveland Heart Disease dataset is used for testing in this study. This data collection was created with 303 occurrences and 75 attributes, but only 14 of them were used in all published studies. Six samples were eliminated because of missing values after preprocessing this investigation's data set. The remaining 297 samples in the dataset have one output label and 13 attributes. Two classes in the output label specify whether HD is present or absent. A 297\*13 features matrix of the retrieved characteristics is thus produced.

*C. Preprocessing of Data Set*

The dataset used in this study's experimental work is briefly described in this section. As previously noted, we employ a state-of-the-art dataset, particularly accessible at 41, for this purpose. This collection of characteristics is a subset of data that African medical professionals have accumulated. We use 14 characteristics from this dataset to determine whether an individual has CHD. The qualities used in the method along with a brief description of each one and, where appropriate, the range of values that can be employed.

*d. Selection Algorithms For Standard State-of-The-Art Features*

The process requires feature selection following data preprocessing. FS is generally a crucial stage in building a grading model. It achieves fine forecasting and short computationally complex models by reducing the number of input features in a classifier. Since machine learning relies solely on data, a dataset is necessary to build a model. A dataset may exist in many formats for a variety of reasons. Each dataset is, therefore, unique from the others. Before using the dataset in our programming, we typically save it as a CSV file.

*e. Bringing in libraries*

To use Python for data preprocessing, we first import a few predefined Python libraries. Three different software are used to prepare the data. They are Mat plot lib, Pandas, and numpy.

*f. Bringing in the data set*

The panda's library's read CSV method, which reads a CSV file and applies various operations, is used to import the dataset. This function allows us to read a CSV file both locally and remotely.

*g. Partitioning the dataset into test and training sets*

The entire dataset is divided into train and test datasets at this phase. The dataset is shuffled to ensure that every class

in the dataset is effectively divided into train and test sets. Eighty per cent of the dataset is used to train the model, and the remaining twenty per cent is used to test the model. Following splitting will be 242 records in the training dataset and 61 in the testing dataset.

*h. Model of Training*

Even though the suggested CNN models include dropout layers, this training schedule is also used to increase classification accuracy and decrease over fitting. The idea of a penalty enables the algorithm to identify its shortcomings and enhance its performance. In this case, the imbalance in a class results in a penalty adjustment of the class weight ratio. It is defined as the ratio of a non-CHD dataset to a CHD dataset. For example, a class weight ratio of 5:1 indicates that, in the computation of error after the epoch before the back propagation stage, we penalize a CHD training sample five times more than the erroneous classification of a non-CHD sample. The model is first trained using 1:N to many epochs, and then the weight ratio is gradually increased with a rapid decrease in epochs357.

*i. Assessment of performance*

Machine learning models can be evaluated using a variety of techniques. Several criteria are being used to assess this project's performance. The words utilized are F1 score, recall, specificity, accuracy, precision, and confusion matrix. The SK learn will be used to import the accuracy, confusion matrix, and other attributes—model of metrics.

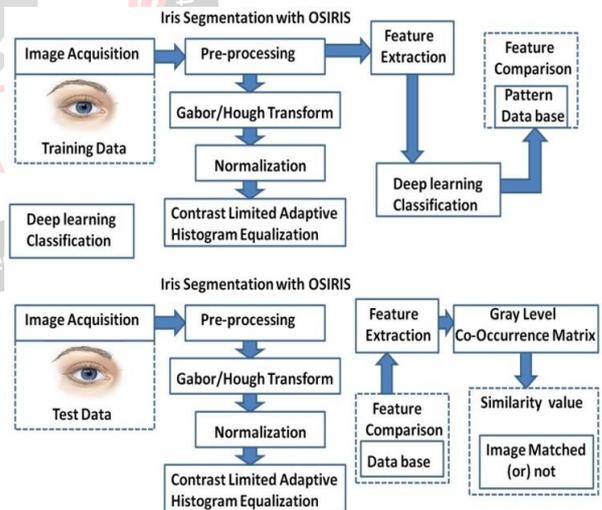


Fig.2: Block diagram of proposed design

*j. Prediction*

A previously trained model is employed to differentiate between people with and without heart disease. The performance of the developed model is evaluated using the test dataset. The program recognizes the provided patient record based on the patterns discovered in the training dataset. Consequently, we can ascertain whether or not the patient has cardiac disease.

