A Hybrid Fish – Bee Optimization Algorithm For Heart Disease Prediction Using Multiple Kernel SVM Classifier

T.Keerthika, K. Premalatha

Abstract— The patient's heart disease status is obtained by using a heart disease detection model. That is used for the medical experts. In order to predict the heart disease, the existing technique use optimal classifier. Even though the existing technique achieved the better result, it has some disadvantages. In order to improve those drawbacks, the suggested technique utilizes the effective method for heart disease prediction. At first the input information is preprocessed and then the preprocessed result is forwarded to the feature selection process. For the feature selection process a proficient feature selection is used over the high dimensional medical data. Hybrid Fish Bee optimization algorithm (HFSBEE) is utilized. Thus, the proposed algorithm parallelizes the two algorithms such that the local behavior of artificial bee colony algorithm and global search of fish swarm optimization are effectively used to find the optimal solution. Classification process is performed by the transformation of medical dataset to the Multi kernel support vector machine (MKSVM). The process of our proposed technique is calculated based on the accuracy, sensitivity, specificity, precision, recall and F-measure. Here, for test analysis, the some datasets used i.e. Cleveland, Hungarian and Switzerland etc., that are given based on the UCI machine learning repository. The experimental outcome show that our presented technique is went better than the accuracy of 97.68%. This is for the Cleveland dataset when related with existing hybrid kernel support vector machine (HKSVM) method achieved 96.03% and optimal rough fuzzy classifier obtained 62.25%. The implementation of the proposed method is done by MATLAB platform.

Rundown phrases— Artificial bee colony algorithm, Fish swarm optimization, Multi kernel support vector machine, Optimal rough fuzzy, Cleveland, Hungarian and Switzerland.

I.INTRODUCTION

The process of gathering useful education from huge information is called as data mining.

[1].In the business society, data mining is used for all due to the fact that sustained by three techniques such as data mining, multiprocessing powerful computers and vast data collection. Related with various fields has some of the distinct characteristics and applications and medical data mining in medical field plays a major possibilities to increasing the unknown information's in the information sets. This information sets are utilized for medical purposes e.g. clinical diagnosis and prognosis [2]. Analysis of medical data's plays a major part and challenged assignment wants to perform effectively and correctly. The heart muscle is blocked off when more than one coronary arteries transfer the blood to heart muscle. This is called as infarction of myocardial [4]. Transformation of blood is stopped at certain period, normally up to 20 mins the artery may die. Currently, the coronary heart disease (CHD) outcome rate has been extracted with the enhancement of intercessional method that generates coronary arteriography (CAG) the ''golden standard'' for CHD result [8].

Heart Disease Prediction System aims to exploit the various data mining techniques on medical data set to assist in the prediction of the heart disease. Determination of heart disease goes over a major part in data mining due to that in worlds major death causes due to the heart diseases [5]. The heart disease id determined based on the process of heart. Few of the components that are used to determine heart diseases are: Cholesterol, High blood pressure, Lack of physical exercise and Obesit [15]. It reduces the charge for obtaining computer based clinical diagnosis data and support of resolution must be wanted [6]. Relations of different methods are presented foe the correct simplification and better efficiency for self moving systems. Different types of heart diseases are arising. The crucial heart diseases are Cardiovascular, Cardiomyopathy and Coronary heart disease [2]. Coronary Artery Disease: Related materials such as fatty, calcium and scar tissue (plague) generated on in the arteries which passes the heart with blood via this, the disorders must enhanced. That paper is known as coronary arteries, the heart muscles needs oxygen and nutrients to pumping of blood [9]. Cardio Valve Disease: heart disease valve called to many infirmities and diseases of the heart valves, that are the tissue flaps that arrange the move of blood via the valves of the heart. Cardiomyopathy Heart Disease: abnormal heart enhancement of structure and process before birth is called as congenital heart disease. This is an issue with the heart's structure and function due to abnormal heart enhancement before birth. This will majorly occurs during the birth [10].

The characterization for chronic condition of rheumatic heart disease (RHD) based on fibrosis and scarring of the cardiac valves and it can corrupt to the heart muscle. It appears from an recurrences of acute rheumatic fever (ARF), an immune mediated multisystem inflammatory disease [7]. Heart disease of rheumatic into a chronic

Revised Manuscript Received on July 18, 2019.

T.Keerthika, Assistant Professor, Department of Information TechnologySir Krishna College of Engineering and Technology, Coimbatore.Tamil Nadu, India.
(E-mail: keerthiglitter@gmail.com)
T.Keerthika, Professors, Department of Computer Science and Engineering,Bannari Amman Institute of Technology, Sathyamangalam, Tamil Nadu, India.

condition in presence to congestive heart failure, strokes, death and endocarditic [10]. The result of RHD is highly efficiently predicted via the utilization of echocardiography. Echocardiography in to regulasrly utilized in the result, management and consequences of patients is known heart diseases. This is to be majorly used in experiments of cardiolsogy diagnostic tests [11]. It can generate useful data's also contain the rate and structure of the heart, capacity of blood pumping, and the area and extraction of any corrupted tissue [14].

