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### RESEARCH ARTICLE

#### A REVIEW ON DIFFERENT COMPUTING METHOD FOR BREAST CANCER DIAGNOSIS USING ARTIFICIAL NEURAL NETWORK AND DATAMINING TECHNIQUES.

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#### Abstract

Breast Cancer is one of the fatal diseases causing more number of deaths in women. . It is known as one of the most common cancers to afflict the female population. The help of technology such as data mining and machine learning can substantially improve the diagnosis accuracy. Artificial neural networks and data mining have featured in a wide range of medical fields .It has been widely used in intelligent breast cancer diagnosis. The aim of our study is to propose an approach for breast cancer distinguishing between different classes of breast cancer. This approach is based on the Wisconsin Diagnostic Breast Cancer and the classification of different types of breast cancer datasets. Breast cancer diagnosis has been approached by various machine learning and data mining techniques for many years. Artificial Neural Networks in most of the instances gives accurate results for the diagnosis of breast cancer and their use can also be extended to other diseases. Knowledge Discovery in Databases (KDD), which includes data mining classification techniques, is a popular research tool mostly for medical researchers to identify and exploit patterns and relationships among large number of variables, and made them able to predict the outcome of a disease using the historical cases stored within datasets. This paper presents a review on classification of Breast cancer using artificial neural network and various data mining classification techniques. Different techniques are used for the diagnosis and prognosis of breast cancer using artificial neural network data mining classification technique. The models were used namely multilayer perceptron (MLP) using back-propagation algorithm, probabilistic neural networks (PNN), learning vector quantization (LVQ) ,radial basis network (RBF), general regression neural network(GRNN), support vector machine (SVM), Adaptive Resonance Neural Networks (ARNN), ART, and Feed Forward Artificial Neural Networks and likewise in data mining .The performance of the network is evaluated using Wisconsin breast cancer data set for various training algorithm based on resulted accuracy. This survey can also help us to know about number of papers that are implemented to diagnose the breast cancer.

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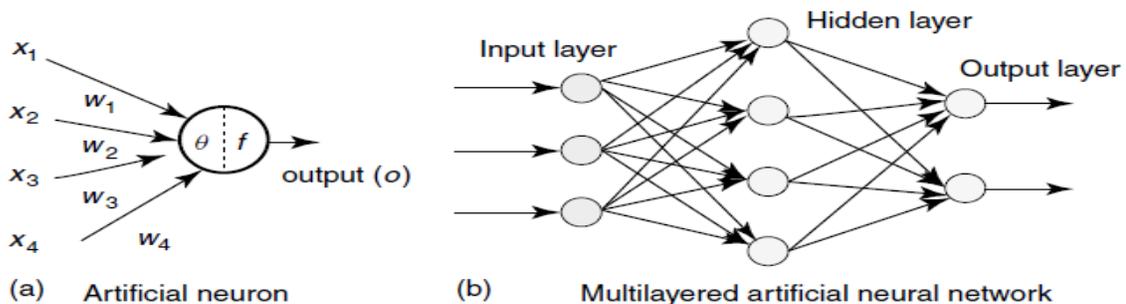
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### Introduction:-

Cancer is a big threat to human life. Based on statistics from the World Health Organization (WHO), deaths caused by cancer will reach about 12 million people in 2030. Breast cancer has become the leading cause of death in women in developed countries. There are two types of breast lesions- malignant and benign. The Radiologists study various features to distinguish between the malignant tumor and benign tumor. The objective of these predictions is to assign patients to either a "benign" group that is noncancerous or a "malignant" group that is cancerous. Early diagnosis requires an accurate and reliable diagnosis procedure that allows physicians to distinguish benign breast tumors from malignant ones. Thus, it is very important to finding an accurate and effective diagnosis method. In recent years different methods have been widely used in prediction, especially in medical diagnosis. In medical application medical diagnosis is one of major problem. Several research groups are working world wide on the development of neural networks in medical diagnosis. Neural networks are used to increase the accuracy and objectivity of medical diagnosis. Artificial neural networks (ANNs) and data mining techniques have been recently proposed as a very effective method for diagnosis of breast cancer. This paper summarizes the application of artificial neural network and various methods of data mining for detecting breast cancer in human. The remainder of this paper is organized as follows. Section 1.1 and 1.2 describes the framework architecture of neural network and brief summary of data mining process and Section 2 describes literature review based on Artificial Neural Network (ANN) and data mining tools. Here in section 3 provides a conclusion of neural network approaches and data mining methods to breast cancer diagnosis.

