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Particle Swarm Optimization and Texture Analysis Image Processing Techniques using MRI Images to Detect Brain Tumor in Human

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Abstract*: Cosmetics and classification findings are the most difficult and powerful task of preparing. MRI (Magnetic Resonance Imaging) is a treatment, which is often used by the radio translator to represent the appearance of a person with no surgery. MRI provides much information on the human body's body, which helps to control the brain's brain. MRI is used for research on high resolution, speed of availability, and high profile profile for patients [19]. The deep part of the MRI shape is primarily responsible for the termination of the brain's brain from the computer that supports medical devices. This book focuses on planning the best way and the best way to diagnose MRI's brain detection if it supports brain arrest if its focus is on surveillance its vision is: benign or operated by using the SVM configuration process. The method we recommend is to create a configuration using the history and management of the process that will create a split by using a test feature (PSO), extracting compression using GLCM, reducing PCA features, to reduce the feature is also used by ICA (Self-Exam) to provide free access for the GLCM and for SVM format. The result is MATLAB2015.

Keywords: SVM, performance matrices, accuracy, PCA, ICA, feature reduction, GLCM

I. INTRODUCTION

The human brain is a soft organ of the body that controls the other side of the body. This document is being done with the help of a configuration process. Each part of the brain has certain functions that control human movement. However, when the brain's brain begins to be unnatural then the brain's brain is getting well and some of the brain's brain can break its habit. The brain's brain is referred to as 'brain' and medical science. The brain can be described as a group of rare cells growing in the brain. The correct description of the brain's brain is still in the worst part of the science of science and the physical outcome of the brain; sometimes it indicates the unusual role of the person, the lens, and the degree few can cause one's life [1]. So, in order to overcome this problem, a comprehensive, comprehensive, comprehensive analysis. Over the last few decades, we have met various difficult ways, one of the most reliable computer-based technologies, and the decision of the brain that is highly appreciated and believe in surgery and alternative treatment.

In the neuroscience, MRI brain is fully expanding the analysis plan. MRI is a commonly used mechanism for the brain's brain and awareness of its territory.

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The traditional technique for CT and MRI's brain and synthesis is in the forefront of the most distant part of human's surveys, in spite of their various varied processes that have not yet occurred [2 , 3]. MRI is a plan without damages or harmless. It offers high-quality images that are commonly used as part of the brain scratch. There are many image processing systems, for example, editorial configuration, image painting, maintenance images, management services, optional options and accessibility features, and configuration.

II. LITERATURE REVIEW

From many years the scholars had been worked in the field of medical science for detecting the brain tumor detection and clustering it. There are many approaches that are given in order to work more efficiently and effectively in medical domain so that it can be more helpful in saving lives of those are suffering from such fatal diseases. Some of the proposed methodologies are discussed below,

A.S. Swakhar et al. [4] has developed a design of shoes by using an ANN. In configuration process, there are three different types of configurations for planning; I) change ii) a way to change with iii) background analysis. The TKFCM description of the K-key feature in Fuzzy C - shows an array of different variations in order to coordinate configuration. The feature generates as saved feature. Finally, medication SVM defines MRI's brain or in normal or intestinal tumors.

G. Singh et al. [5] has developed a new methodology for a brain-absorbed brain that covers Normalization and Normalization with the option of the K-mean / Kmeans Segmentation plan. In the current monitoring process, to begin, the installation image will be solved to improve negative emissions by MRI's analysis using modified systems such as Median channels, production channels, channels high water, high-pressure luggage in Gaussian gap. Examples of the nature of the design are now seen and approved by MRI. At the end, the camera is being taken by obtaining a configuration K-meant to remove the strap from the output. MRI can successfully create SVM so that it can look at the feature. The comments on the SVM classifier specified exactly 91.49%.

H.B.Nokpuru et al. [6] has obtained a contractual agreement by scholars to set up the MRI brain and analyze the three-dimensional viewpoint; M) imaging, ii) or transmitter transmitters and inputs iii) configuration. In the foreground, the RGB of the brain changes as a sponge shadow.