II. RELATED WORK

The healthcare industry is an every passing day they added huge medical records with a patients extra information's. Different techniques of data mining and different experimental tools are the major parts in the patient's disease are detected to minimize the utilization of cumbersome analysis. The aim of this paper is used vital parameters via extract the important data's from the patient's information sets. This is used for addressing the various data mining techniques. This will used to obtain a heart disease. Ritika Chadha and Shubhankar Mayank [16], have introduced the methodology and simplification of ANN techniques, DT (Decision Tree) and Naive Bayes and stress over the outcome and final result provided on the basis of accuracy and time complexity. Based on their outcome their presented method outperformed.

At the present time all the activities are done in the world through internet. The use of computer in the fields of medicine is highly improved. The computerized hospital includes the activities like treatment of illnesses, maintain the patient's information up-to-date that leads to handle huge amount of data regularly. It is very difficult to handle the large amount of data for predicting the heart disease. Data mining approach is a good way for predicting the heart disease at minimum effort. C.Sowmiya and P. Sumitra [17], analyzed the previous detection system and discussed different disputes on the previous system. The result of that paper helps the health consultants to diagnose the disease in less time and predict the probable problems well in advance and save the patient life.

Ashok Kumar Dwivedi [18], have presented the public health disquiet worldwide for prediction of heart disease. Heart patient's grower quickly owned to bad consumption lifestyles and deficient health awareness. Hence that was necessary to structure that diagnose cardiovascular disease. In that situation, heart rate assessment estimated six mechanical learning techniques as possible. The recital of these technique was assessed on eight diverse types performance indices. Moreover, the performance performance attribute curve was evaluated for those instructions. 85% of the highest classification accuracy, logistical logarithmic system reported 89 and 81% distinctly.

Typical classical decision making support systems through a single taxonomy, the simplest mix of these types that shows the enhanced process. Saba Bashir et.al [19], have presented to introducing a group consisting of a novel based on the Advanced Paging Approach with a Multi-Purpose Voting Plan for Inspection and addressing of Heart Disease. The introduced specimen violates the usual process limits via applying a group of five trainees: modest ghosts, linear regression, quadratic rational analysis, example trainer and SVM. Five various information sets are utilized for tests, calculation and validate . Databases derived from publicly available data repositories. Compared to many categories bssy comparing the many effects of the proposed group. Projections of the proposed group sample are estimated by ten times diagnostic and ANOVA statistics.

Many people suffer annually because of heart attacks worldwide. Many symptoms are caused by cardiovascular disease, which is difficult to diagnose the patient as a patient in many patients Mirpouya Mirmozaffari et.al [20], have introduced of Database Mines, a solution used in a database that takes the form of a hidden form from the medical database. There are 209 events and 8 attributes in the database. All methods of clustering are comparable to achieving very delicate accuracy. To increase the accuracy of the solution, the database was proposed by various supervisory and non-supervised methods. This system compares WEKA and computational accuracy in 5 stages, and 40 approaches. Three clocks with 100% accuracy were introduced as high performance algorithms.

The risk of cardiovascular disease (CVD) should be evaluated to evaluate the possible net benefits of the primary vaccine. Risk assessment risks may be misinterpreted exclusively in traditional CVD risk factors, resulting in both treatment and supervision. Coronary arterial calcium (CAC) refining purification coronary atherosclerotic is customized through direct visualization of the spine and generates accuracy for coronary heart disease (CHD). Sina Kianoush et al [21], most recent searches, on CAC focus seriously in medical use, unlike historical studies. This paper described the MESA CHD risk calculator, a currently enhanced CAC-based 10 year CHD risk assessor. The Prevention Treatment Guide will help identify wellness and low risk individuals

J. Henriques et al [22], early detection of heart failure degenerative events. The diagnostic assessment of daily collected physiological data was introduced to evaluate a telemonitoring study. The main hypothesis is that similar trends (trends) have the predictive value in further medical decay. The method consists of two major steps: a trend analog addressing and a prediction process. The unity program combines haar wavelet decomposition, where signals are referred to as set sets of vertical bases, the Karhunen-Loève switching, which allows for a reduced set of sites that can capture the continuous basic behavior of time. The predicted process predicts that future evolution can be assumed from the last physiological time series progress. Thus, the trend established the unity level, and a periodic series of historical data that was developed to present a similarity to the current state, was later used by the close neighboring approach to the present.

III. PROPOSED METHODOLOGY

A heart disease prediction model Clinical assistant can help diagnose cardiovascular disease based on the patient's medical data. Data Mining is a powerful new technology for

the separation of hidden computation and performance information from large databases that can be used to gain deeper and novel insights. When improving the cost of health care and diagnosis, the use of advanced data mining techniques to remove valuable information as a functional approach to improving the quality and accuracy of the health service [23]. In order to determine the heart disease, the existing method use optimal classifier. The earliest feature here was selected by fish swarm optimization and the classification mixed kernel support vector engine was made. The Paramormanship The Exiting Technique as Acoustic High Axis When Compromised to the Exceptioning Technology. Even though the existing technique achieved the maximum accuracy, it has some disadvantages. In order to overcome those drawbacks, the suggested technique utilizes the effective method for heart disease prediction. First input data is pre-implemented and enables the pre-enabled output feature selection option. Hybrid Fish - A special feature choice is used in high-dimensional medical quality to use the use of the bee optimization method. Thus, the proposed algorithm parallelizes the two algorithms such that the local behavior of ABC and global search of FSO are effectively used to find the optimal solution. Thereafter, selected features from medical databases should be classified into MKSVM. The overall flow of the presented diagram is shown in fig.1.