### Artificial Neural Networks:-

Neural networks and fuzzy logic are two approaches that are widely used to solve classification and pattern recognition problems. The main advantage of neural networks is their learning Capabilities and their ease of implementation. Artificial neural networks are also referred to as neural nets artificial neural system, parallel distributed processing systems and connectionist systems. The basic processing elements of neural networks are called artificial neurons, or simply neurons or nodes. In a simplified mathematical model of the neuron, the effects of the synapses are represented by connection weights that modulate the effect of the associated input signals, and the nonlinear characteristic exhibited by neurons is represented by a transfer function. It is necessary for the system to have a labeled directed graph structure where nodes perform some simple computations. From elementary graph theory we recall that a directed graph consists of a set of nodes (vertices) and a set of connections (edges/links/arcs) connecting pairs of nodes. A graph is a labeled graph if each connection is associated with a label to identify some property of the connection.



**Figure 1:-** Architecture of an Artificial Neuron and a Multilayered Neural Network

### Data Mining:-

Data mining is a part of Knowledge Discovery database (KDD) which is an emerging field in recent research for medical diagnosis and prognosis purpose. Data mining process uses data analysis method such as statistics, machine learning and artificial intelligence to attain new non-trivial knowledge, e.g. prediction values, hidden patterns, and dependencies. The aim of DM is extracting new knowledge and deeper insight into a given dataset (often a large-scale dataset), which may continue to be used for decision making. Depending on their purpose of application, DM methods are divided into two groups: methods for prediction and methods for data characterization. Characterization tasks are aimed at finding patterns and associations, while prediction tasks are meant to predict certain events or certain unknown values within the relevant sphere of interests. The main methodological difference is that prediction requires a specific variable (class) to be included into the primary data. The solution can be numeric or categorical; respectively, DM methods for prediction are divided into regression and classification. DM methods can

be divided into three main categories: supervised learning technique; unsupervised learning technique; other. The first category of “supervised learning technique” includes the tasks of classification and prediction. The second category of “unsupervised learning technique” is assigned to the tasks of clustering and association rules mining. Visualization, outlier detection and link analysis are not classified as “supervised learning technique” or “unsupervised learning technique”. A list of the most popular DM methods and techniques according to a survey conducted by KD Nuggets (Piatetsky-Shapiro, 2014) is as follows: decision trees and decision rules (classification); regression; clustering; descriptive statistics; visualization; link analysis; sequence mining; neural networks (classification); support vector machine; Bayes classification and linear genetic programming. Solving DM tasks includes the selection of appropriate algorithms. Both the selection of DM method and algorithm, and parameterization of the optimal algorithm shall depend on the task objectives of the analysis and characteristics of the available data. The most popular DM tasks and methods applied to the medical domain included classification methods: decision trees, neural networks, decision rules, SVM; clustering methods: k-means and hierarchical clustering; association mining and genetic algorithm.

#### **Literature Review:-**

Literature review reveals that different methods used for diagnosis of breast cancer by using artificial neural networks and data mining approaches particularly in medical system. For the sake of comparison, it is very difficult to get a result as of which system is better one as it depends upon *many* factors like number of cases to be examined, type of abnormalities and database being used.

**In 2010, Dr. K. Usha Rani** applied a method of parallel approach by using neural network technique for better classification of diagnosis of breast cancer. The author discussed a variety of different parallelization strategies which have been considered for Artificial Neural Networks like Exemplar Parallelism (EP), Block parallelism, Neuron Parallelism. The experiment in this paper was conducted by considering the single and multi layer neural network models. Back propagation algorithm with momentum and variable learning rate was used to train the networks and MLP was adopted to produce an accuracy of 92% [5].

**In 2010, L. Álvarez Menéndez** introduced a SOM based clustering algorithm and examined the polynomial kernel of Support Vector Machines (SVM) in actual clinical diagnosis of breast cancer. This work indicated that SVM can be effectively used for breast cancer diagnosis to help oncologists in order to decide which women should participate in a screening programme and which should not, In which 100% of the patients with a high probability of suffering the disease will be identified correctly. In addition over the 64% of the patients with low possibilities of suffering from the disease will also be identified correctly[33]

**In 2012, Seema Singh , Sunita Saini , Mandeep Singh** discussed the clustering technique to detect that whether patient’s cancer stage is malignant or benign. This paper presented a model Adaptive Resonance Neural Networks (ARNN) specially ART2 models of neural networks for clustering. Here the ART2 used for classification of benign and malignant separately in respective cluster with a overall performance of 82.64%[11].