Next, Median Filter is linked to the MRI cash flow. Ultimately, the Skull Masking system is used to eliminate non-sensitivity from the MRI image. Big and Erosion are two major scenarios that are used for the framework of the framework. In the second phase of the output, the high-quality image of the image is symmetrical, and the various parts are removed. Finally, in classification, various scientific studies such as SVM.

James Kennedy and Russell Eberhart [3]

They had explained the particle swarm optimization method used for optimizing the wide range of functions and this algorithm is the simple algorithm. They had discussed about the cornfield vector (used to find the position of the affected pixel), quick removal (by utilizing high-performance pixels). The benchmarking reference of the paragraph, app, and appendix, is defined as optimization and optimization and network networking. Speaking about creating a healthy body works with algorithm cells.

S.Vaseghi and H.Jetelova [13]

They had explained the usage of the PCA and ICA on the biomedical images and signal processing. They had proposed an novel method to separate the various EEG signals (Brain signals) generated from brain. The methods employed are sparse coding and blind source separation on the FMRI images. The tool used is MATLAB for processing collected data, denoising the obtained data, to apply ICA and PCA to separate the mixed signals. There future work is find the redundant data in the transferred data. This will drastically reduces the bandwidth/storage of the system.

Tzyy-Ping Jung and Te-Won Lee [14]

They had worked on separating the sources of the brain signals from the recordings. The processes involved are as follows, proved the assumptions for ICA applied for the EEG/MEG data, Collection of the averaged ERPs, analyzing the event-related EEG epochs collected, presented an case study for stimulus induced for alpha ringing, component stability. The functional magnetic resonance image has been applied to the FMRI images. Discussed about the limitations of the ICA method on fMRI images.

R.M. Haralick, et al [16]

The text is one of the most important objects in finding objects or places of interest in the image, whether the image is photomicrograph, picture painting, or satellite image. This book describes some of the running essays that depend on the universe, and displays their application in the third diagnosis of photographic photos: photomicrographs of various types of stones, 20th panchromatic pictures , and the Satellite Satellite System (ERTS) are diverse. We use two solutions: one of the zones is convex polyhedra (analytics analytics), and one of the decisions is the same (resolution-min-max resolution). In the analysis of each of the two-part divided data, provides training and testing. The correct analysis is 89 percent for photomicrographs, 82 percent for art painting, and 83 percent for satellites. The results indicate that textural speed can be readily available and can be easily found.

A. Martinez and A. Kak [21]

In many cases the basis of the imaging system, it is widely believed that the LDA-based algorithm is higher than those based on PCA (General Features Summary). In these communications, we show that this is not always the case. We first speak our case using superb arguments or by displaying data stored on the database. Our general lack of awareness is that when the training is small, PCA may define the LDA, and PCA does not have a significant impact on the various methodologies.

Ouarda et. Al. [24]

They work in the production of different types of tissue and different types of material. They concentrate on the integration of the MR brain by using algorithms and optimization. For their own design in a variety of ways, it uses four ways to look to improve organizational improvements. The research they considered was the highest payment of the conference. The results they derive from their contentment are in terms of accuracy and power.

This journal uses double-blind review process, which means that both the reviewer (s) and author (s) identities concealed from the reviewers, and vice versa, throughout the review process. All submitted manuscripts are reviewed by three reviewer one from India and rest two from overseas. There should be proper comments of the reviewers for the purpose of acceptance/ rejection. There should be minimum 01 to 02 week time window for it.

