

# Challenges in Various Computer Aided Techniques for Prediction of Heart Disease

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**Abstract-** In today's fast-paced world, health has taken center stage. Today's world is affected by an increasing number of new ailments. We will discuss a disease that is responsible for 33 % of global mortality in this study. Yes, we're talking about heart disease. The blood vessels and cardiac are impacted by CVD. Which has a varied impact on each age group. Today, the health department can detect such a disease, but patients must spend a lot of money for it, which is expensive in low and middle income countries like India. As a result, it's critical to employ a technique that can predict CVD based on available data. This review discusses several strategies for analyzing CVD employing automated computer aided learning techniques like as Machine Learning (ML) without using an invasive base method that are currently accessible.

**Keywords—** ML, Attribute selection, Heart Disease, Prediction model.

## I-INTRODUCTION

CVD mean cardiovascular disease. A condition of sick heart can be describe by various name, in fact there is various types of heart diseases like Congenital heart disease, Cardiac Failure, Stenosis of Valve, Coronary heart disease, Angina, Myocardial infraction , Cardiac arrhythmia, heart attacks , Heart failure ,Strokes, Peripheral arterial disease, Myocardial infarction, Aortic disease with among the others.

The generic term "CVD" describes the state of the cardiac muscle and its veins. It generally describe deposition of fats inside the arteries and due to that blood coats risk has been increases.CVD also describe the condition of damage arteries in organs such as heart ,brain kidney & eyes.

"Cardiovascular Disease" is the phrase for "Coronary Illness". This illness prevents the heart from pumping

oxygen to other body parts. which causes chest pain, heart attack and cause of death. As per the World Health Organization, upwards of 15 every year, millions die from heart disease (CVD), which accounts for nearly 30% of all fatalities [9]. Blood pressure, cholesterol, and pulse rate are all different for everyone [1][19]. Difficulty breathing, pain, soreness, weakness, or freezing in your hands or feet are just some of the symptoms of CVD. The hospital's miscommunication and incorrect diagnosis puts the patient's life in peril[1]. because above sign also seen in normal patient also.in such case accurate and proper diagnosis are needed to reduce heart disease risk in patients to severe cardiac problems and enhancing heart life security [2]

## II-OVERVIEW OF HEART DISEASE'S

There are many different type of CVD

### A. Congenital Heart Disease

By birth some babies have a problem of such kind of disease. It is estimated that one infant out of every 1000 is born with it in the United Kingdom.

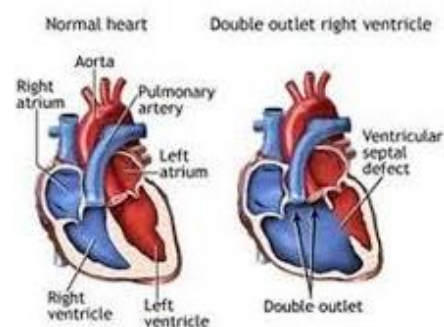


Fig 1 Congenital Heart Disease

**B. Cardiac failure**

Heart attacks occur when the heart is unable to pump oxygenation into every one of the inside cells. It has two type.

- 1 Systolic heart failure
2. Diastolic heart failure.

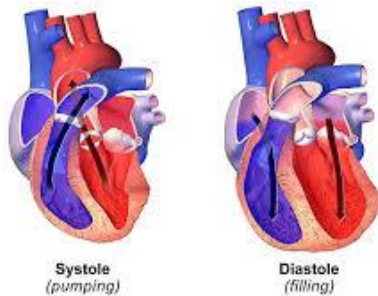


Fig 2 Cardiac Heart Condition

**C. Stenosis of Valve**

Valve is a part connected to aorta & from aorta blood is supplied to all body parts. In this case valve of the heart is narrowing. In normal cases aortic valve is smoothest but due to this disease it become rough. So it cannot open or closed totally.

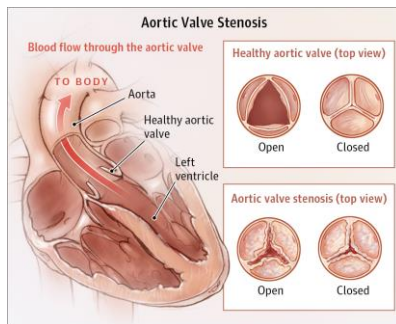


Fig 3 Stenosis of Valve

**D. Coronary Heart Disease**

Once the cardiac muscle's supply of blood with plenty of oxygen is restricted or stopped, arterial cardiovascular disease develops. As a result, the patient may have chest pain, tightness, or a lack of oxygen in the heart muscle, all of which are frequently caused by pain. This puts a greater burden on the heart & can lead to

- i. Angina
- ii. Myocardial Infraction
- iii. Cardiac Arrhythmia
- iv. Heart Attract
- v. Heart Failure

**E. Strokes**

Whenever blood circulation to a section of the nervous system is disrupted, injury results, which is what results in a cerebral infarction, or stroke.