**In 2012, Ali Raad, Ali Kalakech, Mohammad Ayache** discussed the classification of different types of breast cancer (benign and malignant) on Wisconsin Diagnostic datasets using neural network approach, especially multi layer perceptron MLP and the radial basis function RBF. A comparison of MLP and Radial basis function (RBF), in this paper resulted that the RBF technique seems an efficient method for classification in medical applications and especially for the breast cancer classification. RBF network gave 97% efficiency whereas MLP network having 88% efficiency, for that author suggested that RBF network performed better than the MLP network. So the supervised technique RBF can be considered a successful model for the detection and classification of various breast cancers[14].

**In 2012, Bekaddour Fatima** proposed a knowledge extraction and classification of breast cancer disease using basically a Neuro-Fuzzy approach for system design. In this paper the author discussed the diagnosis of the breast cancer using the ANFIS approaches (Adaptive Neuro Fuzzy Inference System). This article dealt with most used algorithm for Performances of the Neuro-Fuzzy systems known as hybrid and back-propagation algorithms. The hybrid methods which combined back-propagation and least squares for learning produced better results than back propagation method and the confusion matrix showing the classification results of the ANFIS model of 98% accuracy [10].

**In 2012 Sonia Narang, Harsh K Verma, Uday Sachdev** reported a systematic review on breast cancer using adaptive resonance neural networks (ARNN), ART and feed forward artificial neural networks. Here the author highlighted the performance of the network using ART Model, a diagnostics system that performs at accuracy [9].

**In 2012, Yasmeen M. George, Bassant Mohamed Elbagoury, Hala H. Zayed and Mohamed I. Roushdy** proposed an intelligent diagnosis system for breast cancer classification. For this purpose the author discussed the Artificial Neural Networks and Support Vector Machines to classify the benign and malignant and used Four classification models namely multilayer perceptron (MLP) using back-propagation algorithm, probabilistic neural networks (PNN), learning vector quantization (LVQ) and support vector machine (SVM). In this paper the author developed computer-aided diagnosis system for breast classification with feature extraction process from image segmentation and applied the different machine learning algorithm on Six data models and predicted that PNN and SVM were used to produce the efficiency of 99.7% in terms of sensitivity and accuracy [13].

**In 2013, Ali KELES, Ayt'urk KELES** preferred on strong diagnostic fuzzy rules for the inference engine of an expert system to be used for breast cancer diagnosis by using a neuro-fuzzy classification tool called NEFCLASS to extract strong diagnosis. To create this model, the "Mammographic Mass" dataset taken from the University of California - Irvine (UCI) Machine Learning Repository was used. The learning algorithm of this tool was heuristic and it had efficient performance diagnosis and classification tasks. The rule base to be used for diagnosis consists of 9 rules using the Breast Imaging Reporting and Data System (BI-RADS), this paper focused on developing a model to diagnose breast cancer because it was quite difficult to distinguish between benign and malignant mammographic findings. For this, the neuro-fuzzy method was used, which has given the best results in medical implementations. To design interference engine a new system was developed called Ex-DBC which is a strong diagnostic tool for the diagnosis of breast cancer with a negative predictive value of 93% [18].

**In 2014, Chandra Prasetyo Utomo, Aan Kardiana, Rika Yuliwulandari** implemented artificial neural network for diagnosing breast cancer based on Breast Cancer Wisconsin Dataset. In this paper the author used extreme learning techniques and the results showed that Extreme Learning Machine Neural Networks (ELM ANN) has better generalization classifier model than Back Propagation Artificial Neural Networks (BP ANN). Here the performance of ELMANN technique compared with BPANN which was based on learning algorithm. This paper showed a result ELM ANN has better performances in term of sensitivity and accuracy in all experiments and with accuracy of more than 95% [22].

**In 2014, Seema Singh, Sushmitha H, Harini J and Surabhi B.R,** proposed an automated technique using a multi-layer Feed Forward network using Back Propagation algorithm is used to classify the WDBC Dataset. In this paper the author used scaled conjugate gradient (SCG) and Bayesian regularization (BR) to predict the accuracy and result with SCG for WBCD was 97.51% of accuracy [21].