III. PROPOSED METHODOLOGY

As we know that the tumor in brain is major threat for life of the patients. Detecting the it as early as possible and a proper medication can surely make the patient come out of the disease[19]. In this paper we had divided the implementation into two parts, in the first part we will be segmenting the image which will isolates the internal lung tissue and facilitates the classification of the tumors. The second part is performing the texture analysis, for which we will extract the segmented image and using those collected features the classifiers are used to make the classify the tumor.[22]

Primarily the aim is to analyze every MRI image and after processing, the machine will provide the decision by saying whether the input image is healthy brain or unhealthy brain. The block of the process is required, the MIR as an entry, preprocess image used by FCM, to make segmentation, collect the features from it and finally a classification of the MRI images as shown in the figure 1.

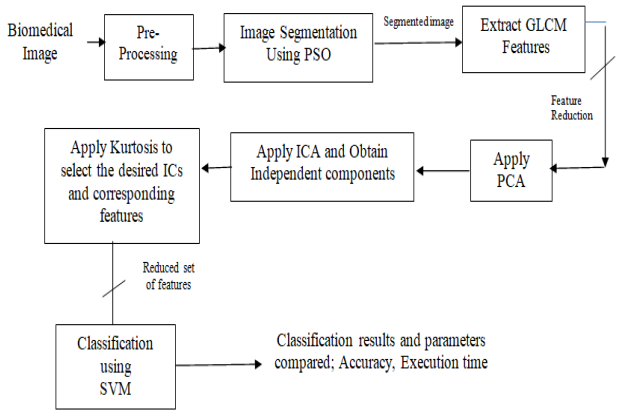

Figure 1: Block Diagram for the proposed algorithm.

The novel algorithm that we have proposed is able to detect the brain tumor by first doing the preprocessing for the MRI image. MRI image often contain artifacts in the image background.

These can be a roadblock for further processing and segmentation because they represent separate components that are also recognized as such by the connected component algorithm, even though they are not part of the tissue that needs to be examined so they leads to inefficient detection which can prove fatal for someone's life[22]. These artifacts are removed from the image background in a first preprocessing step by performing the median filtering operation on the MRI image. After removing noise we will do histogram equalization to enhance the image quality by providing the values to every pixels ranging from 0 to 255[23]. Once preprocessing is done we will apply segmentation to separate the pixels of same kind so that further analysis can be done. After segmentation, GLCM features are extracted and reduced via PCA and ICA in order to increase performance for classification . The detailed analysis is given in the following paper. At the final stage the kurtosis of the all the features(IC's) is taken as parameter to eliminate features. These features are provided to the classifiers to provide decision. These has been summarized in the above figure.
The various intermediate process which are stated above are explained in detail in this subsection and it is as follows:

A. Pre-Processing

MR images often contain artifacts and noises in the image background. These can be a barrier for further processing and segmentation because they represent as a component which will get examined even if it is not required. Therefore, these artifacts are removed from the image background in a first preprocessing step. The preprocessing steps are based histogram equalization for image enhancement and applying median filter on MRI image as it helps to remove pepper noise and salt. The enhanced image provides useful information which improves the quality of image and is beneficial in post-processing, especially in segmentation.[10]. Given below is the detail of preprocessing step we chose:

Median Filter : MR's images can be used for various purposes including many internal content such as device effects, transmitters, environmental issues. So, the sound removal method is an important step in which the smoothens is required to make the image and remove the content. This volume remover and image quality are also called as a restore image. In our project, we will use lots of filters to remove the noise. The smallest icons shine bright and dark in it that is boisterous and the Salt Salt noise is also called. This sound will often have a bright pixel in dark circles and pixels and dark shades of the image. White cloud shades appear in fashion. Because of the unexpected changes the symptoms of the noise rise and result in dead pixels, errors of analog and digital, etc. This type of noise can be removed by the Median switch. We can use clusters that make translators eliminate riots and at times, it runs on top-smoothens images. [32]
Equalization Histogram (HE): Process management is a process for managing images so that they can change the contrast of the image by contributing to the participation of the histogram [31]. The purpose of this process is to provide a regular system of ethical activity [10]. It is used as a process of correction that enhances the image and makes them smaller and able to analyze. It is based on a global system that works with dynamic features. These procedures are simple and easy to apply. As soon as the image is organized and expanded, we will work separately.

