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Efficient Monitoring Of Network Using Hybrid Cross Regression Classification Algorithm (HCRCA) In Distributed System

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Abstract

Pattern lengths are varying in the classification process of dynamic kernel by the support vector machines (SVM) and analysis the data to provide effective decision making process. Generally SVM and Neural Networks classification algorithms are analysed by the classification of patterns to identify the pit falls and mess. It provides good classification for moderated data, while for large datasets the performance efficiency will be drop. To train the sets of data for better accuracy and the efficiency a new Hybrid Cross Regression Classification Algorithm (HCRCA) is designed and developed. The proposed kernel classification algorithm (HCRCA) solves all pit falls and drawbacks, handling large data sets robustly, effectively, fast and reliable. It minimized the back propagation in Neural Networks algorithm and provides better analysis. Further it predicts the issues occur in distributed systems.

Keywords - SVM, Neural Networks kernel, Hybrid, cross regression, classification algorithm.

Introduction

Data Mining is a process of extracting data from pre-existing data into dimensional to get the information. But the accuracy in the process is very less. There are some classification in data mining are supervised learning, pattern recognition and prediction. These are the steps to be followed to extract the data from the large database. But there is a meagre trouble or good at some time where the similar data will be clustered together. Here regression is used to map the data with a predicted variable to define its accuracy and efficiency. Many algorithms have used to improve the accuracy and efficiency to gather more information.

The data's are analysing the information from succinct results and different perspective. The classes or groups are classified by the prediction, supervised learning and pattern recognition. It forms a cluster by grouping the similar data by using segmentation, Partitioning and unsupervised learning. The data's are mapped to real prediction valued variable by regression. It frequently processed by using the classification algorithm like Rot Boost Ensemble Technique, Distance Vector Algorithm, Support Vector Machine For classification, Back Propagation, Simple Bayesian Classifier and Decision Tree Based Algorithm; and cluster algorithm like Hierarchical clustering, Mixture of Gaussians,K-means and Fuzzy C-means.

Large data sets are required high capacity of memory and long time to learn it and provides accurate serve model by using Support Vector machines. In recent years, by increasing of database size the knowledge of it need to be increase. For non-trivial identification process, data understandable and valid potential are need to process for better access, it is done by KDD (Knowledge Discovery in Databases). The recognition of pattern task is done by Data mining which involved in KDD process.Due to regression and classification process of the pattern the SVM algorithm is proposed and used in fields like bioinformatics, face identification and text categorization. SVM become impractical by the memory requirement and the points of training data, the requirements are needed based on the solutions obtained from quadratic programs (QP).In training set, the points of QP is need to update to it, which is divided the large points in to smaller for speed up the handling of massive datasets.

In this paper, learning model of SVM is used to analyse the algorithm, recognize pattern, some classification and regression. It is a combination of machine learning and data mining, helped to separate the categories of points in space and mapped data with clear gap which is wide as possible. SVM not only work on linear classification but also a non-linear classification with kernel trick. Classifying the task of the data is the major part to work on, after that separating each data of its own kind, and separated by hyper plane. Data Mining works on stored transaction data and it will extract the data and transforming to its kind and load the transaction. After analysing the data it will be represented some graphical representation. Kernel is mainly used for recognizing the pattern, ranking, correlation, cluster and optimization of the data.

The paper is summarizing the content as follow: In section II, the related survey of the kernel design and SVM discussion is take place. In section IIIthe proposed work of design and development of the kernel with SVM is discussed. In section IV, the implementation of the algorithm is presented and in section V obtained test results of proposed kernel and the comparisons are take place before the conclusion in section VI.

Related Work

SVM with kernel used for varying pattern length. Speech signal varies alternatively, but using kernel on SVM help to analyse the non-linear signal. SVM is created from the hinge loss. SVM used to identify the training data set which is mostly informative support sectors to form SVM classifiers. SVM are intact with a

data structure consisting of multiple parts to be used for public use from the training set. But there is violation in privacy inherit. To maintain the privacy, SVM classifier is converted to privacy-preserving classifier, which will not disclose the privacy of the vectors. It is called as PPSVC (Privacy Preserving SVM Classifier). There are lots of functions in Kernel; they are Gaussian, Polynomial, Radial Basis, Fisher, Graph and String function. For Privacy preserving Gaussian kernel function. It combining with SVM, makes a precise decision by sensitive values are not exposed possessed by the support vectors. There by applying the PPSVC with the function, public set can be released easily and privacy set is preserved too. But efficiency drops for larger datasets.

