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Identification and Predicting Heart Disease with Data Mining methods - A Survey

Srikanth Meda[1], Dr. Raveendra Babu Bhogapathi[2]

[1]Research scholar, Acharaya Nagarjuna University, Guntur & Associate Professor in the Department of Computer Science and Engineering at R.V.R. & J.C. College of Engineering, Guntur.
[2]Professor, Department of Computer Science and Engineering, R.V.R & J.C College of Engineering, Guntur.

Abstract: Data mining mechanisms allow to create proactive decision making systems. Data mining methods can respond to any environment that usually involve more time and complexity in decision making . In this paper we considered several mechanisms in which data mining methods are used for the prediction of Heart Disease. The data mining systems specifically Decision Tree, Naïve Bayes, Neural Network, K-means Clustering, affiliation arrangement, Support vector machine algorithms are examined on Heart Disease database. This paper examined the general audit of Heart Disease diagnosis, utilizing different data mining strategies. These procedures of data mining utilized as a part of Heart Disease prediction take less time and make process easier and earlier for the diagnosis of Heart Disease with great precision so as to enhance heart safety. This paper investigates distinctive data mining strategies which are utilized as a part of human services for the diagnosis of heart infections utilizing data mining procedures. In this manuscript after discussing about different methodologies, a new fuzzy neural genetic approach is proposed which can exhibit much better performance for earlier heart disease prediction when compared to existing methods.

Keywords: Data Mining Techniques, clustering, classifiers, Heart Disease Prediction.

1. Introduction

Dissimilar methodologies of data mining methods are used as a need of Heart disease prediction by using unique data mining techniques. Life is dependent on viable working of heart since heart is crucial bit of our body. There are several factors which extends threat for causing Heart disease. Now a days, Heart problem is the practical purpose behind majority of deaths in our country.

Our entire life relies upon proficient working of heart. Heart Disease is caused because of narrowing or blockage of Heart supply routes. This is caused by affidavit of fat on inside dividers of blood supply routes and furthermore because of cholesterol. There are some significant Heart Disease factors which incorporate Diabetes, hypertension, weight, smoking, dietary patterns, liquor that influence our entire body. [1]

Some of real symptoms of heart disease are:

•Pain in center of your chest.
•Pain or distress on one or the two arms, the back, neck or stomach.
•Shortness of breath with or without chest pain.
•Nausea, Indigestion, Heartburn, or stomach pain.
•Sweating and Fatigue.

A few sorts of Heart Disease are cardiovascular diseases, heart attacks, Heart Disease and Stroke. Stroke is a kind of Heart Disease it is caused by narrowing, blocking, or solidifying of the veins that go to the cerebrum or by hypertension.

2. Literature Survey

Ma.jabbar et.al [1] proposed an investigation paper "Sickness Diagnosising organization Using Data Mining Methods"[8].The preprocessed data is gathered using clustering computations as K-means to group critical data in database. Maximal Frequent Item set Algorithm is associated for taking out maximal general cases in Heart Disease database. The unending illustrations can be portrayed into dissimilar classes by means of the C4.5 computation as getting ready using the possibility of data entropy.

Ms. Ishtake S et.al [2] proposed an experiential Study on diagnosing of Heart Disease using request data mining techniques"[5]. In this paper, the use of illustration affirmation and data mining frameworks are used for desire of causing danger in the clinical zone of cardiovascular problems is proposed here. A bit of the imperatives of the customary therapeutic scoring structures are that there is a closeness of trademark, straight blends of variables in the data set and from this time forward they are not talented at showing nonlinear complex relationship in remedial spaces. This control is dealt with in this investigation by use of portrayal models which can positively perceive complex nonlinear associations among free

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and ward factors and furthermore the ability to recognize each possible correspondence between marker factors.

Dr. K. Usha Rani [3] presented an examination paper Using Classification Mining Techniques. In this investigation, the therapeutic administration industry, the data mining is in a general sense used for the estimation of Heart Disease. The objective of our endeavors is to predict the Heart Disease with a decreased number of characteristics using Naïve Bayes, Decision Tree.