Fig.1 Flow chart of presented technique

Once the input data is first selected from the database, the procedure is carried out. n the paper, pre-processing is used for the database to get the numeric data from the numerical rankings. In the situation, the non-numeric data has been removed and the number to continue to get the data. Finally, the prerequisite results feature is given according to the choice. The feature selection process description is described in more section of the description.

3.1 Feature writing

Automatically selecting is one of the key research areas of the machine learning domain. The major attraction of feature selections is to help reduce the classification of optimal candidate features and improve accounting overhead, resource demand and storage space. The most influential features are selected in the process, which can understand the interaction between user features and classes. In order to prevent feature for prediction problem, hybridization of fish swarm optimization (FSO) and ABC is proposed in our article. The overall architecture of proposed prediction method is given in figure 1. Here, first, we discuss the background of the FSO algorithm and ABC. Then the detailed proposed Hybrid fish bee algorithm based feature selection is explained.

Fish Swarm Optimization

Synthetic fish swarm algorithm is an optimal technique is based on fish-looking food. Artificial fish swarm algorithm depicts fish, hunting and fish behavior to achieve optimum Algorithm has fast integration speed and strong global search capability and strong weakness. The Fish Swarm Optimization (FSO) algorithm contains steps that is given below,

a. Eligibility of each fish
b. Perform the search for each fish
c. The behavior of swarming fish
d. Run the chase for each fish

These operations are repeatedly repeated until some stoppages occur

Searching Activity:

When the fish fids a region with more food, fish will go directly and quickly to that region.

$$S_{i+1} = S_i + qand(q1)\frac{S_k - S_i}{\left\| S_k - S_i \right\|},$$

$$fitness_j < fitness_i \quad (1)$$

$$S_{i+1} = S_i + qand(q2)$$

s

(2)

Where, S_i - i^{th} element of the fish position S ;

S_k - the fish visual based random new fish selection;

$qand(q1)$ and $qand(q2)$ - random variables.

Swarming action:

In swarming action, it swill swarm naturaly.

$$S_{i+1} = S_i + qand(q1)\frac{S_{cen} - S_i}{\left\| S_{cen} - S_i \right\|},$$

$$fitness_c < fitness_i \ \ and \ \left(\frac{m_s}{m}\right) < \delta \quad (3)$$

Where, m_s -Individual Numbers inside visual S_{cen} .

S_i Neighbors S_{cen} - swarm center.

Chasingaction:

When a fish in the swarm discovers food, after determination of food the others will determine the food dangling.

$$S_{i+1} = S_i + qand(q1)\frac{S_{best} - S_i}{\left\| S_{best} - S_i \right\|},$$

$$fit_{bt} < fit_i \ \ and \ \left(\frac{m_s}{m}\right) < \delta \quad (4)$$

Where, fit_{bt} -Best fitness.

The overall flow chart of the fish swarm optimization method is shown in fig.2,

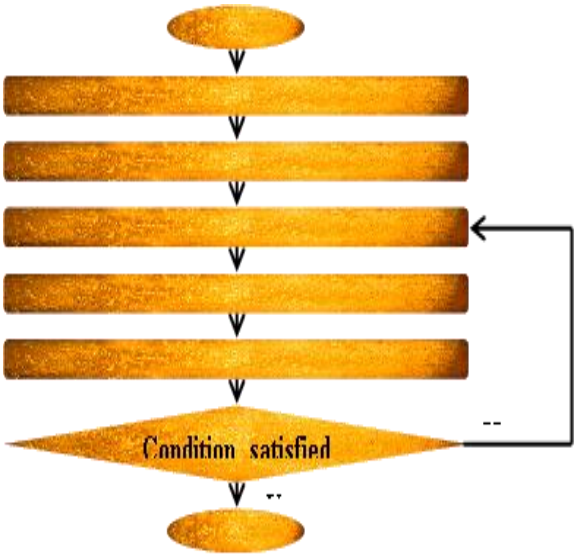

Fig.2 Flowchart for fish swarm optimization

ABC Algorithm

The ABC algorithm is a swarm based, metaheuristic algorithm based on sample modeling of derived from bee colonies. This model includes three main components: employment and unemployment, and food sources. There are synthetic bees in ABC's three groups: Workers, Observers and Scouts. Occupational bees are in the first half of the colony, while the second half has a viewer. The ABC algorithm consists of following steps:

a. Evaluate fitness of each food source
b. Every food source operation performed by employed bee
c. Calculate the process of greedy selection
d. Onlooker bee operation for each food source
e. Perform scout bee operation for selecting new food source

The above steps are processed continuously until, we met the stopping conditions.

Employed bee operation:

Produce new solution for the employed bee by using the following equation,

$$S_{ij}^{New} = S_{ij} + \gamma rand\,(S_{ij} - S_{kj}) \qquad (5)$$

Where S_{ij} -parameter of employed bee jth to ith.