The following are the suggested method regions' primary contributions:

The suggested approach, called Cardio Help, uses a cutting-edge deep learning technique known as a convolutional neural network to forecast the likelihood that a patient would have cardiovascular illness. The first deep learning model we know has been used in the medical industry to predict coronary heart disease (CHD) using only 14 characteristics.



Fig. 3. Retinal image analysis

#### IV. RESULTA AND DISCUSSION

This study used 40 standard iris data and 40 aberrant iris data for system training. Iris data from people without a history of heart disease is considered normal; iris data from people with heart disease is considered abnormal. The training data utilizing Gaussian, polynomial, and linear kernel variants is displayed in Fig. 3. Training iris data can be divided into two classes: regular (red) and abnormal (blue). With an equitable distribution of data, the outcomes of linear kernel training divide the data into each class. The training of polynomial kernels differs because the data is more centralized and isolated. The Gaussian Kernel training produced a tighter grouping than the two prior kernels. The ability of the training results to distinguish between classes based on preexisting characteristics can aid in test data categorization and influence the degree of recognition accuracy. The accuracy of the SVM increases with the distance between the hyperplanes that divide the classes. Five different texture qualities must be taken from the iris data to get more specific training and testing information. The typical values of normal and pathological iris data are different.

##### A. The first layer training stage:

Each label can be divided, and the layers of convolutional neural networks can be used shown in Fig.4.

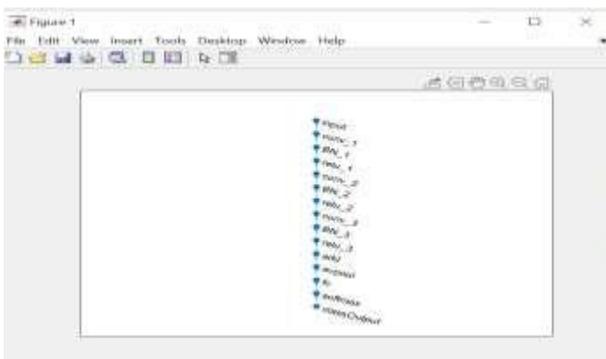


Fig 4.Furst layer training

##### B. Training at the secondary level

This fig determine whether a person is typical or atypical. Layers cannot be separated in a normal individual;separatin g them will make the person weird.

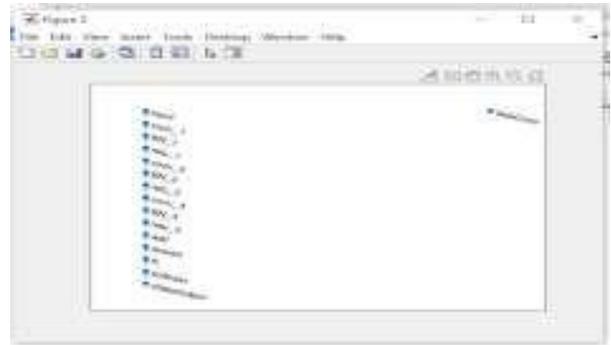


Fig.5.Second layer Training

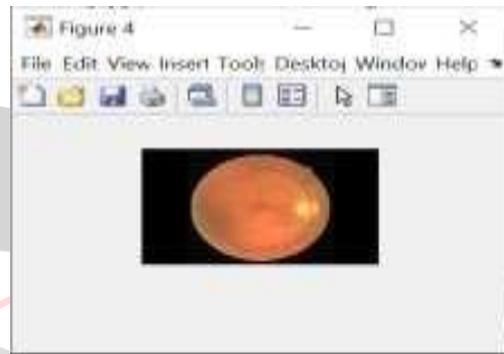


Fig.6.Second layer retina iris image preprocessing.

##### C. Iris image preprocessing

Fig 6. Shown in using a median filter, we may induce noise and improve itwhen an image's noise is eliminated using th e median filter.Black and pepper noise can be used in prepr ocessing stages.

##### D. Histogram

Besides showing the number of pixels in an image at each o f the many intensity values included, the histogram also ind icates the pixel intensity values.