B. Segmentation

The next step for biomedical image analysis after preprocessing and artifacts removal we will do segmentation which will breaks down image into multiple segments and allow easy analysis and helps in extracting meaning full information[22][1]. Previously, Clustering is used as a method for segmentation which was comparatively better as compared to other methods like Otsu, thresholding [5][10]and other but then it was seen that there were certain disadvantages of this method like sensitive to noise, computationally expensive and determination of membership function was not easy too [25]. Therefore, a new method was developed by J. Kennedy and R. Eberhart in 1995 [20] which made new way for image segmentation i.e., Particle Swarm Optimization. PSO has become new approach for image processing techniques. It is a population based optimization technique which tries to find best possible solution with respect to its own position and the also with other's position. The detailed algorithm is described in following section.

Segmentation using the PSO algorithm[20]:

PSO has been used to maximize its effects, and now this method is used to provide efficient organizational arrangements. The function of the PSO is to reduce the complexity of the problem. The algorithm path of PSO has comprehensive knowledge, and explains that this information is for solutions. The rainbow sounds change according to the three principles.

1. Keep on searching for the specified goal (tumor region)
2. Update the checking area based on the distance between each pixels.
3. Update the position of the tumor area based on the optimized solution.

The best analogy for the genetic algorithm is the honey bee, the task of the honey bee is to find the honey(step 1). The bee will be optimize the distance of search to nearer. (step 2), if the bunch of flowers is found it calls the rest and reduces the distance of travelling (step 3). A same analogy is applied for detecting the tumor region.
PSO starts with a group (solution) and detects optimization by updating the generation. In any case, each configuration is updated by following the "best" method. The first is the best solution (better) it has ever achieved. (Value benefits are also stored.) This pbest value is called. Something else is "best" so that the best collection is the best thing, from every one of the people. The best is the world's best and hateful agest. When particles take part of its population as its neighbors, the best is the best place to call the lbest.
After finding the two best values, the particle updates its velocity and positions with following equation (a) and (b).

v = v + c1 * rand * (pbest - present) + c2 * rand * (gbest - present) (a)

present = present + v (b)

'v' is fast, 'present' is an important (solution). is described as mentioned earlier. rand () is the number between (0.1). c1, c2 learns. usually c1 = c2 = 2 which selects value.

There are four steps which are involved in PSO to optimize are as follows,

Most of the evolutionists have this system:

1. The unique generation of the first number
2. Remember the practical value for each topic. It will depend on it for a long time.
3. Reproduction of people depends on medical principles.
4. If required, stop. Otherwise, return to 2.

In the same way, the mystery of our brain is these,

1. Obtain the DICOM images from the MRI images.
2. Considering the same size of the brain perform classification of brain between health and unhealthy.
3. Perform segmentation using PSO by making n=2 (default value, number of neighboring pixels taken into consideration while performing clusters)
4. Change the value of n to obtain the best segmentation result.
5. Calculate the elapsed time and select the optimum image
6. Perform filtering on the best segmented image to separate the brain between normal and abnormal brain.

This is how we obtain segmented image using PSO. Now, on this image we will pe performing further analysis in order to detect and classify the type of tumor. The results for PSO segmented images is shown below.

C. Feature extraction

Features are features that describe the entire image. In the study of the image, one needs an application process to reduce the timing and confusion. This is done to get the most important things in the picture. The materials presented provide material, but they are stored in the source of information. These 13 features can be used to rectify the image which reduces the timing of the configuration.

For each individual's test, we have chosen the GLCM-based event that extends to the type, type, homogeneity, entropy and still making more effective decisions. Conversion is a great change, to find things as good, pleasant, and creative. In the search of images and web browsers use it as a text source.

We will consider detailed selection plans

The purpose of selecting a textbook to identify different aspects of the text is based on various textures and MR textbooks, so we expect writers to discriminate in order to distinguish between the different regions. We use textual text input to use two-digit formats:

1) Definition of gray section in

2) The total number of government runs rapidly. For each example, the writing text is compiled.