To increase the processing speed for the testing phase of the datasets, it requires only selected features rather than all features. To find the activities of database and their feature values, Ada boost with SVM classifier is used. UCI used to determine there is a need of Ada boost or only SVM classifier. It will identify by the identification number of the data. It is tested by connected with human body, the signals are detected from the flow of pressure in the blood, it varies while walking and running. It is a non-linear signal and it is tested with chest and ankles and it produce more optimal results with more accuracy and less alarm rate.

To overcome all the deficiency, SVM combined with the neural networks, mostly all the algorithm are well suited to work with small datasets, but when it goes to larger datasets, the efficiency drops. Using neural network in data mining is more helpful in predicting networking issues over the distributed network. It is more reliable, efficient, fast and robust than other algorithm. Input data is taken and pre-processed and sent it to the hybrid model which is SVM with neural network.

A new model is designed from the input data and data is trained accordingly with SVM and tested using neural network. Sending a training signal to the network, it will generate output. Then combine it with the original output. Calculate the variation from the original output and the tested value output. For each data, it will be calculated is called local error. Adjust the weights to get an overall efficient data. To be implemented in the servers, first initialize the server and use smart agents and routing algorithm have to be specified with several pre-defined factors. And GUI has to be developed to visualize the problems. Based on the input testing data, networking problem will be known in the distributed network. Problems will be solved based on the hybrid model. As shown in Fig [1], the data point linear separation into two classes is done.

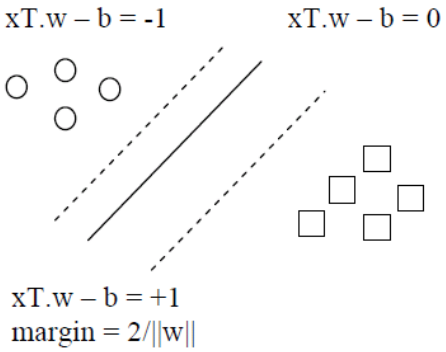

Fig.1: Linear separation of the data points into two classes

A distributed network is kind of system consisting of PCs which won't share a common memory. But all PCs are connected to each other through communication network. In system there will be usual problem will occur like server crash and cable failure. It can be rectified by the hybrid model. The main advantage of this algorithm, greater efficiency for larger datasets and it reduces the back propagation in neural network. Back propagation means for a required input and desired output value is determined to find out the output data of all deltas and neurons.

Proposed Work

In this section the proposed algorithm of design and development is discussed. The kernel function with SVM defines the process of classification and regression.A new Hybrid Cross Regression Classification Algorithm (HCRCA) is proposed with the combine of Support Vector Machine and Neural Networks. The data are classified using SVM and tested using Neural Network. The HCRCA is designed to classify a large datasets and to reduce the pit falls. As shown in Fig [1] the classes are separated from the linear data points. The classification and regression process is done by using proposed algorithm.

The kernel functions of the existing system are

$$K(\mathbf{X_i}, \mathbf{X_j}) = \begin{cases} \mathbf{X_i} \cdot \mathbf{X_j} & \text{Linear} \\ (\gamma \mathbf{X_i} \cdot \mathbf{X_j} + \mathrm{C})^{d} & \text{Polynomial} \\ \exp(-\gamma \mid \mathbf{X_i} - \mathbf{X_j} \mid^2) & \text{RBF} \\ \tanh(\gamma \mathbf{X_i} \cdot \mathbf{X_j} + \mathrm{C}) & \text{Sigmoid} \end{cases}$$

Where,

$$K(\mathbf{X_i}, \mathbf{X_j}) = \phi(\mathbf{X_i}) \bullet \phi(\mathbf{X_j})$$

that is, the data points are mapped with the higher dimensional feature space and the input is represented by dot product.In the proposed kernel the functions parameter are adjustable because of gamma. It locate the range of the axis across entire range and mostly used for kernel function of SVM. The proposed kernel function is take place as per the generated equation 1 and 2:

$$\boldsymbol{S(i,j) = gamma * \sum_{i=1}^{n} \sum_{j=1}^{m} log10(U(i,j) * T(1,i))} \quad (1)$$

Where, U is the data points input size of m x n and V is the feature vector of size 1 x n. T is the transpose of vector V. Gamma is an enhancing constant.