**In 2014, J. Dheeba, N. Albert Singh, S. Tamil Selvi** represented a new classification approach for detection of breast abnormalities in digital mammograms using Particle Swarm Optimized Wavelet Neural Network (PSOWNN). The proposed abnormality detection algorithm was useful in order to process feature extraction from mammograms of 54 patients with WNN. The result showed that the area under the ROC curve of the proposed algorithm is 0.96853 with a sensitivity 94.167% of and specificity of 92.105% with accuracy of 93.167%. The misclassification rate was found to be 0.063291 which is less as compared with the classification done by other classifiers [25].

**In 2014, R.Pavitha, Ms T.Joyce Selva Hephzibah** proposed a automatic support system for classification of breast cancer. It introduced image processing on mammographic images with feature extraction and use of PNN to classify in faster and accurate manner for predicting cancerous or noncancerous data [30].

**In 2014, G.Lavanya, R.Sree Padmini** Proposed a method on PNN and RBFNN for prediction of breast cancer on mammographic data and the accuracy obtained here is 91.66% and 93.33% respectively [28].

**In 2015 Htet thazin tike thein and khin mo mo jun** applied a Island differential algorithm with feed forward neural network in java platform considering WBCD with the help of random migration topology to achieve the accuracy of 99.97% with minimum time span [31].

SL.NO	YEAR	AUTHOR	TOPIC	ALGORITHM/TECHNIQUES	ATTRIBUTES	ACCURACY
1	2010	Dr. K. Usha Rani and Sri Padmavathi Mahila isvidyalayam	Parallel approach for diagnosis of breast cancer Using neural network technique[5]	MLP	WBCD(11 attributes)	92%
2	2012	Sonianarang, harsh kverma, uday	A Review Of Breast Cancer Detection Using Art Model Of Neural Networks[9]	ART and ANN	WBCD	REVIEW
3	2012	Ali raad, ali kalakech, mohammad ayache	Breast Cancer Classification Using Neural Network Approach: MLP and RBF[14]	RBF	WBCD	97%
4	2012	Yasmeen m. George	Breast Fine Needle Tumor Classification using Neural Networks[33]	SVM	WBCD	99.7%
5	2013	Ali keles, ayurk keles	Extracting Fuzzy Rules For The Diagnosis Of Breast Cancer[18]	Neuro-Fuzzy classification tool( NEFCLASS)	Irvine (UCI) Machine Learning	93% of negative predicted value
6	2014	Chandra prasetyo utomo, aankardiana, rika yuliwulandari	Breast Cancer Diagnosis using Artificial Neural Networks with Extreme Learning Technique[22]	Extreme Learning Machine Neural Networks	WBCD	95%
7	2014	Seema singh,	Cancer	SOM and LVQ	WBCD	97%

		sushmitha h, harini j and surabhi b.r	Detection By Using Artificial Network[21 ]			
8	2014	J. Dheeba , n. Albert singh s. Tamil selvi	Computer- aided detection of breast cancer on mammogra ms: a swarm Intelligence optimized wavelet neural network approach[25 ]	particle swarm optimized wavelet neural network (PSOWNN) learning rate and momentum constant set as 0.01 and 0.9	25 item features are extracted	93.671%
9	2014	Abdulmajid, Safdarali, Mubashariqbal, Nabeela kausar	Prediction Of Human Breast And Colon Cancers From Imbalanced Data Using Nearest Neighbor And Support Vector Machines[2 6]	MTD-SVM and MTD- KNN prediction models	13,023 genes in 11 breast	95.18%
10	2014	G.Lavanya,R.sree Padmini	Classificatio n Of Breast Tumor Mass Using Probabilistic Neural Network And Radial Basis Function Neural Network Algorithm[2 8]	Naïve base classifier and RBFNN Algorithm	tumor based on mammography data	NBC= 91.6667 % RBFF= 93.3333%
11	2015	Basavaraj hiremath & S.C Prasannakumar	Automated Evaluation Of Breast Cancer Detection	image processing morphological operation+SVM	75 mammographic images	89.33%

			Using SVM classifier[11]			
12	2015	Htet thazin tike thein and khin mo mo	An Approach For Breast Cancer Diagnosis Classification Using Neural Network[31]	A Island differential algorithm with feed forward neural network in java platform	WBCD	99.97%