Gray-level co-occurrence matrix (GLCM) is a browser review editor that deals with the connection about pixels. The matrix (co, d, i, j) represents gray-acting behaviors (ie, j), (i, j) apart from the side view.

Definition coD 2D, P, is in matrix, where is the gray figure in an image. For industrial purposes, the size of the skin may be reduced if one chooses to follow them, thus reducing the conversion of business partners. Explanation is as a deposit as P8, compared to a two-dimensional pixel number with intensities in j. The two sides of the distance are directed to the displacement cast d = (dx, dy), where dx represents the pixel numbers moving on the axis, and dy represents the number of pixels go with the y-axis of a fragmented image. Speed users provide specific text and instructions.

The Haralick's features are extracted from the GLCM, as it is simple to collect and easily differentiable. We have collected the fourteen features which are as follows, [16]

Second Quarter, Contrast, Description, Composition of Squares, variance Variety in different periods, Average of Sum, Entropy Entry, Nutrition, Entropy, Intensity Intelligence, Distribution, Specifications, Processual Information, 2D,.

Angular second moment: ASM is the same freedom of image. This practice will only have gray hair, giving GLCM a few and a high P (i, j). This method was given:

$$ASM = \sum_{i=0}^{G-1} \sum_{j=0}^{G-1} (P(i,j))^2 \quad \text{Equation1}$$

Contrast: It is the a measure of the intensity contrast between a pixel and its neighbor over the whole image. The formula is given by,

$$\sum_{i,j} |i-j|^2 p(i,j) \quad \text{Equation 2}$$

Correlation: it is the sum of how to connect the pixel to the neighbor over the entire image. Systematic arrangements are provided,

$$\sum_{i,j} \frac{(i-\mu i)-(j-\mu j)p(i,j)}{\sigma_i \sigma_j} \quad \text{Equation3}$$

Sum of Squares and average: in order to remove the negative pixels we are going to use the sum of squares. If negative numbers are not converted into positive while averaging everything becomes zero.

Entropy: This is one of the randomness, having the highest advantage when everything in C is equal.

$$-\sum_i \sum_j c_{i,j} \log c_{i,j} \quad \text{Equation 4}$$

Homogeneity: a value that measures the closeness of the distribution of elements in the GLCM to the GLCM diagonal. The equation is given by,

$$\sum_{i,j} \frac{p(i,j)}{1+|i-j|} \quad \text{Equation 5}$$

Instead of storing all the fourteen features set in the database we are reducing the number of feature to reduce the size of the database.

D. Feature Reduction

After features are extracted there are number of features which are redundant and unwanted. As storing and using all the features will not only consume extra memory and but also it will reduce the efficiency and accuracy of the overall system. There are number of methods that have been suggested for feature reduction [17]. In [18] we studied about comparison of PCA, ICA, LDA as feature selection techniques, In our project we will be proposing a new a technique for feature reduction which will combine PCA and ICA and we will see that how our method increased accuracy when the reduced feature is given to classifier[21].

PCA (Principle Component Analysis)

To perform the above stated issue the PCA is used which is going to reduce the dimensionality of the data base the steps followed are as follows,

- Take the whole dataset consisting of + 1 texts and ignoring such names in our new dataset becomes d dimensional.

- Confirm its meaning for any part of the dataset.
- Connect to all dataset matrix functions.
- Install eigenvectors and corresponding.
- Type the eigenvectors by reducing the eigenvalues and selecting the eigenvectors and the most eigenvalues that form a d × kd matrix W.
- Use this d-opt-in sheet to adjust the view to a new area.

PCA will reduce the feature set according the eigen value . The features with higher value will be retained and other will be ignored. By using the above steps instead going for more features the dominant features are selected by performing inverse of the matrix operation on image. PCA fails when data is non-gaussian and accuracy is restricted when there is large dimension data[21][26].