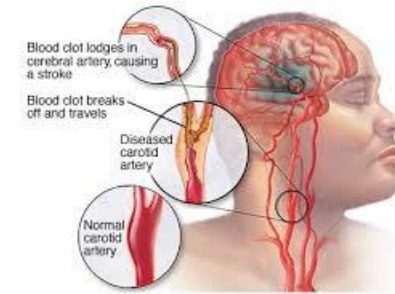


Fig 4 Stroke Condition

**F. A transient Schematic Attack**

It's also known as a transient ischemic attack (TIA), and it's similar to a stroke except that the vital fluid flow to the cerebrum is gives out for a brief period of time. It has a significant effect on the face, arms, and voice.

**G. Peripheral Arterial Disease**

An obstruction in a vein supplying blood to the extremities, most frequently in the thighs, is the cause of peripheral artery disease. This may result in

1. Cramping leg pain
2. Hair loss on legs & feet
3. Weakness in legs
4. Persistent ulcers on the feet & leg

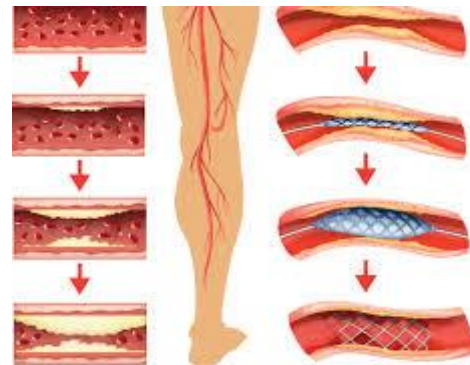


Fig 5. Peripheral Arterial Disease

**III -CHALLENGES IN PREDICTION MODEL FOR CVD**

**A. The Invasive Based Techniques**

Most of the doctors analyses the patients by his or her medical background. Sometimes doctors suggested to some medical reports .due to that to examine a patients need time as well as money. To overcome this situation one of the Invasive based method is required.

### **B. Data Computation**

A WHO calculate that every year almost 17.5 Million people lose their life due to CVD.

Most of the health care organization in India, Japan and rest of the world gather number of the patient data. By using this data they try to analyze for predicting the CVD. But all data are not in specific format so it's very difficult to analyze all data. There are number of the system has adopted to analyze this data but all system has own methods, own computation so it's need a universal scale to define all gather data in universal format.

### **C. Feature Selection**

For any data analysis techniques feature selection is it very important task. Most of the time for train of any model its important to select particular or number of features. If ant trainer select all feature that might be give degrading results. To selecting a feature it also known as attributes selection. Each attributes decide the model efficiency but it's not mean that all attributes are necessary for increasing efficiency of model sometimes we neglecting any one attributes for enhancing the results.

For example in CVD , if we carriers a data from UCI library then there is total 13 attributes are provided but if we analyses then all 13 attributes are not needed for predicting CVD ,if we ignore one or two attributes then model efficiency also increases.

## **IV-RELATED WORK**

A method for identifying but whether or not the person has cardiac disease has been proposed by Dinesh Kumar G, et al [1]. They deployed data pre-processing techniques such as filtering noisy data, filling default values, and clearing missing data. Based on the acquired data, the fastest approach with an accuracy rating of 91.61%, turns out to be logarithm regression.

Ashir Javeed et al [2] introduce a new diagnostic method utilizes RSA to select features and a random forest model that predict heart failure. That system was upgraded using the grid search technique, which culminated in a classification accuracy of 93.33 percent but potentially lowering training accuracy.

With the accurate diagnosis of cardiac failure, Liaqat Ali et al [3] created a hybrid expert system combining two Support Vector Machine models

Liaqat Ali et al [4] were able to modify features and eliminate the difficulties caused by the predictive model,

such as underfitting and overfitting. They utilised a thorough hunt strategy to identify the optimally designed deep neural network (DNN), and they employed the  $X^2$  analytical methodology. Can Xiao et al. [5] present an improved three-dimensional U-net convolutional neural network deep learning system for myocardial vessel delineation and risk of illness forecasting. The researchers assert that coronary artery segmentation is now complete thanks to the improved U-net network model and cardiac cross extract technology. A novel attribute reduction (NFR) model that is compatible with the Machine learning and DM algorithms and reduces error rates while improving system efficiency was presented by Syed Javeed Pasha et al. [6]. Pronab Ghoshet al [7] presented a mechanism that integrates many strategies to obtain reliable cardiac disease prediction. The authors used a mixed datasets and combination classification algorithms, including the Random Forest and Decision Tree bagging techniques, among several. Jian Ping Li et al [8] suggested a ML based approach for investigating cardiac disease that would be both efficient and accurate. The precision of SVM employing the suggested attribute choice approach is 92.37 percentages that is regarded as having excellent results when compared to earlier suggested strategies. Amin Ul Haq et al [9] used noninvasive approaches like machine learning to distinguish between healthy and heart disease individuals. They used various algorithms with various feature selection.

Senthil kumar Mohan et al. [10] introduce a new Combining RF with a linear framework to combine the best aspects of both approaches.