**In 2006, Haowen You and George Rumble**, performed a survey on comparative analysis of different methods of Support Vector Machine, Bayesian classifier and other Artificial neural network classifiers (Back propagation, linear programming, Learning vector quantization, and K nearest neighborhood) on the Wisconsin breast cancer classification problem. In this paper the author applied statistical learning theory for solving classification and regression problems. The goal of SVM is to determine a suitable hyper plane with maximum margin which can be computed as an optimization problem. Similarly the author applied various learning algorithm employed to the Bayesian network this includes AD (All dimensions) Trees, TAN (Tree Augmented Naïve Bayes) and K2. In this paper training for SVM was conducted by varying a variety of C and gamma ( $\gamma$ ) values based on 10 fold cross Validation where as for Bayesian network three types Bayesian network i.e., Naïve, K2 and Bayes were examined to determine best network with higher prediction accuracy. Out of these all method SVM gives better accuracy so the SVM has been determined to be more superior to Bayesian network since it provides higher prediction accuracy by comparing the performance of both networks to other neural network approaches[32].

**In 2006 Seral Sahana, Kemal Polata, Halife Kodazb, Salih Gune** introduced a new method By hybridizing a fuzzy-artificial immune system with  $k$ -nearest neighbour algorithm, in order to solve diagnosis problem via classifying Wisconsin Breast Cancer Dataset (WBCD) and classification accuracy of 99.14% was obtained[2].

**In 2006 Sudhir d. Sawarkar, dr, Ashoka. Ghatol** have done a survey on Kohonen self-organizing map neural network for classification of breast cancer. For diagnosis the efficiency of self organizing map neural network showed that it can support the doctors or physicians to consider it as a second opinion of the learning machine to prevent biopsy. This method gave more efficiency nearly 98.88% as compared to SVM method which gives 96.26%[1].

**In 2010, Sarvestan Soltani A, Safavi A, Parandeh M. N. and Salehi M** discussed different neural network such as Multilayer Perceptron (MLP), Self Organizing Map (SOM), Radial Basis Function (RBF) and Probabilistic Neural Network (PNN) which are used to classify WBC and NHBCD data and compared all the network according to their accuracy. In this paper the author investigated RBF and PNN were proved as the best classifiers in the training set. But the PNN gave the best classification accuracy when the test set was considered[3].

**In 2010, Orlando Anunciacao, Bruno C. Gomes, Susana Vinga, Jorge Gaspar, Arlindo L. Oliveira and Jose Rueff** has discussed the applicability of Decision Tree for detection of high-risk breast cancer groups[4].

**In 2010, Dr. Medhat Mohamed Ahmed Abdelaal and Muhamed Farouq** investigated the capability of the classification SVM with Tree Boost and Tree Forest in analyzing the DDSM dataset. In this paper the author used SVM technique and show promising results for increasing diagnostic accuracy [6].

**In 2010, Wei-pin Chang, Der-Ming and Liou**, discussed the genetic algorithm which gave better results and better accuracy than other data mining models for the analysis of the data of breast cancer patients. In this paper the author used different method like artificial neural network, decision tree, logistic regression, and genetic algorithm for the comparative studies and the accuracy[12].

**In 2011, Shelly Gupta, Dharminder Kumar, Anand Sharma** have done a survey on data mining techniques to enhance the breast cancer diagnosis. In this paper author discussed different commonly used method for data mining classification tasks like Decision Trees (DT's), Support Vector Machine (SVM), Genetic Algorithms (GAs) /

Evolutionary Programming (EP), Fuzzy Sets, Neural Networks, Rough Sets and summarized various review and technical articles on breast cancer diagnosis [7].

**In 2011 Hui-Ling Chen, Bo Yang, Jie Liu , Da-You Liu** proposed a rough set (RS) based supporting vector machine classifier (RS\_SVM) .The RS reduction algorithm was employed for features selection followed by SVM(support vector machine)in order to achieve the highest classification accuracies (99.41%, 100%, and 100% for 50–50% of training-test partition, 70–30% of training-test partition, and 80–20% of training-test partition, Respectively) for a subset that contained five features[8].

