A SURVEY ON MRI BRAIN CANCER CLASSIFICATION TECHNIQUE

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Abstract— **Brain tumor is an abnormal growth of brain cells within the brain. Brain tumor detection and segmentation and is one of the most challenging and time consuming task in medical image processing. MRI (Magnetic Resonance Imaging) is a visualization medical technique, which provides plentiful information about the human soft tissue, which helps in the diagnosis of brain tumor. MRI is an imperative technique used for brain tumor detection and verdict. Study of medical MRI images by the radiologist is very difficult and time overwhelming task and correctness depending upon their experience. To overcome this problem, the automatic computer aided system becomes very obligatory. The brain tumors are classified into malignant and benign using SVM and KNN classifiers. The odds of survival can be expanded in the event that the tumor is identified effectively at its initial stage. In this paper highlight study of different techniques on brain cancer classification. In Proposed system we will use computer based procedures to detect tumor blocks or lesions and classify the type of tumor using Artificial Neural Network (ANN) in MRI images of different patients with Astrocytoma type of brain tumors. The image processing techniques such as histogram equalization, image segmentation, image enhancement, morphological operations and feature extraction have been developed for detection of the brain tumor in the MRI images of the cancer affected patients.**

Keywords—Classification, MRI, SVM, KNN, PCA, Skull masking, ANN.

I. INTRODUCTION

Brain is the center of human central nervous system. The brain is a complex organ as it contains 50-100 billion neurons forming a gigantic network. A brain tumor is a mass of unnecessary and abnormal cell growing in the brain or it can be defined as an intracranial lesion which occupies space within the skull and tends to cause a rise in intracranial pressure. Brain tumors are mainly classified into two i.e. Benign and Malignant. Benign tumors are non-cancerous and they seldom grow back where as malignant tumors are cancerous and they rapidly grow and invade to the surrounding healthy brain tissue. MRI is an indispensable contrivance in the clinical and surgical environment due to superior soft tissue differentiation, high spatial resolution, contrast and it does not use any harmful ionizing radiation which may have an effect on patients.

The MRI is the most regularly utilized methodology for imaging brain tumors and recognition of its territory. The customary strategy for CT and MRI brain images grouping and tumor recognition are still for the most part in light of an immediate human investigation of those images, in spite their being various other diverse techniques have just been proposed [2,3]. MRI is a non-destructive and non-invasive strategy in nature. It gives high-resolution images which are generally utilized as a part of brain scanning reason. There are many image processing method, for example, histogram equalization, picture segmentation, image enhancement, morphological operation, feature choice and obtaining the features, and order.

The MRI image may contain both normal and abnormal images. Feature extraction refers to various quantitative measurement of medical images typically used for decision making regarding the pathology of a structure or tissue. In image processing, feature extraction is a special form of dimensionality diminution. When the input data to an algorithm is too large to be processed and it is assumed to be disgracefully unnecessary, then the input data will be transformed into a compact representation set of features. Brain tumors are abnormal masses in or on the brain.

A. Background

Previously clustering approach was being used for biomedical area which focuses on MRI brain image segmentation process with modified fuzzy clustering. This work has not considered the noise removal and can be have better segmentation based on quantization. Segmented image will detect the brain tumor. Also, we are going to detect the size and stage of the tumor. To provide an optimized solution for highlighting the affected area of the brain with segmentation in color images. To detect the size and stage of Brain tumor. a strategy that accomplishes tumor stage by utilizing ANN. In the pre-processing stage, three distinctive differentiation upgrade plans have been connected; i) adjusted ii) adaptive threshold and iii) histogram imaging. The TKFCM calculation which is basically a combined approach of the K-implies and Fuzzy C-implies plans has been embraced with specific alterations for actualizing the division organize. In the feature extraction the property based measurement features have been inferred. At long last, the SVM conspire characterizes the brain MRI picture either into the normal or having tumor classes.