Carlos Ordonez et.al[4] has shown a paper on Healthcare Data System. In this manuscript, the data mining strategy to measure hypertension from understanding helpful records with eight unique diseases is designed. our consideration on data mining is to remove covered precepts and associations among diseases from a genuine medical care Data System by means of Naive Bayesian and J-48 classifiers.

Nidhi Bhatla et.al [5] proposed a work on a half and half approach by consolidating two ordinary machine learning algorithms specifically Genetic Algorithm (GA) and Support Vector Machine (SVM) for the characteristic determination. The GA is utilized as the developmental algorithm for diminishing the aggregate number of traits. The outcome relies upon the health assessment on the work utilized. The chromosomes are chosen with more noteworthy parameters. The outcomes are approved for each of the five data collections in UCI data storehouse.

Shantakumar B.Patil et al.[6] proposed Heart disease expectation utilizing genetic algorithms. In the proposed work, genetic algorithms are utilized to decide the properties which contributes more towards the finding of heart problem which in round about way that diminishes the quantity of test which should have been taken by a patient. The 13 test credits are decreased to 6 test traits utilizing the genetic algorithms.

Abhishek taneja et al. [7] proposed a work on harsh set with formal idea examination. In this work, a structure is developed with two procedures, in particular preprocess and post process. In the pre-process the standards are blended utilizing harsh set and in the post procedure the formal idea examination is utilized for the depiction. The procedures are isolated into arrangement, idea detailing and data examination. It produces an arrangement of standards, the principles sets are diminished, rules are approved and the experimental examination on the data set is directed. The experimental examination is directed on hypertensive Heart disease, Heart disease, and cardiomyopathy.

V. Manikantan et.al [8] proposed an investigation on K-nearest neighbor in diagnosing Heart disease. The researches performs analysis of Heart disease by applying K-Nearest Neighbor (KNN) system. The outcomes demonstrated that by applying the KNN the results accomplished higher precisions. The outcome likewise demonstrated that applying determination parameters couldn't improve the KNN precision in the Heart disease finding.

K.Srinivas et.al [10] presents "audit on expectation framework for heart disease determination utilizing data mining strategies" .The examination demonstrates that utilizing distinctive systems and taking diverse number of qualities, we get distinctive exactnesses for anticipating heart infections.

G.Subbalakshmi et.al[11] presented an outline of Heart Disease probability utilizing data mining strategies. These methods take less time and make process quick for diagnosis framework to anticipate Heart Disease with great precision to enhance their comfort. T.John Peter et.al[12] utilizes three grouping procedures to be specific they are , choice tree, Naïve Bayes, and K-nearest neighbor and demonstrates the execution among them. It has decided the best expectation system as far as its precision and mistake rate on determining dataset.

Chaitrali S et.al [13] exhibits a method on illustration of heart infections diagnosis for therapeutic analysis. This exploration give review of momentum methods of learning revelation in databases that are utilized as a part of medical research in Heart Disease prediction by utilizing data mining systems.

D. Shanthi et.al [14] builts up a diagnosis framework for heart failure, utilizing choice tree, Neural Network and Naïve Bayes strategies utilizing 15 qualities in year 2013.

P. K. Anooj et.al [15] anticipated the investigation of various data mining strategies that can be utilized in mechanized Heart Disease diagnosis frameworks. The examination demonstrates that Neural Network with 15 qualities has demonstrated the precision which uses a smart framework based Support Vector Machine alongside a twisting premise fuction organization is displayed for analysis and demonstrates the outcome that SVM can be effectively utilized for diagnosing Heart Disease.

J. C. Obi et al. [16] utilized a Radial Basis Function(RBF) to anticipate the medical solution for heart disease. Around 300 patient's data were gathered from the Ramesh Hospital, Guntur. RBFNN (Radial Basis Function– Neural Network) can be depicted as a three-layer sustain forward structure. The three layers are the info layer, concealed layer and yield layer. The concealed layer comprises of various RBF units (nh) and inclination (bk). Every neuron on the concealed layer utilizes a curved premise work as a nonlinear exchange capacity to work on the data. The frequently utilized RBF is generally a Gaussian capacity.