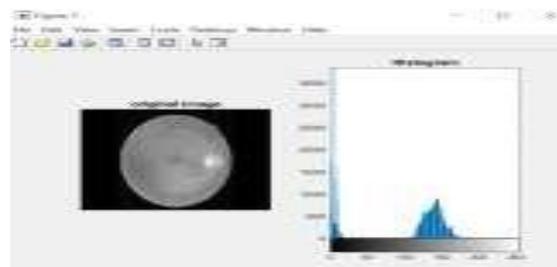


Fig 7. Histogram

##### E. Equalization of histograms

It is a computer image processing method that enhances image contrast.Fig.8.shows can be used to enhance an image's contrast by modifying its intensity values and to change contrast using an image's histogram.

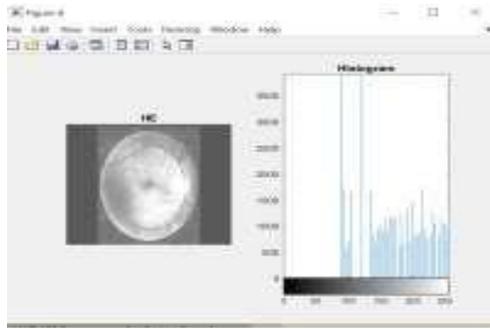


Fig. 8. Equalization Histogram

F. Error in Root Mean Square

Fig 9.shows in one of the most widely used metrics for assessing quality forecasts and can determine the mean value in the original image

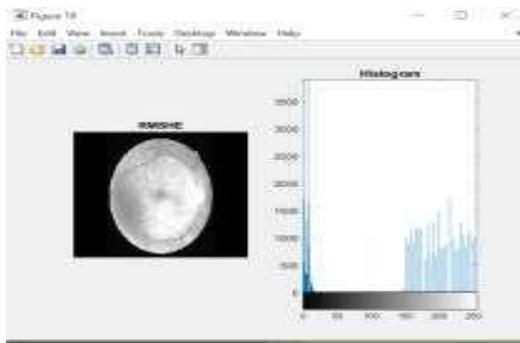


Fig 9. Root mean square value

G. Cache method

The overabundance of contrast is addressed by this adaptive histogram equalization. It has the ability to manipulate the small areas of an image shown in Fig.10.The final result Fig 11.shows the normal or abnormal condition of patient.

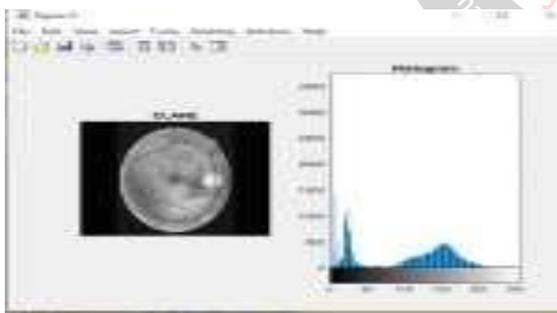


Fig. 10. Cache Method

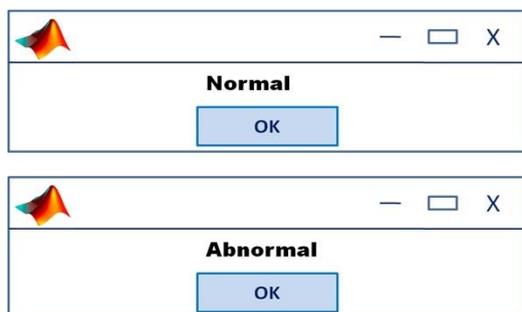


Fig. 11. Display the final result

V. CONCLUSION

Deep learningbased irisbased coronary heart disease detecti on has demonstrated encouraging outcomes.In recent years, there has been a lot of research on the application of deep l earning algorithms for medical diagnosis, and it has been d emonstrated that these algorithms contain helpful informati on that may be utilized to identify various diseases.Althoug h the developed model's accuracy provenadequate, the appr oach can be further enhanced by using more sophisticated d eep learning algorithms and adding more data.By increasin g the dataset and utilizing more sophisticated deep learning models, the detection of coronary heart disease using deep l earning can be further enhanced.