B. Motivation

In medical practices, the early detection and recognition of brain tumors accurately is very vital. In literature, there are many techniques has been proposed by different researchers for the accurate segmentation of brain tumor. Some discoveries such as X-rays, ultrasound, radioactivity, magnetic resonance imaging (MRI) or computed tomography and the development of tools that can generate medical images have facilitated the development of some of the most efficient exploration tools in medicine [10].

MRI Image segmentation is based on set of process of brain tumor detection; pixel intensity based features are extracted. Image Segmentation group pixels into regions and hence defines the object regions. Segmentation uses the features extracted from image. Classification is the last step in process of brain tumor image into normal or abnormal and classifies the abnormality type whether it is benign or malignant. This study evaluates various techniques which are used in tumor detection from brain MRI. In this paper we are aiming to take review of different methods of brain tumor image segmentation. We are aiming to present the different MRI images segmentation methods and provide comparative study of all methods [9].

II. LITERATURE SURVEY

The main goal is to highlight advantages and limitations of these methods. Key image processing techniques for brain MRI image segmentation is classified as k-means, SVM, FCM, k-nearest neighbor, neural network**,** ad boost, genetic and other methods etc.

Parveen, Amritpalsingh[2] purposed algorithm is a combination of SVM and fuzzy c-means, a hybrid technique for prediction of brain tumor. Here, the image is enhanced using contrast improvement, and mid-range stretch. Double thresholding and morphological operations are used for skull striping. Fuzzy c-means (FCM) clustering is used for the image segmentation. Grey level run length matrix (GLRLM) is used for extraction of feature. Then, Linear, Quadratic and Polynomial SVM technique is applied to classify the brain MRI images. Real data set of 120 patients MRI brain images have been used to detect 'tumor' and 'non-tumor' MRI images. The SVM classifier is trained using 96 brain MRI images, after that the remaining 24 brain MRI images was used for testing the trained SVM. SVM classifier with Linear, Quadratic and Polynomial kernel function give 91.66%, 83.33% and 87.50% accuracy respectively and 100% specificity.

Astinaminz, Prof. Chandrakant Mahobiya[8] proposed an effective automatic classification method for brain MRI is projected using the Adaboost machine learning algorithm. The proposed system consists of three parts such as Preprocessing, Feature extraction and Classification. Preprocessing has removed noise in the raw data, it transforms RGB image into gray scale, median filter and thresholding segmentation is applied. For feature extraction by using GLCM technique 22 features were extracted from an MRI. For classification boosting technique used (Adaboost). It gives 89.90% accuracy and result in normal brain or in Malignant or Benign type of tumor. In future work, we can work of quadratic and polynomial kernel function. The accuracy of the system will be increased by increasing training database images. Also the system can be implementing for different types of classes like Glioma and Meningioma.

Garima Singh, Dr. M.A. Ansari [9] proposed a novel technique which includes Normalization of Histogram and K-means Segmentation. First, input image is pre-processed in order to remove the unwanted signals or noise from it. To de-noise filters such as Median filter, Adaptive filter, averaging filter, Un-sharp masking filter and Gaussian filter is used in the MRI images. The histogram of the pre-processed image is normalized and classification of MRI is done. Finally, the image is segmented using K-means algorithm in order to take out the tumor from the MRI. Efficient classification of the MRIs is done using NB Classifier and SVM so as to provide accurate prediction and classification. Naive Bayes and SVM Classifier give accuracy 87.23% and 91.49% respectively. SVM give better classification accuracy. For implementation MATLAB is used. The proposed method has some limitations that it could not find out the precise or accurate boundary of the tumor region. In the future, improvement in the proposed algorithm can be done by working on the limitations, the quality of the output images can be improved by using better morphological operations.