D. Shanthi. al. [17] proposed an Efficient Classification Tree Technique for Heart Disease Prediction. This paper breaks down the order tree methods in data mining. The grouping tree algorithms utilized in this paper are Decision Stump, Random Forest and LMT Tree algorithm. The target of this exploration was to think about the results of the execution of various characterization methods for a heart disease dataset.

A. Sudha et.al. [18] have delineated about how the datasets are accessible for heart disease , by and large a crude in nature which is exceptionally repetitive and conflicting. There is a need of pre-preparing of these data collections; in this stage high dimensional data collection is lessened to low data collection.

G.Komarasamy et al.[21] displayed a choice that is emotionally supportive network for heart disease grouping. Support vector machine (SVM) and artificial neural network (ANN) are the two primary techniques utilized as a part of this

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framework. A multilayer perception neural network (MLPNN) with three layers are utilized to build up a framework for the purpose of predicting heart disease. This multilayer perception neural system was prepared by back-proliferation algorithm which is computationally a productive technique. Results demonstrated that a MLPNN with back-engendering procedure can be effectively utilized for diagnosing heart disease. M.A.Nishara Banu et al. [22] proposed a heart disease diagnosis framework in view of Auxiliary Equation Modeling (AEM) and Fuzzy Cognitive Map (FCM).They utilized Canadian Community Health Survey (CCHS) 2012 dataset. Here, twenty critical qualities were utilized. AEM is utilized to produce a weight framework for the FCM which at that point predicts a plausibility of cardiovascular diseases. A AEM is characterized with connection between's CCC 121(a variable which characterizes whether the respondent has heart disease) alongside 15 characteristics. The AEM characterized in the past segment is presently utilized as the FCM despite the fact that they have accomplished the required fixings (i.e. weight network, ideas and causality).70% of the data index was utilized for preparing the AEM demonstration and the remaining 20% for testing the FCM display. The exactness acquired by utilizing this model was 67%.

Sujata Joshi [23], proposed, an advanced method which has been done to accomplish higher order proficiency in Decision Tree . It is an approach for early recognition of heart disease by using assortment of highlight. These sort of approach can likewise be use for other circle of research. Other than choice tree different other approaches accomplishing the objective of great location of heart disease in people are considered.

K.Sudhakar.et.al, [24] demonstrated that in multivariate anomaly recognition for finding the limit value, the Mahalanobis separation is utilized as the separation measure. It likewise demonstrated that the χ 2 plot that, plots against the Mahalanobis are removed and the χ 2 conveyance. The focuses that don't lie on the straight line are considered as anomalies. In any case, this strategy is done physically by choosing the random estimations.

Jyoti Soni et al. 2015., [25] proposed strategies for finding the shrouded designs. The harsh set hypothesis is utilized as the intense scientific apparatus in finding the control deductions. Less number of reductions were extricated. The algorithm lessened the properties with less reductions and center. It likewise decreased the algorithm time in delivering the run reductions from the huge datasets.

Beant Kaur et al.,[26] utilized the harsh set hypothesis and the second stage utilized the automatic validation. The harsh set hypothesis is utilized for grouping and the automatic validation, utilized for order. The RST is utilized to discover the groups of items by giving the arrangement of articles as data. Fuzzification was utilized to produce the automatic aligned principles by extricating a auto deduction framework. The examinations were carried on heart disease datasets and the assessment measurements like affectability, specificity and exactness are broke down.

Ms. Ishtake et al. [27], utilized Support vector machines to identify the anomalies. The anomalies are recognized by registering the probability depth for the class when the value does not fall under limit, it is considered as strange. SVM is utilized when the issues are identified with managing high dimensional picture database. The separation is computed to gauge the relationship. The normal coefficient values are figured and checked in the event that they fall under the limit conditions. One-class and Two-class characterization approaches are ordered. The one class order is to discover the limit between two classes. It is more invaluable in isolating at least two classes.

Nidhi Bhatlet et al., [28] proposed a dimensionality reduction system to reduce the space and expands the execution. Meta-heuristics procedures are utilized for the dimensionality reduction. It is more helpful to limit space, data recovery is quicker, productive picture preparing, better perception and exact grouping for area situated datasets.