$$K(i,j) = \frac{exp(S(i,j))}{\pi} \quad (2)$$

The flow of the kernel is shown in Fig [2]. First the data sets need to be trained and it have done by using HCRCA model. Then as per the flow of the model the data are separated to classes. As per the SVM function of classification and regression the process of HCRCA also considered the same function. The changes are made to the function of kernel only. The C-SVM classification involves in reducing the error function $\frac{1}{2} w^T w + C\sum_{i=1}^{N} \xi_i$. The constraint from the subjects is $y_i\left(w^T \phi(x_i)+b\right) \geq 1-\xi_i$ and $\xi_i \geq 0, i=1,\ldots,N$.

Where, C as capacity constant, w as vector coefficients, b as constant and ξ_i - the parameter represented to handle non-separable input data. N training cases is index by i labels and the labels are represented as individual variable. The kernel transforms data to space and the error is castigated and carefully chosen it to avoid over fitting. For example, as shown in Fig [2] the input data is transforms to space.

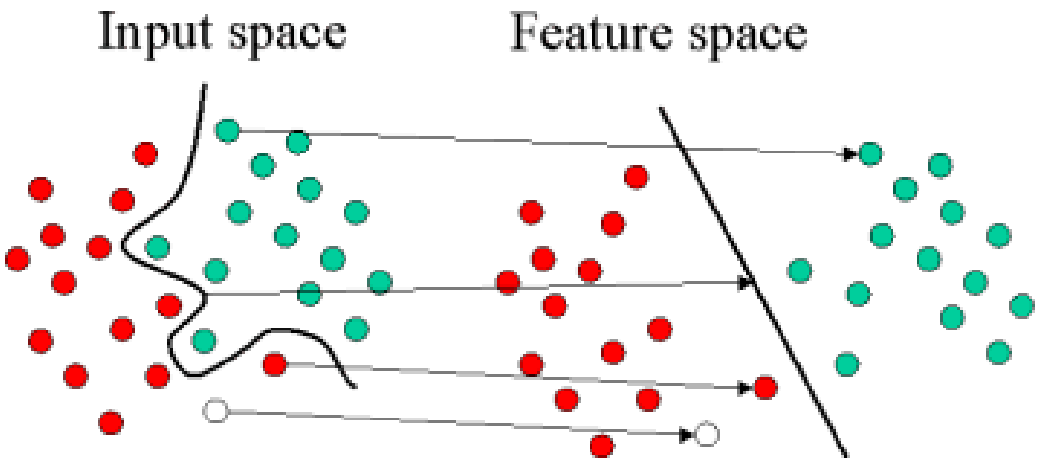

Fig. 2: Data transform to features space

In nu-SVM classification, the function as $\frac{1}{2} w^T w + C\sum_{i=1}^{N} \xi_i$ and the constraints as $y_i\left(w^T \phi(x_i)+b\right) \geq 1-\xi_i$ and $\xi_i \geq 0, i=1,\ldots,N$, $y \in \pm 1$ represent the class labels and the independent variables represented by xi.

In regression of SVM, y = f(x) + noise is a task to find a correct predict class in SVM, it not presented before. It is used to achieve the trained sample sets to optimize the error function in the classification of the proposed model. Based on the depended definition of error function, this model recognized the epsilon-SVM regression and nu-SVM regression.

In epsilon-SVM regression the error function is, $\frac{1}{2} w^T w + C\sum_{i=1}^{N} \xi_i + C\sum_{i=1}^{N} \xi^{\bullet}{}_i$ and minimize the subject of the function as $w^T \phi(x_i)+b-y_i \leq \varepsilon+\xi_i^{\bullet}$, $y_i - w^T \phi(x_i) - b_i \leq \varepsilon+\xi_i$ and $\xi_i, \xi_i^{\bullet} \geq 0, i=1,\ldots,N$.

In nu-SVM regression, the error function is $\frac{1}{2} w^T w - C\left(\nu\varepsilon + \frac{1}{N}\sum_{i=1}^{N}\left(\xi_i + \xi_i^{\bullet}\right)\right)$ and

minimize to $\left(w^T\phi(x_i)+b\right)-y_i \le \varepsilon+\xi_i$, $y_i-\left(w^T\phi(x_i)+b_i\right)\le \varepsilon+\xi^*_i$ and $\xi_i,\xi^*_i \ge 0, i=1,\ldots,N,\varepsilon \ge 0$.