G Rajesh Chandra, Dr. Kolasani Ramchand, H Rao [4] proposed method in that MRI image of brain is de-noised using DWT by thresholding of wavelet co-efficient. Genetic algorithm is applied to detect the tumor pixels. A genetic algorithm is then used in order to determine the best combination of information extracted by the selected criterion. The present approach uses k-Means clustering methods into Genetic Algorithms for guiding this last Evolutionary Algorithm in his search for finding the optimal or sub-optimal data partition. This method achieved segmentation accuracy from 82 percent to 97 percent of detected tumor pixels based on ground truth. The limitation of this work is that wavelet transform require large storage and its computational cost is high.

Mukambika P. S., Uma Rani K. [1] Proposed Methodology in which Image is processed through: Preprocessing, Segmentation, Feature extraction Classification stages. In preprocessing, Morphology technique using double thresholding is applied to remove the skull out of the MRI brain images. The present work presents the comparison study of two techniques used for tumor detection of MRI images. One is based on the Level set method that uses the non-parametric deformable models with active contour to segment the brain tumor from the MRI brain images. The other one is the K-means segmentation algorithm. After the segmentation decision making is performed in two stages: Feature extraction using Discrete Wavelet Transform and Gray Level Co-occurrence Matrix, and classification using the Support Vector Machine. Dataset of MRI brain tumor images includes T2 weighted 17 benign and 24 malignant tumor images of different patients. SVM with Level Set and K-Means segmentation classify image into normal brain, benign or malignant tumor with 94.12% and 82.35% accuracy respectively. Level Set method gives better results than k-means segmentation.

K. Sudharani, Dr. T. C. Sarma, Dr. K. Satay Rasad [6] Proposed Methodology include methods like Histogram, Re-sampling, K-NN Algorithm, Distance Matrix. First, Histogram gives the total number of specified value of pixels distributed in a particular image. Re-sampling re-size image to 629X 839 for proper geometrical representation. Classification and identification of brain tumor by using k-NN which is based on training of k. In this work Manhattan metric has applied and calculated the distance of the classifier. The algorithm has been implemented using the Lab View. Algorithm has been tested on 48 images. The identification score for all images are about 95%.

Ketan Machhale, Hari Babu Nandpuru2, Vivek Kapur3, LaxmiKosta [13] proposes an intellectual classification system to recognize normal and abnormal MRI brain images. Under these techniques, image preprocessing, image feature extraction and subsequent classification of brain cancer is successfully performed. In pre-processing MRI brain RGB images are converted in grey scale image. Median Filter is applied to remove noise from mire image. Then Skull Masking is use to remove non-brain tissue from MRT brain image. Dilation and erosion are two elementary morphological operations used for skull masking. In feature extraction symmetrical, gray scale and texture features are extracted. When different machine learning techniques: Support Vector Machine (SVM), K- Nearest Neighbor (KNN) and Hybrid Classifier (SVM-KNN) is used to classify 50 images, it is observed from the results that the Hybrid classifier SVM-KNN demonstrated the highest classification accuracy rate of 98% among others.

Rasel Ahmmed, Nirban SenSwakshar, Md. FoisalHossain, Md. AbdurRafiq[14] proposed method which include stages like image pre-processing, segmentation, feature extraction, SVM classification and tumor stage classification using Artificial Neural Network(ANN). In pre-processing three contrasts enhancement techniques like adjusted, adaptive threshold and histogram imaging using both weiner2 and median2 filter is applied. Segmentation is done by TKFCM algorithm which is integration of the K-means and Fuzzy c-means with some modification. Feature extraction is done in two orders. In First order statistic features and in Second order region property based statistic features are derived. Then SVM classify brain MRI image into normal or tumor brain. Brain Tumor stage is classified by ANN classifier. The number of the used data for each MRI image of normal brain, malignant tumor, and benign tumor is obtained from 39 images where 3 normal, 9 benign, 17 malignant I, 6 malignant II, 3 malignant II, and 1 malignant IV stage tumor brain MRI images. The accuracy of proposed method is 97.44%.