Once the PCA is performed the dimension of the dataset will be reduced. The reduced data set will be given for ICA in order

Independent Component Analysis (ICA): [14]

Before understanding what is ICA let us see why we need ICA here, basically PCA and ICA are going to produce a similar output but the only difference is that the ICA is going to provide a vector for each independent pixels when two or more number of pixels are mixed. We have several overlapped pixels in the medical image hence the ICA is applied to obtain a separate vector for every independent signal/feature.[27]

Lets see how the mixed data are separated by ICA,

To reduce the set of components obtained for each corresponding feature the kurtosis is found for every feature. After obtaining the kurtosis for every component retain only the feature which has higher kurtosis value and discard rest.

The mathematical model for ICA is as follows,

The component Xi of the observed random vector x = (x1,x2,…..xn) are generated as the sum of independent component sk, k=1,2…..n

$$x_i = a_{i,1}s_1 + \cdots .... + a_{i,1}s_1 \qquad \text{Equation 6}$$

Spread through mixing material, k

This type of texture may be stored in a quick form

$$x = \sum_{k-1}^{n} s_k\ a_k \qquad \text{Equation 7}$$

Where is the vex x represented in the vector bag ak = (a1k,..amk) which is the primary vector that forms the array of matrix mixing A = (a1, a2 .... .. a) in the form of generative can write it x = as the site s = s1, s2 ... ..sn

As an example in x1, x2 ... ..xn of vector vector vector, the function is to predict and matrics A in sources s. This is done by quick and quick investigation and creating a business that will make it less beneficial to calculate this $s_k = w^T x$.

Once IC's are obtained we will apply Kurtosis on the obtained ICs in order to eliminate the features corresponding to the ICs. The next part will show how kurtosis is an important parameter for eliminating the ICs.

Kurtosis: After applying ICA to our reduced feature set we will be obtaining a matrix of Independent components. In order to remove components which are less required we will make use of a statistical parameter i.e., Kurtosis. Kurtosis is defined 4th order moment of statistical measure We will apply Kurtosis to the set of IC's we have obtained and find out the Kurtosis value for each IC's. [28]

$$kurtosis = \frac{\frac{\sum_{i=1}^{M}(y_i - y^-)^4}{M}}{s^4} - 3 \qquad \text{Equation 7}$$

We are using kurtosis to retrieve the icon by finding appropriate vectors and pursuing pursuit pursuits.

For univariate data Y1, Y2, ..., YN, the formula for kurtosis is

$$Kurt(y) = E\{Y^4\} - 3(E\{Y^2\})^2 \qquad \text{Equation 8}$$

where y is the meaning, s is a standard configuration, and N is the number of key data. Note that by reading the kurtosis, the N-denomination method is used more than N - 1.

The main reason for finding the kurtosis is to calculate the degree / decline of this issue. Optional options will be based on the value of the kurtosis. Lower levels will be discarded and chosen high for the best of the difference between normal brain and disease.

Tumor Classification: We can classify human brain as healthy or unhealthy brain. A unhealthy brain is the one which tumor is present or not. If tumor is present then it can be at different stages. So, on the basis of their stages we will classify tumor into broad classes benign. The process of brain tumor starts with feature extraction of the image. Several feature extraction algorithms exist, we had chosen the GLCM features as it gives dominating results compared to DWT decomposition method.

Classification: Usually this phase has the two sub-division training and testing phase. Those are explained below, For Classification the Support Vector Machines are used[30]. The training phase for every image the features are collected and the classifier is trained based on the training data set with the specified class (normal or diseased brain). After training the classifier is allowed to test the new data. In our proposed methodology we have selected the single class SVM which is able to make a difference between two classes i.e. normal or tumor one. Once the decision is made we will calculate performance on accuracy and time execution[29].SVM stands for the Support Vector Machines, it is the famous classifier as it efficiently classifies the data into respective classes compared to other classifiers. The decision by the SVM are based on the hyperplane design. Hence the hyper plane need to choose accurately. The selected hyperplane should be significantly away from both the class's data as shown in below figure