**In 2012 Gouda I.Salma , M.B Abdelhalim and Magdy Abd-elghany Zeid** performed a comparison among different classifiers such as decision tree, MLP, Naïve Bayes, sequential minimal optimization (SMO) and Instant Based for K nearest neighbour (IBK) on three different database of breast cancer WBC,WBCD and WPBC with the help of weka tool and predicted the accuracy of 97.2818% for WBC 97.7153% for WDBC and 77.3196% for WPBC dataset respectively[16].

**In 2012 Mohammad Fiuzy, Javad Haddadnia, Nasrin Mollania, Maryam Hashemian, Kazem Hassanpour** introduced a new algorithm that can detect breast cancer based on combining artificial intelligent system and Fine Needle Aspiration (FNA). Here the study of the Features of Wisconsin Data Base Cancer which contains about 569 FNA test samples (212 patient samples (malignant) and 357 healthy samples (benign)) were studied by combining the Artificial Intelligence Approaches, such as Evolutionary Algorithm (EA) with Genetic Algorithm (GA), and also used Exact Classifier Systems (here by Fuzzy C-Means (FCM)) to separate malignant from benign samples with an accuracy of 96% [17].

**In 2012 Shweta Kharya** approached various data mining techniques such as decision tree, associate rule mining ,ANN Naïve Bayes Classifier, Logistic Regression,SVM(support vector machine), Bayesian Networks on breast cancer database and the ultimate conclusion was found that Decision tree is found to be best predictor with 93.62% Accuracy on benchmark dataset (UCI machine learning dataset)[15].

**In 2013 B.M.Gayathri ,C.P.Sumathi and T.Santhanam** wrote a survey paper on various diagnosis process of breast cancer by different machine learning process and data mining process with accuracy and emphasized on (RVM)relevance vector machine for diagnosis of breast cancer database[19].

**In 2013 Kung-jeng Wnag,Bunjira Makond and Kun Huang Chen and Kung Min Wang** proposed a new set of classifier algorithms combination of synthetic minority oversampling technique (SMOTE) and particle swarm optimization (PSO), while integrating some well known classifiers, such as logistic regression,C5 decision tree (C5) model, and 1-nearest neighbor search and analyzed that SMOTE+PSO+C5 gave an accuracy of 94.255% [24].

**In 2013,K.Menaka, S.Karpagavalli** made a comparison with support vector machine to that of linear genetic programming on diagnosis of breast cancer in terms of accuracy and finally result was obtained that linear genetic programming was significantly better in both prediction and training time[20].

**In 2014 Bichen Zheng, Sang Won Yoon , Sarah S. Lam** used a hybrid of K-means and support vector machine (K-SVM) algorithms . The K-means algorithm was utilized to recognize the hidden patterns of the benign and malignant tumors separately and use of machine learning algorithm (SVM) was used to obtain the new classifier to differentiate the incoming tumors. Based on 10-fold cross validation, the proposed methodology improved the accuracy to 97.38%, when tested on the Wisconsin Diagnostic Breast Cancer (WDBC) data set from the University of California –Irvine machine learning repository[23].

**In 2014 B.Padmapriya, T.Velmurugan** carried out a review work on various data mining classification techniques applied to diagnose breast cancer database.In a survey of review work they got a final conclusion that, among the various classification algorithms ID3, C5.0, ID3, APRIORI, C4.5 and Naïve Bayes in breast cancer analysis,C4.5 is better than the other algorithms[27].

**In 2015,Kasra Madadipouya** used a a new algorithm based on C4.5 on WBCD (Breast Cancer)which is based on entropy of the attribute and a comparison made with weka tool and result was satisfactory having an accuracy of 97.9%[29].