III. CONCEPTUAL BACKGROUND

1. Preprocessing: The primary task of preprocessing is to improve the quality of the MR images and make it in a form suited for further processing by human or machine vision system. In addition, preprocessing helps to improve certain parameters of MR images such as improving the signal-to noise ratio, enhancing the visual appearance of MR image, removing the irrelevant noise and undesired parts in the background, smoothing the inner part of the region, and preserving its edges [5]. To improve the signal-to-noise ratio, and thus the clarity of the rawMRimages, we applied adaptive contrast enhancement based on modified sigmoid function
[4].

2. Image Classification: It is an important process in biomedical image analysis, and it is required for the effective examination of brain tumor from the MR images [8]. Skull stripping is the process of eliminating all no brain tissues in the brain images. By skull stripping, it is possible to remove additional cerebral tissues such as fat, skin, and skull in the brain images. There are several techniques available for skull stripping; some of the popular techniques are automatic skull stripping using image contour, skull stripping based on segmentation and morphological operation, and skull stripping based on histogram analysis or a threshold value.

TABLE I. FEATURE CLASSIFICATION TECHNIQUE

METHODS	**DESCRIPTION**	**ADVANTAGES**	**DISADVANTAGES**
Multi-Classification Support Vector Machine.	Multi-Classification SVM (MCSVM) extracted the boundaries of 7 kinds of encephalic tissues successfully and proved satisfactory generalization accuracy.	Firstly, it has a regularization parameter, which makes the user think about avoiding over-fitting. Secondly it uses the kernel trick, so you can build in expert knowledge about the problem via engineering the kernel.	The theory only really covers the determination of the parameters for a given value of the regularization and kernel parameters and choice of kernel. In a way the SVM moves the problem of over-fitting from optimizing the parameters to model selection.
PCA and PNN assisted automated brain tumor classification.	Probabilistic Neural Network (PNN) with mathematical technique called Principal Component Analysis (PCA) is used to give more accurate and fast solution than the Conventional methods of brain tumor classification.	The use of PCA to reduce the dimensionality of the data and the use of PNN for tumor classification will improve the speed and accuracy of the result.	All the PNN systems do not yield a satisfactory result in all the practical applications
SVM–KNN: Discriminative Nearest Neighbor Classification for Visual Category Recognition.	A hybrid of these two methods which deals with the multiclass setting that can be applied to large, multiclass data's and with less complexity in computations both in training and at run time, and yields outstanding results.	This method can be applied to large, multiclass data sets for which it outperforms nearest neighbor and support vector machines, and remains efficient when the problem becomes intractable for support vector machines.	In practice, training an SVM on the entire data set is slow and the extension of SVM to multiple classes is not as natural as NN
Classification of tumor type and grade using SVM-RFE.	The binary SVM classification accuracy, sensitivity, and specificity are proved to be high for the discrimination of metastases from gliomas, and for discrimination of high grade from low grade neoplasm.	The multi-class problem is solved by constructing and combining several binary SVM classifiers into a voting scheme.	In a way the SVM moves the problem of over-fitting from optimizing the parameters to model selection.
Texture features, Fuzzy weighting and SVM.	Fuzzy logic is used to assign weights to different feature values based on its discrimination capability. The multi class SVM provides better classification accuracy even if the features of different classes have	SVM is a margin based classifier which achieve superior classification performance compared to other algorithms	Training an SVM on the entire data set is slow and the extension of SVM to multiple classes.