Shashikant Ghumbrl et al., [29] examined about the expectation of the heart disease utilizing data mining strategies like decision trees, Naïve Bayes, Neural Networks, order and Genetic Algorithm. It demonstrates the investigation of different techniques utilized as a part of the probability of the heart disease.

3. Approaches Used For Data Mining

The following approaches are used for the prediction of Heart Disease.

3.1 K-means Clustering:

The algorithm groups the records of data in a predefined number of clusters [11]. This methodology hopes to fragment the records in data set recognitions into K-clusters. In this, data is grouped into K-clusters where K is considered as data parameter and assigns each data‟s to packs in perspective of the observation‟s region to the mean of cluster. The cluster‟s mean is then more figured and the procedure will proceed again[3].

Steps engaged with K-means algorithm are as per the following:

- Select the quantity of clusters.
- Randomly make k-clusters and discover focal points of clusters.
- Calculate the separation between every datum point and clusters focal points.
- Assign the data point to the nearest clusters focal points.
- Recalculate the new clusters focal points.
- Repeat the above steps until the end condition is met.

This strategy is utilized as a part of different medicinal applications, for example, Heart Disease diagnosis. This method permits running on vast databases. This is the speediest algorithm among all.

However K-means clustering has several drawbacks which includes

1) Difficult to predict K-Value.
2) With global cluster, it didn't work well.
3) Different initial partitions can result in different final clusters.
4) It does not work well with clusters of Different size and

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Different density.

3.2 Decision Trees:

This strategy is more appropriate for clustering issue. categorization is an unsupervised learning method used to anticipate the class of articles whose class name is ambiguous [3]. In this procedure for the most part, two stages are included making a tree and actualize that tree to the dataset. There are different decision tree algorithms, for example, C4.5, ID3, C5.0, and CART [5].

C4.5 algorithm is an expansion of the fundamental ID3 algorithm. This approach gives most extreme precision on preparing data. Decision Tree Structure gives an "assumtion at that point" that makes the outcome simple for clarification. This is utilized as a part of different activity examines especially in basic leadership and to recognize a system to accomplish an objective [2].

Even decision trees performs well it also has drawbacks like They are unstable, meaning that a small change in the data can lead to a large change in the structure of the optimal decision tree.They are often relatively inaccurate. Many other predictors perform better with similar data. This can be remedied by replacing a single decision tree with a random forest of decision trees, but a random forest is not as easy to interpret as a single decision tree.For data including categorical variables with different number of levels, information gain in decision trees is biased in favor of those attributes with more levels.[6]Calculations can get very complex, particularly if many values are uncertain and/or if many outcomes are linked.

3.3 SVM Classifier:

Support vector machine is an ordered and degeneration technique used to augment the prescient precision without over fitting the data to be prepared. This strategy can resolve direct and non straight characterization issues. This strategy is utilized for bigger number of datasets, with countless fields [12].

This procedure performs well on data collections having most extreme number of attributes.SVM describes preparing data into Kernel space. Mostly Kernel spaces utilized are-straight(utilizes spot item), Quadratic, polynomial Radial Basis work piece, Multilayer discernment portion and so on There are additionally numerous techniques to execute SVM, for example, quadratic programming successive insignificant enhancement and minimum squares[13]. A hindrance is that the algorithm is delicate to the decision of variable settings, making it harder to utilize and tedious to distinguish the best.

This classifier also has several disadvantages as that the theory only really covers the determination of the parameters for a given value of the regularization and kernel parameters and choice of kernel. In a way the SVM moves the problem of over-fitting from optimizing the parameters to model selection. Sadly kernel models can be quite sensitive to over-fitting the model selection criterion. An important practical question that is not entirely solved, is the selection of the kernel function parameters - for Gaussian kernels the width parameter [sigma] - and the value of [epsilon] in the [epsilon]-insensitive loss function.

3.4 Naive Bayes:

This is a classifier approach which is utilized when the dimensionality of the info is high. This is an essential system for some machine learning strategies and used to make models. This strategy gives a method for investigating and understanding the data. This technique depends on Bayes hypothesis.

$P(M/N) = P(N/M)/P(M)$

This therefore ascertains the likelihood of M given N, when M deals with reliance occasion and N deals with earlier occasion [2]. This algorithm depends on the presumption that a quality incentive on a given class is autonomous of the estimations of different properties [5].