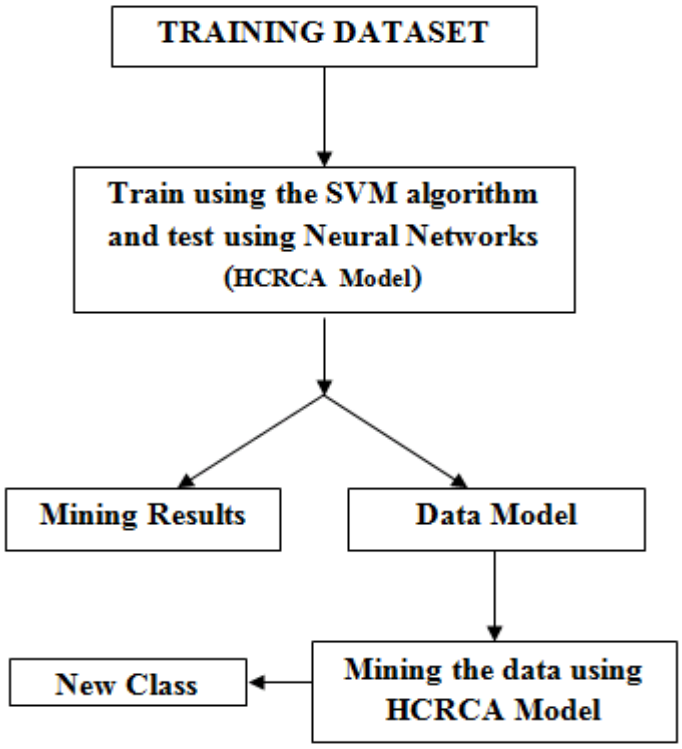

Fig. 3: HCRCA Model - Flow work

The proposed model is design with the cross regression. It coordinates the section in to 4 parts as per the axis (XX, XY, YX and YY). It is analysed to find the correctness of the process of classification of inter and intra cluster. Inter cluster shows the differentness of the large cluster and used to maximize the data sets. The division of the cluster in to small is defined in it. Generally in existing system the false hit and mess shows the wrong information's as correct and correct as wrong. In order to overcome this issue the process of the proposed clustering method is implemented. It consists in cross process. As shown in fig [3] the flow work of the HCRCA model is performed in the network. The function of designing kernel function is as in Fig [1].

General process of pre-processing: Selection of databases for the execution and evaluation of HCRCA model. Use 60% for training the data and balance 40% for testing. Train the data using proposed algorithm and for accuracy test the data. Then trained the input data to Neural Networks and calculateGradient and Hessian for error minimizing until the gradient is zero evaluate for all vector elements. Calculation of gradient andgeneralized Hessianof fat *ui*,

$$\Delta f(ui) = C(-DH)T(e - DHui) + + ui \qquad (3)$$

$$\delta 2f(ui) = C(-DH)Tdiag([e - DHui]^*)(-DH) + I \quad (4)$$

With*diag([e – DHui]*)* denotes thediagonal matrix*(n+1)x(n+1)* whose *jth* ,diagonal entry is sub-gradient of the step function *(e – DHui)+*.

As mentioned, the data is trained and sent as input to the HCRCA Model. The data mined to produce the results of new class and classified until it classify data gain. The trained samples ate present in Neural Network (NN) and compare the desired output to calculate the error of each neuron. In that the output of lower and higher of output and the scaling factors are adjustable to match the output which is known as error. Adjust the weights to lower neuron local error and assign "blame" to it at previouslevel. That to connect to neurons bystronger weights and repeat it using each one's "blame" as its error.

Pseudo Code for HCRCA

1: Input: training dataset represented by A and D matrices.
2: Starting with u0 € Rn+1 and i = 0
3: Repeat
4: For fast execution: move first row to buffer.
   a. $ui+1 = ui - \delta 2f(ui) - \Delta f(ui); i = i + 1$
   b. Until $\Delta f(ui) = 0$, Return *ui*
   c. Substitute the values in equation 1.
5: Initialize the weights (often randomly) and ui be the input to neural networks.
6: Repeat (for each example the training set uido: O = neural-net-output(network, ui);
   Forward pass
7: T = teacher output for ui
8: Calculate error (T - O) at the output
   Units (when comparing to ordinary NN Algorithm the difference is Negligible).
9: If needed follow back propagation steps 10:
10: Compute delta_wi for all weights from hidden layer to output layer; backward pass
11: Compute delta_wi for all weights from input layer to hidden layer ; backward pass continued
12: Update the weights in the network * end
13: until all examples correctly classified or Stopping criterion satisfied
14: return network

By this HCRCA work the data are trained in this algorithm for better performance and accuracy. It provides fast and accurateclassification;large data sets are handled, minimized the matrix weight, no need of more adjustment in weightduring back propagation and negligible in error rate.