	overlapping boundaries.		
Wavelet Transformation (WT), Principal Components Analysis (PCA), Feed forward - Back Propagation Neural Network (FP-ANN) and k-Nearest Neighbors.	Sensitivity rate and Specificity rate for the Classifiers FP-ANN is 95.9% and 96%and k-NN obtained a success of 96% and 97% respectively.	Seven Statistical measures including skewness, Kurtosis, Specificity etc., are measured.	The theory only really covers the determination of the parameters for a given value of the regularization and kernel parameters and choice of kernel.
Sphere-shaped support vector machine (SSVM) and Immune algorithm.	Optimal parameters selection is done using Immune Algorithm and SSVM classification is very much successful in classifying data with high irregularities.	The multi-class problem is solved by constructing and combining several binary SVM classifiers into a voting scheme.	In a way the SVM moves the problem of over-fitting from optimizing the parameters to model selection.
Multiclass support vector machines (M-SVM) followed by KNN (K-nearest neighbor).	The multiple image queries are supported by using M-SVM.	In the models that we have seen, we select a hypothesis space and adjust a fixed set of parameters with the training data	The model cannot be interpreted (there is no description of the learned concepts)
Least Squares Support Vector Machines (LS-SVM) compared with k-Nearest Neighbor, Multi layer Perceptron and Radial Basis Function Networks.	Analysis of the statistical features like sensitivity, specificity, and classification accuracy proved that LS-SVM yields better.	The multi-class problem is solved by constructing and combining several binary SVM classifiers into a voting scheme.	In a way the SVM moves the problem of over-fitting from optimizing the parameters to model selection.
Multiresolution Independent Component Analysis (MICA) and SVM.	MICA based SVM classification accuracy has increased 2.5 times than other ICA based classifications	SVM is a margin based classifier which achieve superior classification performance compared to other algorithms	Training an SVM on the entire data set is slow and the extension of SVM to multiple classes.
Spatial gray level dependence method (SGLDM), Genetic Algorithm (GA) and SVM.	A hybrid method using SGLDM for Feature extraction, GA for Feature Reduction	The multi-class problem is solved by constructing and combining several binary SVM	In a way the SVM moves the problem of over-fitting from optimizing the parameters to model

	and SVM classifier proves high statistical measures.	classifiers into a voting scheme.	selection.
Texture feature coding method (TFCM) and Support Vector Machine.	Along with Cascade-Sliding-Window technique for automated target localization, this approach is applicable to mammograms with 88% accuracy.	In order to capture the essence of texture information of an image, a set of texture feature descriptors was developed to represent the kernel texture information of the image.	some of the features usually have large magnitudes and others have small magnitudes
Connected component labeling (CCL), Discrete Wavelet Transform (DWT) and SVM.	SVM works well with this combination proves to be robust and produces high quality results.	The approximation sub signal shows the general trend of pixel value, and three detailed sub signal show vertical, horizontal and diagonal details or changes in image.	DWT technique is much efficient technique in quality.
Feature ranking based Ensemble SVM classifiers.	Better results for nested feature set and thereby suitable for detecting Alzheimer's disease (AD) and autism spectrum disease (ASD).	The multi-class problem is solved by constructing and combining several binary SVM classifiers into a voting scheme.	In a way the SVM moves the problem of over-fitting from optimizing the parameters to model selection.
Discrete wavelet Transform (DWT), Principal component analysis (PCA), k-means clustering and k-nearest neighbor classifier.	Segmentation using k-means Clustering. Seven Statistical measures including skewness, Kurtosis, Specificity etc., are measured and compared.	In the models that we have seen, we select a hypothesis space and adjust a fixed set of parameters with the training data	The model cannot be interpreted (there is no description of the learned concepts)
Content Based Image Retrieval (C.B.I.R.) and Support Vector Machine.	C.B.I.R based on texture retrieval along with SVM classifier suitable for detecting Multiple Sclerosis and tumors	SVM is a margin based classifier which achieve superior classification performance compared to other algorithms	Training an SVM on the entire data set is slow and the extension of SVM to multiple classes.
Ripplet transforms Type-I (RT), PCA	Overcomes the drawbacks of DWT	The use of PCA to reduce the dimensional	All the PCA systems do not yield a satisfactory