S_{ij}^{New} -newly arrived solution for F_{ij} in the jth parameter;

S_{kj} - S_{ij} in employed bee population neighbor bee;

$\gamma rand$ -number of randomly chosen, range [-1,1];

Possibility Evaluation:

Assign each employed bee a selection probability using the following equation,

$$P_l = \frac{fit_l}{\sum_{n=1}^{SN} fit_n} \qquad (6)$$

Where fit_l is fitness value of l^{th} employed bee;

Operation of Onlooker bee:

The employed bee and onlooker bee has same number of food sources. Each food source selection process is evaluated initially by using the employed bee in the previous step.

Scout bee operation:

Scout bee performs a random search to replace abandoned food sources, utilizing the below eqn,

$$S_{ij} = S_{ij\,\min} + rand[0,1](S_{ij\,\max} - S_{ij\,\min}) \qquad (7)$$

Where, $S_{ij\,\max}$ and $S_{ij\,\min}$ is upper and lower boundaries for S_{ij} ;

The overall flow chart of the artificial bee colony algorithm is shown in fig.3,

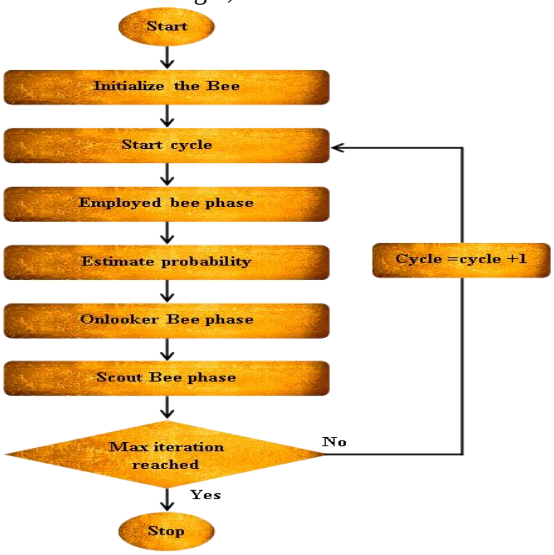

Fig.3 Flowchart for artificial bee colony optimization

Hybrid Fish Bee optimization

The goal of this analysis is effectively select the features developed on the HFSBEE algorithm. In this section our presented algorithm of hybrid optimization is composed centrally located FSO (fish swarm optimization) and ABC algorithm. The primary drawback of FSO technique shows up lower convergence speed and furthermore its takes maximal time to determine the optimal solution. In any case, ABC has the disadvantages that the population of solution increases the computational cost and slow down when used in sequential processing. Based on the hybridized this two optimization algorithm, that conquer the weaknesses of the each execution of FSO, ABC that has benefits of effectively recognizing and quickly focalizing, with the aim that this defective design in a shorter evaluation time. By our suppositions, the segmentation result of presents that the proposed HFSBEE accomplished preferable execution over the individual advancement. The procedure of proposed HFSBEE based feature selection is clarified below;

Initialization Solution

The solution is the primary procedure for beginners. Our

presented method analyzed an start solution (S) as number of feature value. The major purpose our document is to select the features that are optimized based on this project.

Fitness Evaluation

Right now the initial solution is created; every person's fitness value is calculated and stored for future reference. Exercise function is defined by the equation (8).

$$fit = \max Accuracy \tag{8}$$

fit denoted as fitness

We evaluate the exercise capacity for each proposition by using equation (8). Maximal Exercise proposition capacity is measured the best capacity available. The excess capacity is developed on these proportions are updated to find the best solution.

Searching, Swarming and Chasing Operation

❖ Searching behavior

It is a basic biological action of fish looking for food. It is based on a random search, with a tendency toward food concentration. The searching behavior is done by using equation (2).

❖ Swarming behavior

For the minimization of dangerous assembling of fish. The general objective of swarms contains fulfilling food intake wants, entertaining swarm members, and inducing new swarm members. The swarming behavior is done by using equation (3).

❖ Chasing behavior

When a fish locates food, neighboring individuals follow. The chasing behavior is done by using equation (4).

Scout bee operation

If the fitness values of the presented solution do not be enhanced by a continuous evaluated number of iterations, which is called 'limit', those outcomes are abandoned, and those solution become the scouts. The scouts are removed by the equation (7).

Termination standards

The algorithm suppresses the number of mainly executed testing's accomplished and the proficient that assets the best fitness value is collected and it is find as the best feature value. Once the best fitness is achieved by a method for HFSBEE algorithm, then the selected feature is passes to the classification process.

3.2 Classification with the aid of MKSVM

SVM is the mainly known techniques for its optimal solution. Despite it si better in theoretical and ususal process, support vector machine is not applicable for types of higher information sets hence SVM wants to cure the quadratic programming problem (QP) used to determine hhyper plane separately , which creates an challenging calculation problems. Hence, the Multi-kernel SVM technique is proposed in our paper to apply the types process for higher information sets. Here the selected features from the above process will be used as the testing input for the Multi-kernel Support Vector Machine (MKSVM) classification. As the MKSVM will be already trained with the input database, it is easy to identify the classification with extracted features. In this paper, medical datasets were taken and the obtained optimal features of input dataset were classified. MKSVM process has two phases. That are Training phase and the Testing phase.