Performances Analysis

In this section the analysis of the proposed algorithm is evaluated the performance and accuracy in order to prove the efficiency than the existing system. It is very fast in classification and regression of the system. It classify the datapoints in 20-dimensionalinput space into two classes on PCs (3GHz Pentium IV, 512 MB RAM, Linux).

The vectors can transposed from column vectorsto row vector by T superscript. The vector of the dot product of inner, x, y is denoted by sx.y. The vector x of 2-norm is denoted by ||x||. The matrix A[mxn] willbe in n-dimensional real space Rn of m data points. Them data point's classes +1, -1 are denoted by diagonalmatrix D[mxm] of -1, +1. Then e as column vector of 1, Z as slack variable, C as positive constant, I denotethe identity matrix and w,b as the hyper-plane scalar and coefficients.Table I shows the actual and predicted class of the confusion matrix. The performance metrics of the HCRCA model are as follow:

Sensitivity(S):measures the actual positives proportion which are correctly identified.

$$S = t\_pos / pos \quad (5)$$

Specificity(SP):measures the negatives proportion which areidentified correctly

$$SP = t\_neg / neg \quad (6)$$

Precision(P):also named as reproducibility or repeatability, is the degree to which repeatedunchanged conditions for measurements and shows same results.

$$P = t\_pos / (t\_pos + t\_neg) \quad (7)$$

Accuracy (A):is the closeness degree for the measurements of quantity's actual(true) value quantity.

$$A = sensitivity * pos / (pos + neg) +$$

$$A = sensitivity * pos / (pos + neg) + specificity * neg / (pos + neg) \quad (8)$$

Table I: confusion matrix

Actual Class	Predicted Class	
	C1	C2
C1	True Positive	True Positive
C2	False Positive	True Negative