and Least Square (LS-SVM).	and NN and proves to be new successful combination as RT+LS-SVM.	ity of the data and the use of SVM for classification will improve the speed and accuracy of the result.	result in all the practical applications
Grey Level Co-occurrence Matrix (GLCM), Artificial Neural Network (ANN) and Back Propagation Network.	Achieves a balance between the net's memorization and generalization. Detects Astrocytom a type of tumors efficiently.	An ANN is used to model complex patterns and prediction problems. ANNs have the ability to learn and model non-linear and complex relationships , which is really important because in real-life, many of the relationships between inputs and outputs are non-linear as well as complex.	Unlike many other prediction techniques, ANN does not impose any restrictions on the input variables
Artificial Neural Network (ANN), Grey Level Co-occurrence Matrix (GLCM), and Neuro Fuzzy Classifier.	Automated detection of Pathological tissue, without any need for the Pathological testing.	ANNs have the ability to learn and model non-linear and complex relationships , which is really important because in real-life, many of the relationships between inputs and outputs are non-linear as well as complex	ANN does not impose any restrictions on the input variables
Back Propagation Network [BPN], Probabilistic Neural Network (PNN) and GLCM.	Histogram equalization is performed to avoid the dark edges.BPN based classifier produces 77.56% and PNN produces 98.07% of accuracy in tumor detection.	The use of PNN to reduce the dimensionality of the data.	All the PNN systems do not yield a satisfactory result in all the practical applications
Modified Probabilistic Neural Network (PNN) model.	PNN Model based on Learning Vector Quantization (LVQ) performance is measured with 100% accuracy.	The use of PNN to reduce the dimensionality of the data.	All the PNN systems do not yield a satisfactory result in all the practical applications

ANN, SVM, Fuzzy measures, Genetic Algorithms (GA), Fuzzy support Vector Machines (FSVM) and Genetic Algorithms with Neural Networks.	FSVM resolves unclassifiable regions caused by conventional SVM and genetic algorithm-based neural network outperforms gradient descent-based neural network.	ANNs have the ability to learn and model non-linear and complex relationships , which is really important because in real-life, many of the relationships between inputs and outputs are non-linear as well as complex. SVM is a margin based classifier which achieve superior classification performance compared to other algorithms	ANN does not impose any restrictions on the input variables. Training an SVM on the entire data set is slow and the extension of SVM to multiple classes.
PNN Classifier with Image Encryption.	Classification accuracy is about 100-85% and original content has been encrypted to avoid exploitation of the image.	The use of PNN to reduce the dimensionality of the data.	All the PNN systems do not yield a satisfactory result in all the practical applications
Multimodal fuzzy image fusion.	Image quality is preserved even with blurs without any limitations. Best suitable for blurry images.	In order to capture the essence of texture information of an image, a set of texture feature descriptors was developed to represent the kernel texture information of the image.	some of the features usually have large magnitudes and others have small magnitudes
CA (Cellular Automata) based segmentation and ANN.	Seed based segmentation is reliable only for small set of data. Seed is selected using co-occurrence and Run-Length features.ANN provides high classification accuracy.	An ANN is used to model complex patterns and prediction problems. ANNs have the ability to learn and model non-linear and complex relationships , which is really important because in real-life, many of the relationships between	Unlike many other prediction techniques, ANN does not impose any restrictions on the input variables

		inputs and outputs are non-linear as well as complex.	

3. Feature Extraction: It is the process of collecting higher-level information of an imagesuch as shape, texture, color, and contrast. Infact, texture analysis is an important parameter of human visual perception and machine learning system. It is used effectively to improve the accuracy of diagnosis system by selecting prominent features. It introduced one of the most widely used image analysis applications of Gray Level Co-occurrence Matrix (GLCM) and texture feature.