Optic pictures are inexpensive and easily acquired and without egregiousness at an outpatient clinic, does provide insight about cardiovascular risk. Using deep learning, many cardiovascular risk variables from retinal pictures are described [11].

Data mining methods are used by Santhana Krishnan et al. [12] to identify potential coronary artery bypass graft cases. The author used code written in Python to analyse UCI datasets for his studies. The suggested approach achieves 91% precision utilising DT and 87% precision using Naïve Bayes.

Abhishek Rairikar et al [13] investigated cardiac disease prediction technologies with a bigger number of input variables. The approach makes use of 13 other factors, including cardiovascular health, cholesterol levels, race, and other terms used by doctors, to determine an individual's likelihood of getting heart failure.

M.A.Jabbar and Shirina Samreen [14] used Hidden Nave Bayes to assess if somebody is healthy but has heart illness.

They utilised an effective and exact categorization to HNB for the purpose of predicting cardiovascular disease, and they enhanced the reliability of HNB relative to NB. The MAFLA algorithm was proposed by Sarath Babu et al [15], and decision tree grading and descriptors are loaded into K-means algorithms.

This K-mean technique is used for clustering. Chun-yan Zhu et al. [16] looked at the research region and issues with prediction with readmission patients. Anjan Nikhil Repaka et al [17] suggested Smart Heart Disease Prediction (SHDP) to forecast risk variables for heart disease using Navies Bayesian. The author suggests developing a smartphone and online software to estimate the possibility of coronary artery disease.

Table I. Methods Used for Prediction

Sr no	Author	Classification methods Used	Accuracy	Conclusion
1	Dinesh Kumar G et al [1]	1)LR 2) NB 3) RF 4) SVM 5) Accuracy module	1)0.9161585 2)0.9095528 3)0.8953252 4)0.882622 5)0.9070122	Provide a mechanism for forecasting CVD using ML techniques by used of R software.
2	Amin UI Haq et al [2]	1)LR 2) NB 3) DT 4) SVM 5) ANN 6) K- NN 7) RF	1)89 (c=100) 2)85 3)74 4) 87 (kernel = RBF) 5) 77 6) 80 (k=1) 7)85	When using the FS algorithm, the classifiers LR with 10-fold cross-validation got accuracy of 89 percent.
3	Senthil Kumar Mohan et al [10]	1) DT 2) Language Model 3) SVM	1) 85 2) 85.1	In terms of predicting cardiac disease,

Sr no	Author	Classification methods Used	Accuracy	Conclusion
		4) RF 5) NB 6) NN 7) HRFLM	3) 86.1 4) 85 5) 75.8 6) 88.4	HRFLM showed to be pretty accurate.
4	Ryan Poplin et al [11]	Deep Learning	NA	His research suggests that information on retinal scans are a rapid, easy, simple method to obtain information about heart disease in an ambulatory situation.
5	Mr.Santha Krishnan et al [12]	1) DT 2) NB	1) 91 2) 87	People with heart disease were properly diagnosed 91% of times by the DT model and 87% of the period by the NB.
6	Mr. Abhishek Rairikar et al [13]	1)KNN 2) DT 3) NB	NA	In comparison to Decision trees and Naive Bayes, the report believes that KNN offers precise results.
7	Mr. M.A.Jabar, Shirina et al [14]	1) Hidden Naïve Bayes 2) NB	1) 94.4 2) 85.18	When compared to alternative approaches,

Sr no	Author	Classification methods Used	Accuracy	Conclusion
				the experimental results suggest that the HNB model performs better.
8	Mr. Sarath Babu et al [15]	1) Genitic algorithm 2) K-means algorithm 3) MAFIA algorithm 4) Decission tree classification	NA	The DT is a very effective tool that uses thirteen elements.
9	Chun-yan Zhu et al, [16]	1) ANN 2) K-means algorithm	1) 90.62 2) NA	ANN achieves 90% accuracy & 80% sensitivities .
10	Mr. Anjan Nikhil Repaka et al [17]	1) Navive Bayes	89.77	The accuracy of NB is 89.77 %
11	Mr. Vikas Chaurasi a et al [18]	1) CART 2) ID3 3) DT	1) 83.49 2) 72.93 3) 82.5	CART Classifier with an accuracy of 83.49 percent and a proposed analytical rate of 0.23 seconds

We highlight some research effort and a comparison study in the table above.

#### V-CONCLUSION

Forecasting within the healthcare sector has greatly benefited from data mining. Doctors use integrated software to help locate the condition that is driving the patients' symptoms. Thus, the cardiac condition record of the University of California, Irvine is utilised. The UCI archive is being used. Apart from that, some researchers used a database from a Beijing, China-based A-grade hospital.

Scholars have been employing techniques as well as algorithms such LR, SVM ,KNN, Artificial Neural Network (ANN),), NN, DT, Language Model, Hidden Nave Bayes, CART and many others to aid health-care practitioners in producing more accurate heart-disease examinations and They demonstrate that a data mining strategy is critical for predicting and evaluating CVD without invasive testing.

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