SL.N O	YEA R	AUTHOR	TOPIC	ALGOROTHIM/TECHNIQU ES	ATTRIBUTE S	RESULT S
1	2006	<b>Haowen You and George Rumbe</b>	Comparative Study of Classification Techniques on Breast Cancer FNA Biopsy Data[32]	Support vector machines SVM), Bayesian network (BNT), K Nearest neighborhood (KNN), Learning vector quantization (LVQ), Linear programming (LP) and Back propagation network (BPN)	WBCD	100%FO R KNN
2	2006	Seral Sahan, Kemal Polat, Halife Kodaz, Salih Gune	A new hybrid method based on fuzzy- artificial immune system and <i>k</i> -nn algorithm for breast cancer diagnosis[2]	fuzzy-artificial	WBCD	91.4%
3	2006	Sudhir d. Sawarkar, Dr. Ashok a. Ghatol	Breast Cancer Malignancy Identification using Self- Organizing Map[1]	SOM	WBCD	98.88%
4	2010	Sarvestan Soltani A, Safavi A, Parandeh M. N. and Salehi M	Predicting Breast Cancer Survivability using Data Mining Techniques[3]	SOM, MNP, RBF & PNN	WBC, NHBC D	PNN is better choice
5	2010	Orlando Anunciacao, Bruno C. Gomes, Susana Vinga, Jorge Gaspar, Arlindo L.Oliveira and Jose Rueff	A Data Mining approach for detection of high-risk Breast Cancer groups[4]	Decision Tree	Dataset department of genetics	Fisher Exact Test value of $9.7 \times 10^6$
6	2010	Dr. Medhat Mohamed Ahmed Abdelaal and Muhamed Farouq	Using data mining for assessing diagnosis of breast cancer[6]	SVM	DDSM	high gain of svm with minimal error
8	2011	Shelly Gupta, Dharmind er Kumar, Anand Sharma	Mining Classification Techniques Applied For Breast Cancer Diagnosis And Prognosis[7]	DT'S, SVM, GAS, EP	_____	Review
9	2011	HUI-Ling Chen, Bo Yang, Jie Liu	support vector machine classifier with	RS-SVM	WBCD	99.41%

		, Da-You Liu	rough set-based feature selection for breast cancer diagnosis[8]			
10	2012	Gouda I.Salma , M.B Abdelhalim and Magdy Abdelghany Zeid	Breast Cancer Diagnosis on Three Different Datasets Using Multi-Classifiers[16]	decision tree, MLP, Naïve Bayes, sequential minimal optimization (SMO) and Instant Based for K nearest neighbour (IBK)	WBC,WBCD and WPBC	97.2818 % for WBC 97.7153 % for WDBC and 77.3196 % for WPBC
11	2012	Mohammad Fiuzy, Javad Haddadnia, Nasrin Mollania, Maryam Hashemian, Kazem Hassanpour	Introduction of a New Diagnostic Method for Breast Cancer Based on Fine Needle Aspiration (FNA) Test Data and Combining Intelligent Systems[17]	FNA,EA,GA	WBCD	96%
12	2012	Shweta Kharya	Using Data Mining Techniques for Diagnosis and Prognosis of Cancer Disease[15]	decision tree, associate rule mining ,ANN Naïve Bayes Classifier, Logistic Regression,SVM(support vector machine), Bayesian Networks	UCI machine learning dataset	93.62
13	2013	B.M.Gayathri ,C.P.Sumathi and T.Santhanam	Breast Cancer Diagnosis Using Machine Learning Algorithms –A Survey[19]	RVM	_____	REVIEW
14	2013	Kung-jeng Wnag,Bunjira Makond and Kun Huang Chen and Kung Min Wang	A hybrid classifier combining SMOTE with PSO to estimate 5-yearsurvivability of breast cancer patients[24]	Synthetic minority oversampling technique (SMOTE) and particle swarm optimization (PSO), C5 decision tree (C5) model	Seer cancer database	94.255%
15	2013	,K.Menaka, S.Karpagavalli	Breast Cancer Classification using Support Vector Machine and Genetic	SVM,LGP	WBCD	99% using LGP

			Programming[20]			
16	2014	Bichen Zheng, Sang Won Yoon, Sarah S. Lam	Breast cancer diagnosis based on feature Extraction using a hybrid of K-means and support vector machine algorithms[23]	hybrid of K-means and support vector machine (K-SVM) algorithms	WBCD	97.38%
17	2015	Kasra Madadipouya	A New Decision Tree Method For Data Mining In Medicine[29]	C4.5	WBCD	97.9%

### Conclusion:-

In the review of diagnosis of breast cancer database, some of following points were much emphasized. Some of the review paper already predicted about the accuracy of different machine learning algorithm .Due to limitation of ANN various modified form of machine learning algorithm as well as hybrid process were adopted to improve accuracy with least time span .some of paper clearly presented that accuracy was above 95% to 99% . Various data mining process also considered predicting the diagnosis of breast cancer with high accuracy and result showed that decision tree, KNN algorithm and PSO is better in terms of accuracy calculation. Feature extraction with some good algorithm should be carried out with certain modified form of machine learning algorithm or data mining process to a large volume of data in a small time span with much higher accuracy.

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