TABLE II. FEATURE EXTRACTION TECHNIQUES

METHODS	DESCRIPTION	ADVANTAGES	DISADVANTAGES
Principal Component Analysis and kernel Support Vector Machine.	PCA has reduced 65536 to 1024 feature vectors. DWT+PCA +KSVM with GRB kernel achieved the best accurate classification result 99.38% than other HPOL and IPOL kernels.	The use of PCA to reduce the dimensionality of the data and the use of SVM for classification will improve the speed and accuracy of the result.	All the PCA systems do not yield a satisfactory result in all the practical applications
Gray Level Co-occurrence Matrix, PCA and SVM using RBF kernel function.	Features Extracted by using GLCM and classified with RB-Kernel gives 100% classification accuracy better than PCA.	The use of PCA to reduce the dimensionality of the data and the use of SVM for classification will improve the speed and accuracy of the result. The multi-class problem is solved by constructing and combining several binary SVM classifiers into a voting scheme.	All the PCA systems do not yield a satisfactory result in all the practical applications. In a way the SVM moves the problem of over-fitting from optimizing the parameters to model selection.
Discrete wavelet Transform (DWT), Principal component analysis (PCA), k-means clustering and k-nearest neighbor classifier.	Seven Statistical measures including skewness, Kurtosis, Specificity etc., are measured.	In the models that we have seen, we select a hypothesis space and adjust a fixed set of parameters with the training data. The use of PCA to reduce the dimensionality of the data and the use of SVM for classification will improve the speed and accuracy of the result.	The model cannot be interpreted (there is no description of the learned concepts). All the PCA systems do not yield a satisfactory result in all the practical applications
GLCM (Grey Level Co-occurrence Matrix) and SVM.	Texture based feature selection using GLCM and SVM classifier combination has proved to get accurate results but only for smaller dataset.	SVM is a margin based classifier which achieve superior classification performance compared to other algorithms	Training an SVM on the entire data set is slow and the extension of SVM to multiple classes.
Wavelet based Principal component analysis with Fuzzy C-means Clustering.	PCA based Fuzzy C-means Clustering system yields more and accurate information about the abnormal tissues and WM through supportive visuals than conventional PCA.	The use of PCA to reduce the dimensionality of the data. Unlike k-means where data point must exclusively belong to one cluster center here data point is assigned membership to each cluster center as a result of which data point may belong to more than one cluster center.	All the PCA systems do not yield a satisfactory result in all the practical applications. In FCM, Euclidean distance measures can unequally weight underlying factors.
Linear Discriminant Analysis, PCA and SVM.	LDA selects vital feature which are compared with PCA and SVM accuracy of 98.87%.	The use of PCA to reduce the dimensionality of the data and the use of SVM for classification will improve the speed and accuracy of the result. The multi-class problem is solved by constructing and combining several binary SVM classifiers into a voting scheme.	All the PCA systems do not yield a satisfactory result in all the practical applications. In a way the SVM moves the problem of over-fitting from optimizing the parameters to model selection.
PCA and	PCA with	The use of	All the PCA

Supervised Learning Techniques (BPN, RBF and LVQ) .	BP has produced around 95-96% recognition rate for 4-5 error images.	PCA to reduce the dimensionality of the data and the use of SVM for classification will improve the speed and accuracy of the result.	systems do not yield a satisfactory result in all the practical applications
GLCM, KNN, ANN, PCA+LDA.	GLCM, PCA + LDA combination best reduces the dimensions reducing computational cost.	The LDA is sensitive to overfit and validation of LDA models is at least problematic. In KNN, in the models that we have seen, we select a hypothesis space and adjust a fixed set of parameters with the training data	One disadvantage of discriminant function analysis compared to logistic regression is that the former can generate predicted probabilities outside the range 0-1. In KNN, the model cannot be interpreted (there is no description of the learned concepts)

CONCLUSION

The relevance of these techniques is the direct clinical application for segmentation. The target area is segmented and the evaluation of this tool from the doctor, whom the project has cooperated with, is positive and this tool helps the doctors in diagnosis, the treatment plan making and state of the tumor monitoring. The image processing techniques such as histogram equalization, image segmentation, image enhancement, morphological operations and feature extraction have been developed for detection of the brain tumor in the MRI images of the cancer affected patients.

REFERENCES

[1] Mukambika P. S., Uma Rani K. "Segmentation and Classification of MRI Brain Tumor" in International Research Journal of Engineering and Technology (IRJET) Volume: 04 Issue: 07 July -2017.