Training phase: The intake of training phase is obtained from the outtake of feature selection. The support vector machine reveals choice for the kernel to obtain the effectiveness. In the feature space the event is linearly inseparable; it is related with the space of superior based on the Radial basis kernel function in order that the issues arise as linearly separable. Moreover, the relation of more than two kernel functions used to achieve the superlative precision than that achieved by working of any SKF (single kernel function).

IV. MKSVM (MULTI-KERNEL SUPPORT VECTOR MACHINE)

The classification method of multi-kernel SVM is proposed in our paper. It utilizes the kernel function to classify the data's without the use of hyper planes. The kernel functions generally used in practice are of linear, quadratic, polynomial, sigmoid and RBF (Radial Basis Function) kernel function. In our innovative technique, linear, quadratic and RBF kernel functions were combined and the average of three functions is used here to separate the data's of the same classification. The innovative work employs the integration of three kernel functions given as:

$$MK_A(f,g) = \frac{\left(x^T y + z\right) + \left(1 - \frac{\|f-g\|^2}{\|f-g\|^2 + z}\right) + \left(\exp(-\xi \| f-g \|^2\right)}{3} \tag{9}$$

The above equation can also be rewritten as:

$$MK_A(f,g) = \frac{\left(L_k(f,g) + Q_k(f,g) + RBF_k(f,g)\right)}{3} \tag{10}$$

Where $MK_A(x,y)$ in the above equation symbolizes the integrated kernel function representation of the linear, quadratic and RBF kernels.

Testing phase:

The result of feature selection is applied to the input of testing phase and the output denotes the input dataset as normal or abnormal.

V. OUTCOME ANALYSIS & RESULTS

In our paper we are analyze the outcome achieved by applying our presented method for simplification purpose our proposed technique was applied in MATLAB platform. The presented method is HFSBEE performed by windows machine having Intel Core i5 processor with speed 1.6 GHz and 4 GB RAM. The suggested classification technique is examined in three datasets such as Cleveland, Hungarian and Switzerland. These three information sets are obtained from the UCI machine learning repository.

4.1 Evaluation Metrics

The assessment metrics are Sensitivity, Specificity, Accuracy, Precision, recall and F-measure that the presentation of the suggested scheme is assessed. The traditional count assessment such as True Positive (TP), True Negative (TN), False Positive (FP) and False Negative (FN) are exploited here.

Sensitivity

It is defined as the ratio of a number of true positives to the sum of true positive and false negative.

$$Sen_t = \frac{TrPo}{TrPo + FaNe} \tag{11}$$

Specificity

It is defined as the ratio of a number of true negatives to the sum of true negatives and false positives.

$$Spe_t = \frac{TrNe}{TrNe + FaPo} \tag{12}$$

Accuracy

It can be evaluated using the values of sensitivity and specificity. It can be meaned as

$$Acc = \frac{TrPo + TrNe}{TrPo + FaPo + TrNe + FaNe} \tag{13}$$

Precision

It is defined as the ratio of true positive to the sum of true positive and false positive. It is denoted as,

$$\Pr e = \frac{TrPo}{TrPo + FaPo} \times 100 \tag{14}$$

Recall

Recall is the ratio of true positive to the sum of true positive and false negative. It is expressed as,

$$\mathrm{Re}c = \frac{TrPo}{TrPo + FaNe} \times 100 \tag{15}$$

F-Measurement

The combination of precision and recall measures are comprises i=a mean value of harmonic is called as F-measure. .It is indicated as follows,

$$F = 2 * \left(\frac{P * R}{P + R} \right) \tag{16}$$

4.2 Performance Measures:

The outcome of our presented technique helps to address the effectiveness of classifications. Here we are hybrid the FSO and ABC for medical data classification. By means of that the proposed accuracy value for classification also changes. Table.1 is tabulated in the part,

Table.1 performance measure of presented technique

Measures	Cleveland	Hungarian	Switzerland
Sensitivity	0.9878	0.9521	1
Specificity	0.9640	0.9716	0.973
Accuracy	97.68	95.91	97.56
Precision	0.9700	0.9835	0.7272
Recall	0.9878	0.9521	1
F-measures	0.9788	0.9675	0.8421

Table.1, illustrates the calculation values are addressed for the three information sets, based on that, we can regard the effectiveness of our presented data's for medical type system. The accuracy values of three information sets 97.68%, 95.91% and 97.56%. The sensitivity values of three information sets 0.9878%, 0.9521% and 1%. The dataset values for specificity is 0.964%, 0.9716%, and 0.973%. The proposed HFSBEE is achieves the precision and recall value for three dataset is 0.9700%, 0.9835%, 0.7272% and 0.9878%, 00.9521%, 1% respectively. F-measure svalue for the presented work is 0.9788% for Cleveland dataset 0.9675% for Hungarian dataset 0.8421% for Switzerland information set.

4.3 Effectiveness of the classification

Here, we describe the effectiveness of the medical data classification using hybrid fish bee classifier. The goal function is utilised to effectively classify the medical data using optimal feature selection method. The efficiency of their presented method, we are related with the off work. Here our presented work includes the off work as traditional FSO and ABC. In the existing, optimal rough-fuzzy classifier is used.