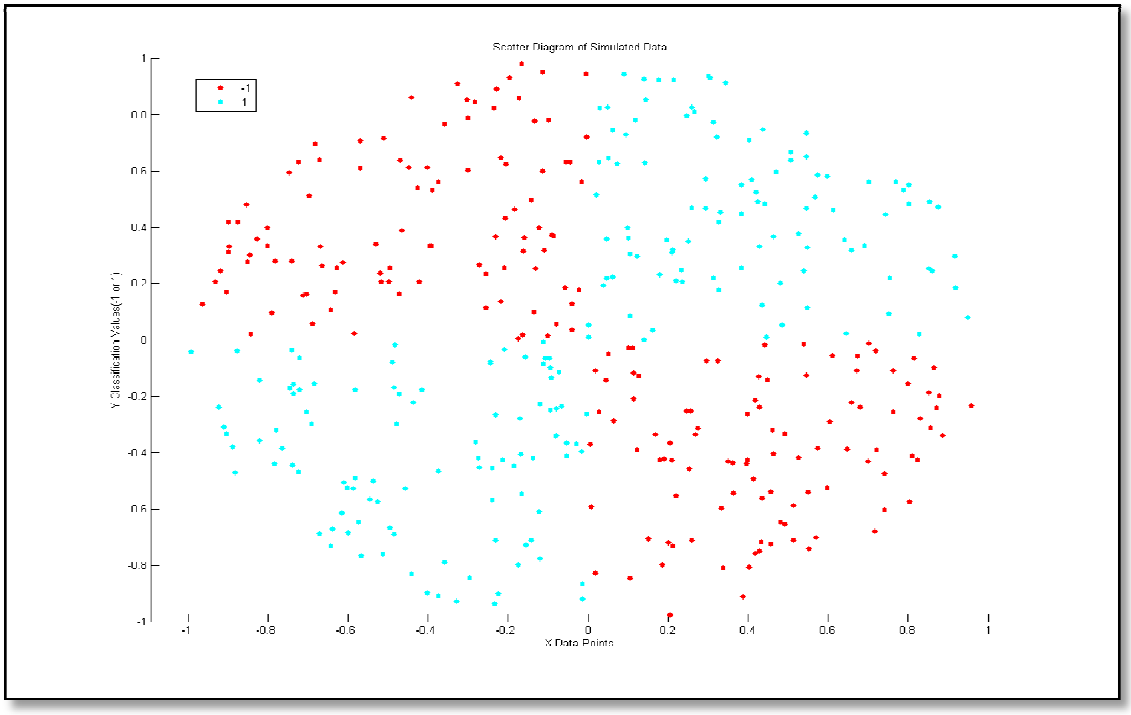

Fig. 4: Input Figure

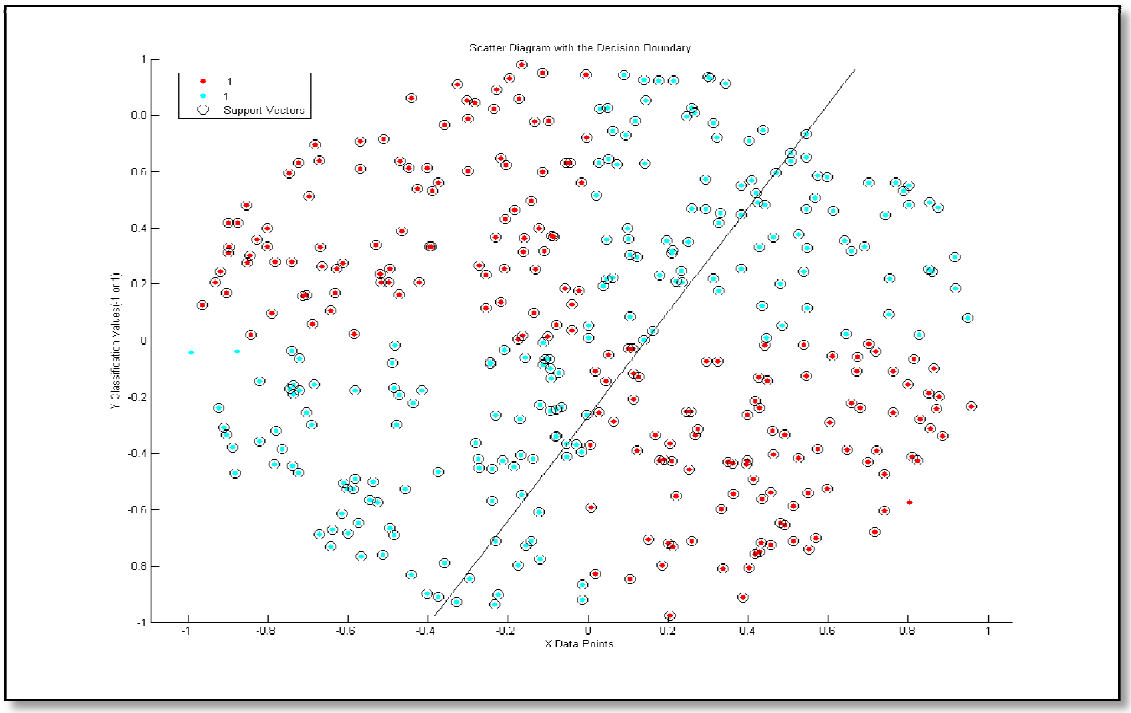

Fig.5: Output of the Linear Kernel

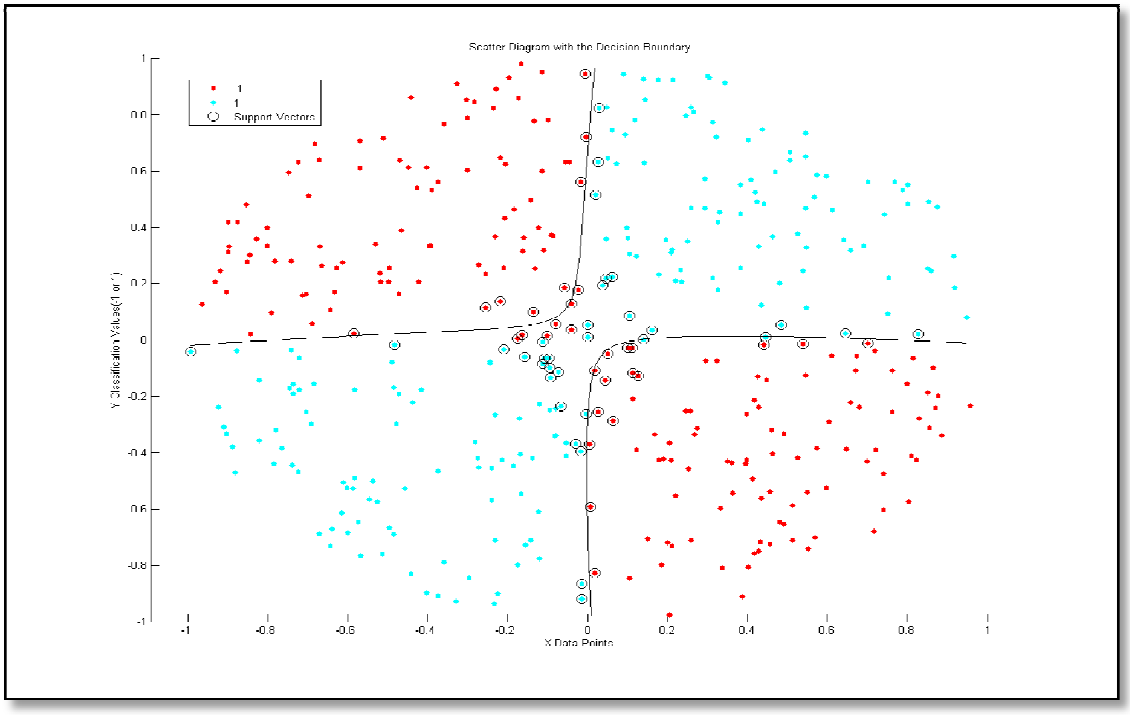

Fig.6: Output of the Polynomial Kernel

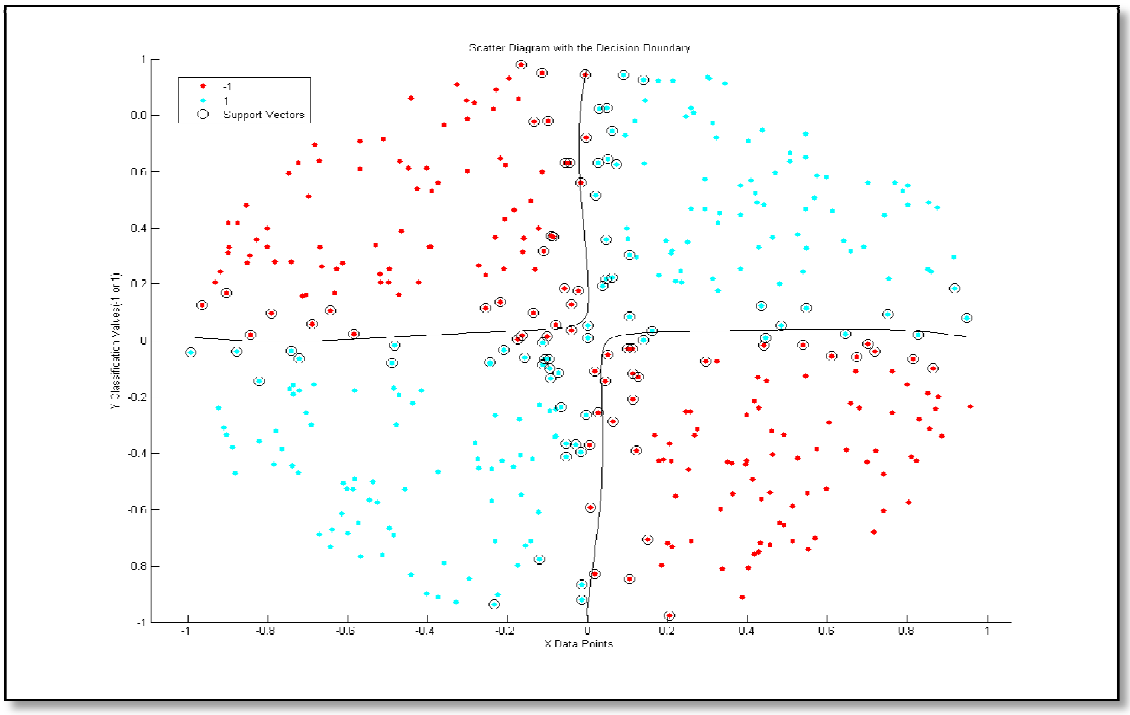

Fig.7: Output of the RBF Kernel

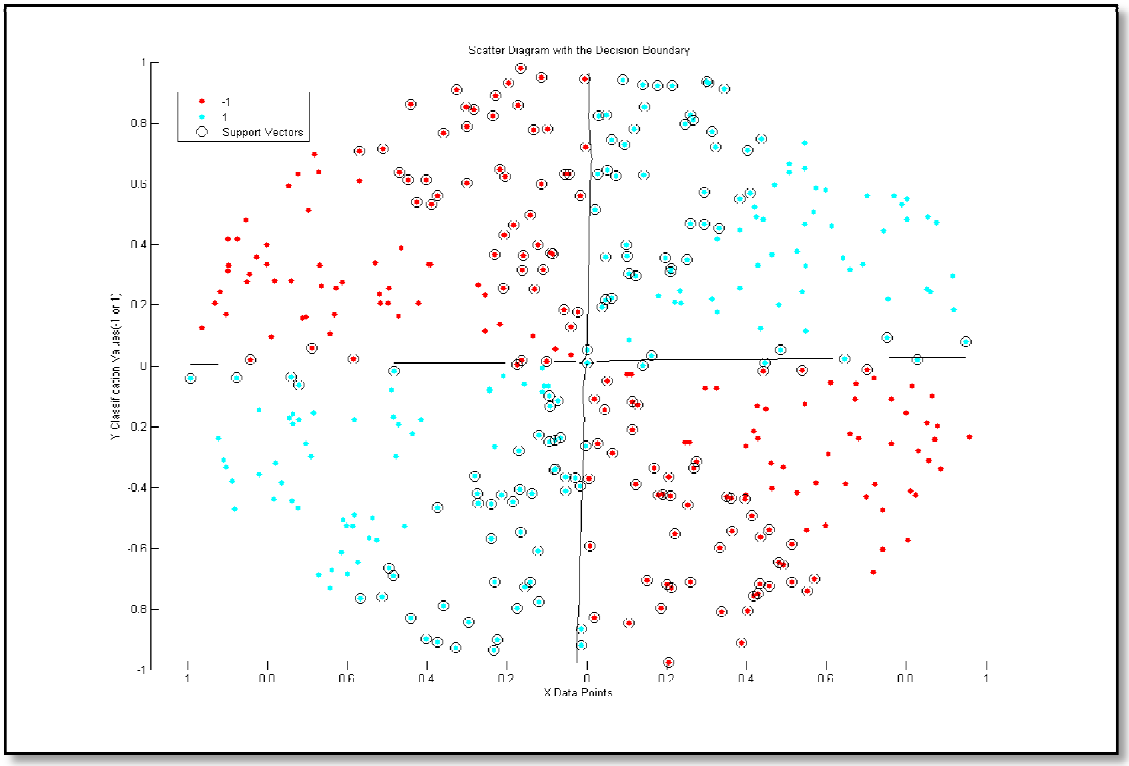

Fig.8: Output of HCRCA Kernel

Table II: Comparison of the kernel for various data sets

S.No	Kernel	Out Of Sample Percentage	Accuracy
Fisher iris Dataset			
1	LINEAR	47.25	52.75
2	POLYNOMIAL	3.89	96.11
3	RBF	5.79	94.21
4	PROPOSED	2.25	97.75
Ionosphere Dataset			
1	LINEAR	43.68	56.32
2	POLYNOMIAL	31.27	68.73
3	RBF	7.64	92.36
4	PROPOSED	5.22	94.78
Bacteria Genome Dataset			
1	LINEAR	35.55	64.45
2	POLYNOMIAL	27.33	72.67
3	RBF	16.76	83.24
4	PROPOSED	3.69	96.31

In this research work, the data sets like Fisher iris, Ionosphere and Bacteria Genome data sets are considered for analysis of algorithm and comparison with

various kernels. Fig [4] shows the input for the kernel for evaluating results and Fig [5-8] shows the performances of the corresponding results of the kernel. Table II shows the performances and accuracy of the various kernels with different datasets.

Conclusion

The proposed algorithm of HCRCA model provides better performances and accuracy when compare to existing system. It removes the existing model drawbacks using kernel functions and provides efficient, reliable and accurate classification. It performs with large datasets and measures the accuracy and efficiency of it.It minimizes back propagation which increases the efficiency of classifying data and reduced time. In large data sets this algorithm is fast, efficient and accurate.

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