[2] Parveen, Amritpal Singh "Detection of Brain Tumor in MRI Images, using Combination of Fuzzy c-means and SVM" in 2nd International Conference on Signal Processing and Integrated Networks (SPIN) 2015

[3] M. H. O. Rashid, M. A. Mamun, M. A. Hossain and M. P. Uddin (2018), Brain Tumor Detection Using Anisotropic Filtering, SVM Classifier and Morphological Operation from MR Images.

[4] G Rajesh Chandra, Dr. KolasaniRamchand H Rao "TUMOR DETECTION IN BRAIN USING GENETIC ALGORITHM" in 7th International Conference on Communication, Computing and Virtualization 2016

[5] SanjanaChawla, Rajiv Sharma "Application of Data Mining in Bioinformatics" in International Journal of Engineering Science and Computing, June 2016

[6] K. SUDHARANI, Dr. T. C. SARMA, Dr. K. SATYA RASAD "Intelligent Brain Tumor Lesion Classification and Identification from MRI Images Using k-NN Technique" in International Conference on Control, lnstrumentation, Communication and Computational Technologies (lCCICCT) 2015

[7] Ashraf M. Said, Fatma S. Ibrahim "Comparative Study of Segmentation Techniques for Detection of Tumors Based on MRI Brain Images" in International Journal of Bioscience, Biochemistry and Bioinformatics Issue September 2017

[8] AstinaMinz, Prof. ChanddrakantMahobiya "MR Image classification using Adaboost for brain tumor type" in IEEE 7th International Advance Computing Conference (IACC) 2017

[9] Garima Singh, Dr. M. A. Ansari "Efficient Detection of Brain Tumor from MRIs Using K-Means Segmentation and Normalized Histogram" in IEEE Issue 2016

[10] Vaibhavi Solanki, Ms. Vibha Patel, Ms. Supriya Pati, Brain MRI Image Classification using Image Mining Algorithms, Proceedings of the Second International Conference on Computing Methodologies and Communication (ICCMC 2018) IEEE Conference Record # 42656; IEEE Xplore ISBN:978-1-5386-3452-3

[11] Wassim El Hajj Chehade, Riham Abdel Kader and Ali El-Zaart, Segmentation of MRI Images for Brain Cancer Detection, 2018 International Conference on Information and Communications Technology (ICOIACT)

[12] Mr.Deepak .C.Dhanwani, Prof. MahipM.Bartere "Survey on Various Techniques of Brain Tumor Detection from MRI Images" in International Journal of Computational Engineering Research Vol, 04 Issue, 1 Issn 2250-3005, January-2014

[13] KetanMachhale, HariBabuNandpuru, VivekKapur, LaxmiKosta "MRI Brain Cancer Classification Using Hybrid Classifier (SVM-KNN)" in international conference on instrumentation and control (ICIC) MAY 28-30, 2015.

[14] Rasel Ahmmed, AnirbanSenSwakshar, Md. FoisalHossain, and Md. AbdurRafiq "Classification of Tumors and It Stages in Brain MRI Using Support Vector Machine and Artificial Neural Network" in International Conference on Electrical, Computer and Communication Engineering (ECCE), Cox's Bazar, Bangladesh, February 16-18, 2017

[15] Sathees B. Kumar, Dr. Anbu R. Selvi "Feature Extraction Using Image Mining Techniques to Identify Brain Tumors" in IEEE Sponsored 2nd International Conference on Innovations in Information Embedded and Communication Systems ICIIECS 2015

[16] S.U.ASWATHY, Dr G.GLAN DEVA DHAS, Dr. S.S.KUMAR "A Survey on Detection of Brain Tumor from MRI Brain Images " in International Conference on Control, Instrumentation, Communication and Computational Technologies (ICCICCT) 2014

[17] Ruchi D., Deshmukh et al "Study of Different Brain Tumor MRI Image Segmentation Techniques" in International Journal of Computer Science Engineering and Technology(IJCSET) Vol 4, Issue 4,133-136 April 2014