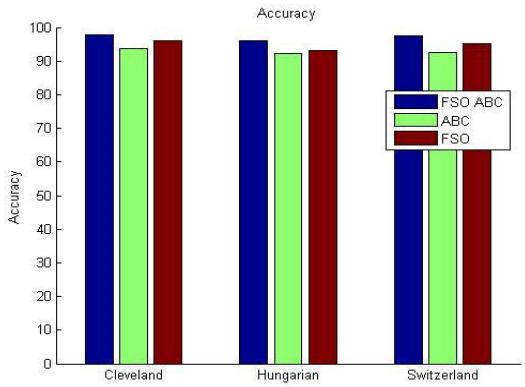

Fig.4 Accuracy comparison for three different datasets

In our work, we use optimal feature selection method for medical data classification. For classification the proposed method use hybrid fish bee is used. When analyzing fig.4

the proposed HFSBEE classifier is compared with FSO and ABC. Analyzing the fig.4, we are able to identify that the presented HFSBEE technique extremely performed with maximum accuracy rate of 97.689% when related with FSO attains 96.03% and ABC classifier is achieves 93.72% for Cleveland dataset. When compared to the previous work our proposed method achieves the maximum accuracy value for Cleveland data. The whole accuracy rate of Hungarian information set is 95.91% but the FSO classifier obtains 93.19% accuracy rate and ABC gets the accuracy value of 92.17%. For Switzerland dataset the proposed technique obtains the high accuracy values of 97.56% when related with off methods.

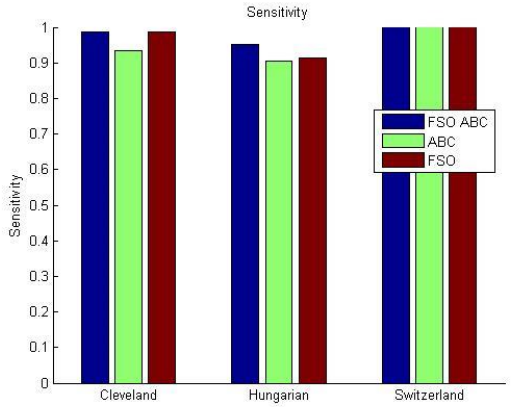

Fig.5 Sensitivity comparison for three different datasets

Analyzing of fig.5, the presented sensitivity values for three data's are plotted. In Cleveland dataset, the sensitivity value of HFSBEE rate is 0.9878%, FSO classifier obtains the sensitivity value is 0.9878% and also ABC classifier get the value is 0.9329% for sensitivity. The sensitivity rate of Hungarian dataset, the presented method reaches the 0.959 % of sensitivity value but the existing method FSO and ABC achieves sensitivity value of 0.904% and 0.9148% respectively. In Switzerland informationset the sensitivity value for both presented techniques and existing FSO classifier is 1% but the ABC reaches minimum sensitivity value of 1%

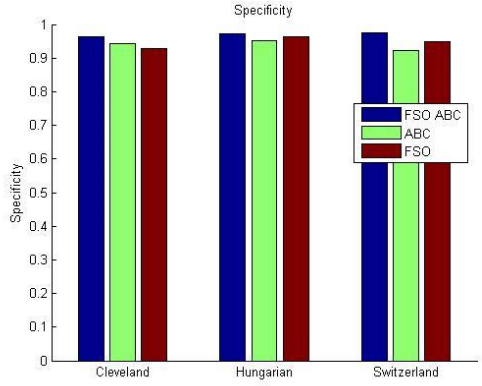

Fig.6 Specificity comparison for three different datasets

When addressing fig.6, the presented specificity values for three information sets are plotted. In Cleveland informationset, the specificity value of HFSBEE rate is 0.9640%, FSO classifier achieves the specificity value is 0.9424% and also ABC classifier get the value is 0.9280% for specificity. The specificity value of Hungarian dataset, of our presented method reaches the 0.971% of the value for specificity of our presented method FSO and ABC achieves specificity value of 0.952% and 0.962% respectively. In Switzerland information set the specificity rate for both presented article and existing FSO classifier is 1% but the ABC reaches minimum sensitivity value of 1%

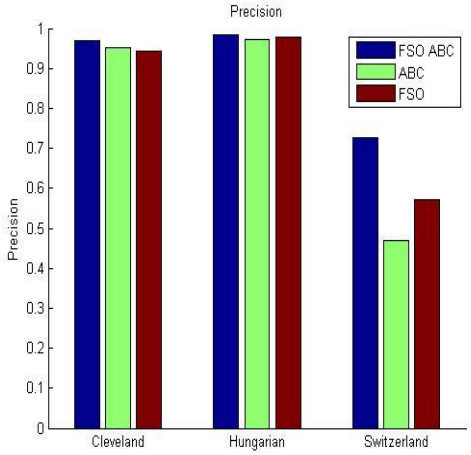

Fig.7 Precision comparison for three different datasets

Fig.7 elegantly exhibits the comparison graph for precision value. In this a HFSBEE is related with FSO and also the ABC. From the result, our proposed work shows the maximum precision value. For comparison we are taking three different dataset. Precision value for the proposed HFSBEE classifier is achieves maximum value for three medical dataset compared to the existing method.