A novel Heart Disease diagnosis framework plans to anticipate the likelihood of Heart Disease threat to patients. Investigation estimated by various researcher‟s demonstrates that utilizing diverse data mining procedures having distinctive number of qualities, we get various predictions for foreseeing Heart Disease. This paper introduces a review for different data mining methodologies, for example, basic leadership, K-means grouping, Naïve-Byes, Support vector machine(SVM) for Heart Disease diagnosis and look at the exactnesses of various algorithms for Heart Disease expectation framework. Table 1 speaks up perspective of different data mining strategies with various data grouping mechanisms.

The first disadvantage is that the Naive Bayes classifier makes a very strong assumption on the shape of your data distribution, i.e. any two features are independent given the output class. Due to this, the result can be (potentially) very bad - hence, a “naive” classifier. Another problem happens due to data scarcity. For any possible value of a feature, you need to estimate a likelihood value by a frequent approach. This can result in probabilities going towards 0 or 1, which in turn leads to numerical instabilities and worse results.

Approaches used	No of attributes	Accuracy
K-means, MAFIA, C4.5	13	89%
KNN, Neural Network, Naïve Byes, Decision Tree	13	99.2%
Decision Tree, Naïve Byes, Neural Network	13	89.2%
Neural Network, SVM	13	85%

Table1: Summarized view of various data mining techniques

4. Proposed Method

The fuzzy neural genetic algorithm method fix the data effectively and decide the anomalies in the expansive size of heart disease database. The presentation of automatic data set idea effectively manages the vulnerability issues. The uncertainty with the reasonable limit presentation measures the level of the occasion rather than event level. Then again, the lattice based exception arrangement technique utilizing

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Triangular Boundary experiences the computational complexities.

The proposed fuzzy neural genetic algorithm reduces the computational complexities and enhances the exception discovery capacity. The proposed method also overcomes the drawbacks of the existing methodologies and yields better results. The extraordinary presentation of data set by utilizing their components inside the limit indicates a component either inside or outside is considered than uncertainty. This work investigates the utilization of automatic justification in the grouping of data and proposes a technique that can decide exceptions in the heart data collection and anticipate them by settling the unwanted data.

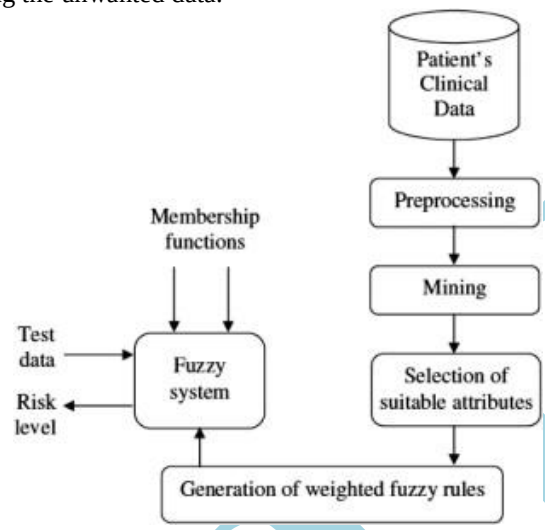

Fig-1 Framework of Proposed Mehod

5. Conclusion

Heart Disease is one of the fundamental issues of death worldwide and the early prediction of Heart Disease is basic. The PC based Heart disease prediction structure helps the specialist as a gadget for Heart disease investigation. Several Heart Disease portrayal structures are investigated in this paper. From the examination it is assumed that, data mining methods utilized expects a critical part in earlier prediction of Heart Disease. In future, we are aiming to propose a feasible infirmity desire structure to anticipate the Heart Disease with better exactness using particular data mining frameworks, for instance, Naïve Bayes figuring and Decision Tree maintained by cushy neural inherited estimation. Fuzzy Neural genetic algorithm is helpful for Heart disease prediction in starting time and the execution of the system can be obtained by preprocessed dataset. The prediction accuracy can be upgraded by decreasing in number of features considered. The manuscript performs review on various methods and suggested a new fuzzy neural genetic algorithm for the best prediction of Heart Disease.

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