Furthermore, more precise findings may be obtained by co mbining iris data with other physiological characteristics. Since the iris includes essential information about several m edical disorders, more research can be done to determine th e possibility of using the iris to diagnose additional diseases To enhance patient outcomes and lower medical expenses, deep learning algorithms may also be used for the early dia gnosis and prediction of coronary heart disease.Furthermore, attempts might be made to create an intuitive user interfa ce that medical practitioners can utilize to quickly and accu rately diagnose patients.

REFERENCES

- [1] A. L. Bui, T. B. Horwich, and G. C. Fonarow "Epidemiology and risk profile of heart failure," *Nature Reviews Cardiology*, vol. 8, no. 1, p. 30, 2011.
- [2] Ajay Kumar Dharmireddy, D Sowjanya, D Aravind, G Sowmya, A Chandu, G Venkateswara Rao "Low Kickback Noise and High-Speed Multistage Comparator for High-Speed SAR ADC's " *International Journal of Microsystems and IoT*, vol. 2, issue. 2, 614–621, 2024.
- [3] J.Mohana Prithvi, Ajaykumar Dharmireddy "Multitrack Simulator Implementation in FPGA for ESM System" *International Journal of Electronics Signals and Systems*,pp.81-84, 29th Sep 2013.
- [4] Dharmireddy, A., & Gottipalli, M. D."Social Networking Sites Fake Profiles Detection Using Machine Learning Techniques" *Asian Journal For Convergence In Technology (AJCT) ISSN-2350-1146*, vol. 9, issue 3, pp.09-15, 2023
- [5] Dharmireddy, Ajaykumar, et al. "Dermatological disease detection and preventative measures using deep convolution neural networks." *AIP Conference Proceedings*. Vol. 2971. No. 1. AIP Publishing, 2024.
- [6]Ajaykumar Dharmireddy., Srinivasulu, P., Greeshma, M., Babu, V. S., Kumar, M. R., & Rajasekaran, A. S. "Driver Drowsiness Detection Using AIoT and Machine Learning Techniques" *Artificial Intelligence*

- of Things, Auerbach publisher, Vol.1, pp.1-30,, 2025.
- [7] N Swathi, Ajay Kumar Dharmireddy "Wireless Charging Stations Utilizing Solar Energy For Electric Vehicles" *i-Manager's Journal on Power Systems Engineering*, Vol. 12 , Issue 2 ,Aug 2024, pp. 1-7.
- [8] Ajaykumar Dharmireddy, Kambham Jacob Silva Lorraine, and Ravi Kumar. "Pesticide Prediction and Disease Identification with AIoT." *The Future of Agriculture: IoT, AI and Blockchain Technology for Sustainable Farming* ,vol. 62, 2024.
- [9] Ajaykumar Dharmireddy., Ravikumar, M. and Kumar, B.V., "Identifying Chronic Kidney Failure through Machine Learning". *i-Manager's Journal on IoT and Smart Automation*, 2(1), 2024.
- [10] Dharmireddy, Ajaykumar, et al. "Surface potential model of DM Fin TFET for steeper slope characteristics." *AIP Conference Proceedings*. Vol. 3122. No. 1. AIP Publishing, 2024.
- [11] Ajaykumar Dharmireddy G.Vihari, V.Swathi , Vurla Veeraju "Accident Analysis on Construction Sites Using Data Mining and Natural Language Processing " *Journal of Propulsion Technology* , Vol. 44, issue 6 ,PP.18-26,2023..
- [12] Resul Das, I. Turkoglu, and A. Sengur, Expert systems with applications, vol. 36, no. 4, pp. 7675–7680, 2009
- [13] L. A. Allen, L. W. Stevenson, K. L. Grady, N. E. Goldstein, D. D. Goldstein, L. A. Allen, L. W. Stevenson, K. LR. M. Matlock, N. R. Cook, G. M. Felker, G. S. Francis, P. J. Francis "Decision making in advanced heart failure: a scientific review," by Hauptman et al." *American Heart Association Statement*," *Circulation*, vol. 125, no.no. 15, pp. 1928–1952, 2012.
- [14] A. Kurnar, "Fuzzy resolution process for diagnosis of cardiac illness," *Journal of Artificial Intelligence*, vol. 5, no. 1, pp. 47–55, 2012.