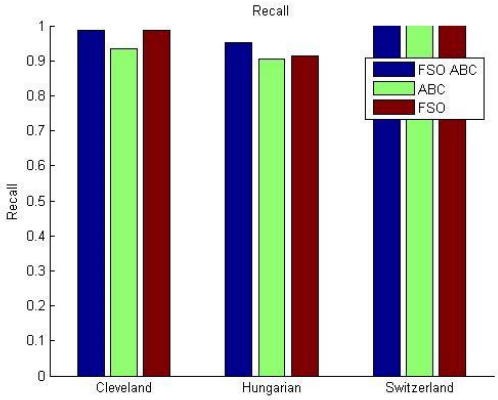

Fig.8 Recall comparison for three different datasets

In the suggested technique we evaluate the recall value. In Cleveland informationset, the recall value of HFSBEE rate is 0.9878%, FSO classifier achieves the recall value is 0.9878% and also ABC get the recall value is 0.9329%. The recall value of Hungarian dataset, the presented technique reaches the 0.9521 % of recall value but the previous method FSO and ABC classifier achieves recall value of 0.914 % and 0.904 % respectively. In Switzerland information set the recall value for both presented article and existing FSO classifier is 1% but the ABC reaches minimum recall value of 1%.

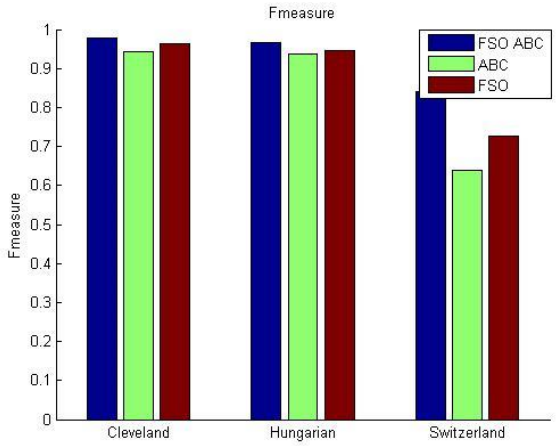

Fig.9 F-measure comparison for three different datasets

When analyzing fig.9, the proposed technique obtains the high f-measure value when related to the off techniques. When analyzing fig.7, the proposed f-measure values for three datasets are plotted. In Cleveland dataset, the value of f-measure for HFSBEE value is 0.9788%, FSO classifier achieves the f-measure value is 0.9415% and also ABC classifier get 0.9642% for f-measure value. The f-measure value of Hungarian dataset, the presented technique reaches the 0.967% of f-measure value but the existing method FSO and ABC achieves sensitivity value of 0.936% and 0.945% respectively. In Switzerland information set the f-measure value for both presented article and existing FSO classifier is 0.72% but the ABC reaches minimum f-measure value of 0.64%. The classification precision of our presented technique is related to the exiting technique, which is mentioned in table.2. It is shown in below section,

Table.2 Comparative analysis of different classifier

Dataset	MKSVM	HKSVM	Optimal rough fuzzy
Cleveland	97.689%	96.039%	64.50
Hungarian	95.918%	93.197%	87.75
Switzerland	97.56%	95.121%	80

When analyzing the table.2, the three datasets are Cleveland, Hungarian and Switzerland, here the classification MKSVM proposed technique obtains high rate when related to another method. From the result, it is purely that the introduced method went better than the previous methods.

V. CONCLUSION

In this article, classifications of medical data's are obtained by using an effective method. Here, the testing of datasets are on the UCI machine learning repository i.e. Cleveland, Hungarian and Switzerland etc., this is used to testing of our presented technique. The process of our presented method is calculated by applying sensitivity, specificity, accuracy, precision, recall and F-measure. The testing output shows that our presented technique went better than the accuracy of 97.68%. This for the Cleveland dataset that related with existing hybrid kernel support vector machine (HKSVM) method achieved 96.03%. 62.25% for optimal rough fuzzy classifier obtained. In the future work, we will have enough scopes to process with different optimization methods and classification techniques and generate more recent heights of greatness in process.

VI. REFERENCES

1. Taneja, Abhishek. "Heart disease prediction system using data mining techniques", Oriental Journal of Computer science and technology 6, no. 4 (2013): 457-466.
2. Negi, Smita I., and Vijay Nambi. "The role of carotid intimal thickness and plaque imaging in risk stratification for coronary heart disease", Current atherosclerosis reports 14, no. 2 (2012): 115-123.
3. Kim, Jae-Kwon, Jong-Sik Lee, Dong-Kyun Park, Yong-Soo Lim, Young-Ho Lee, and Eun-Young Jung. "Adaptive mining prediction model for content recommendation to coronary heart disease patients", Cluster computing 17, no. 3 (2014): 881-891.
4. Srinivas, K., G. Raghavendra Rao, and A. Govardhan. "Rough-Fuzzy classifier: A system to predict the heart disease by blending two different set theories." Arabian Journal for Science and Engineering 39, no. 4 (2014): 2857-2868.
5. Hsieh, Nan-Chen, Lun-Ping Hung, Chun-Che Shih, Huan-Chao Keh, and Chien-Hui Chan. "Intelligent postoperative morbidity prediction of heart disease using artificial intelligence techniques." Journal of medical systems 36, no. 3 (2012): 1809-1820.
6. Kang, Yuan-Yuan, Yan Li, and Ji-Guang Wang. "Ambulatory blood pressure monitoring in the prediction and prevention of coronary heart disease." Current hypertension reports 15, no. 3 (2013): 167-174.
7. Hafez, Mona, Sohier Yahia, Waleed Eldars, Heba Eldegla, Mohamed Matter, Gehan Attia, and Samia Hawas. "Prediction of residual valvular lesions in rheumatic heart disease: role of adhesion molecules." Pediatric cardiology 34, no. 3 (2013): 583-590.
8. Jian-ling, Sun, Zhao Ying, Gao Yu-lian, Xiong Li-juan, Guo Ji-hong, and Li Xiao-ying. "Coronary heart disease diagnosis bases on the change of different parts in treadmill exercise test ECG." Cell biochemistry and biophysics 67, no. 3 (2013): 969-975.
9. S.M Uma and E.Kirubakaran, " Intelligent Heart Diseases Prediction System Using A New Hybrid Metaheuristic Algorithm," International Journal of Engineering Research & Technology (IJERT), Vol. 1 Issue 8, pp. 1-7, October - 2012.
10. S.Vijayarani and S.Sudha, " Comparative Analysis of Classification Function Techniques for Heart Disease Prediction,"International Journal of Innovative Research in Computer and Communication Engineering, Vol. 1, Issue 3, pp. 1-7, May 2013.
11. Van der Velde, A. Rogier, Wouter C. Meijers, and Rudolf A. de Boer. "Biomarkers for risk prediction in acute decompensated heart failure." Current heart failure reports 11, no. 3 (2014): 246-259.
12. Vogt, Winnie. "Evaluation and optimisation of current milrinone prescribing for the treatment and prevention of low cardiac output syndrome in paediatric patients after open heart surgery using a physiology-based pharmacokinetic drug–

disease model." Clinical pharmacokinetics 53, no. 1 (2014): 51-72.
13. Moos, Shira I., Jaap Stoker, Gajenthiran Nagan, Roderick S. de Weijert, David NH van Vemde, and Shandra Bipat. "Prediction of presence of kidney disease in a general patient population undergoing intravenous iodinated contrast enhanced computed tomography." European radiology 24, no. 6 (2014): 1266-1275.
14. Rasool, Muhammad Fawad, Feras Khalil, and Stephanie Läer. "A Physiologically Based Pharmacokinetic Drug–Disease Model to Predict Carvedilol Exposure in Adult and Paediatric Heart Failure Patients by Incorporating Pathophysiological Changes in Hepatic and Renal Blood Flows." Clinical pharmacokinetics 54, no. 9 (2015): 943-962.
15. T. Revathi and S. Jeevitha, " Comparative Study on Heart Disease Prediction System Using Data Mining Techniques," International Journal of Science and Research (IJSR), vol. 6, no. 14, pp.1-7, 2013.
16. Ritika Chadha and Shubhankar Mayank, " Prediction of heart disease using data mining techniques," Research Article, vol.10, no.16, pp.1-6, 2016.
17. C.Sowmiya and P. Sumitra, "Comparative Study of Predicting Heart Disease By Means Of Data Mining," International Journal Of Engineering And Computer Science, Volume 5, Issue 12, Page No. 19580-19582, Dec. 2016.
18. Ashok Kumar Dwivedi, " Performance evaluation of different machine learning techniques for prediction of heart disease," original Article, vol. 10, no.1, pp. 1-9, 2016.
19. Saba Bashir, Usman Qamar and Farhan Hassan Khan, " BagMOOV: A novel ensemble for heart disease prediction bootstrap aggregation with multi-objective optimized voting," Technical paper, no.10, vol.6, pp. 1-19, 2015.
20. Mirpouya Mirmozaffari, Alireza Alinezhad and Azadeh Gilanpour, " Heart Disease Prediction with Data Mining Clustering Algorithms," International Journal of Computing, Communications & Instrumentation Engneering, vol.4, issuse.1, pp.1-5, 2017.
21. Sina Kianoush, Mahmoud Al Rifai, Miguel Cainzos-Achirica1,Priya Umapathi, Garth Graham, Roger S. Blumenthal, Khurram Nasir and Michael J. Blaha, " An Update on the Utility of Coronary Artery Calcium Scoring for Coronary Heart Disease and Cardiovascular Disease Risk Prediction," Research Article, vol.18, no.13, pp.1-11, 2016.
22. J. Henriques, P. Carvalho, S. Paredes, T. Rocha, J. Habetha, M. Antunes and J. Morais," Prediction of heart failure decomposition events by trend analysis of telemonitoring data," vol.10, no.15, pp.2168-2194, 2015.
23. T. Keerthika and K. Premalatha, "Heart Disease Prediction System Using Optimal Rough-Fuzzy Classifier Based on ABC", Asian Journal of Information Technology, Vol.15, No.3, pp. 481-492, 2016.