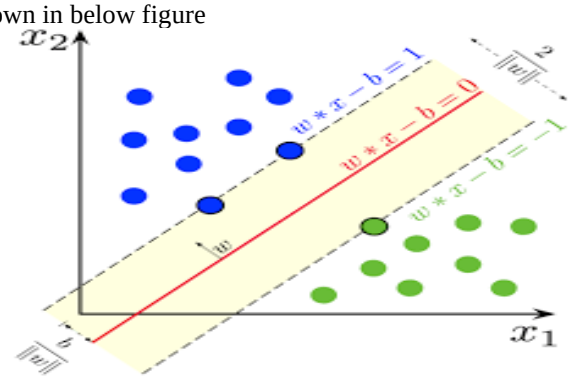

Figure 2: SVM hyperplane Illustration

The figure 3 shows that the SVM has been designed an three hyperplanes with the three different equations, the blue color indicates one class and the green indicates another class. Blue and green beans are called as helpers. If the training summary is split apart, we can choose a binary as a dividend of two data, so that the distance between them is as far as possible.

The region is called the two hyperplans called "massive," but the highest half of the hyperplans are between them. By organizing dataset or banner, these letters may be interpreted through the configuration.

The equations for generating the hyperplane lines are as follows

$$\vec{w} * \vec{x} - b = 1$$

The above equation is used to generate the boundary line for making decision. Any data which comes on this line or lesser belongs to one class and it is with the label 1. (In figure line nearer to blue)

The boundary line for differentiating the another class the equation is given below

$$\vec{w} * \vec{x} - b = -1$$

The labels can be -1/1 or 1/0 these labels are used to make the difference between two features in the dataset. So this equation generates the below line which is nearer to green color in the Figure 3.

The question is to select the optimum line which successfully makes an boundary between two class and is given by equation.

w*x – b = 0. This is the optimum line which is significantly distant from both the class dataset.

For our experiment instead of blue and green balls we are placing the reduced feature set generated from ICA. The kernel of the SVM we are using is the linear kernel as we posses only two classes to differentiate i.e., malignant or benign.

IV. RESULTS AND DISCUSSION

The experiment was carried on the MATLAB 2015. The SVM toolbox has been utilized to perform the training and testing phase. The proposed algorithm can be implemented on any system with the above stated MATLAB version. The main contribution of the paper is that for the existing method of brain tumor detection we have proposed an optimization technique such as PSO, PCA, ICA mainly to reduce the data dimension of the stored database and to reduce the time required to execute the whole process. The algorithm is intelligent enough to make a difference between the normal and tumor brain based on its training experience.

The below figures were captured the time of execution.

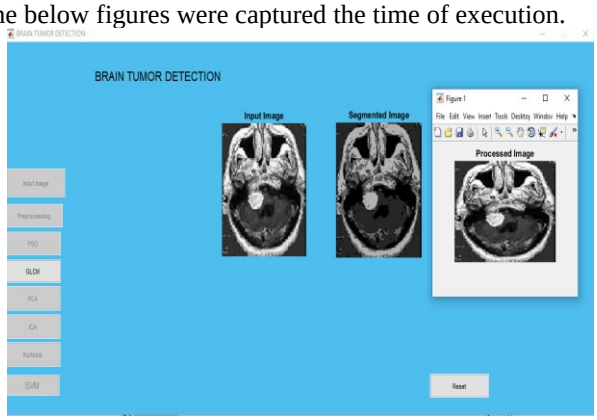

Figure 3: GUI of the proposed methodology.

4.1 Difference of proposed algorithm with the existing algorithm

The accuracy of the proposed system has been formulated in the below graph, it contains the accuracy of PCA, ICA, LDA and combination of PCA and ICA (Proposed methodology). The combination of PCA and ICA is going to provide a higher accuracy and it is representing below.

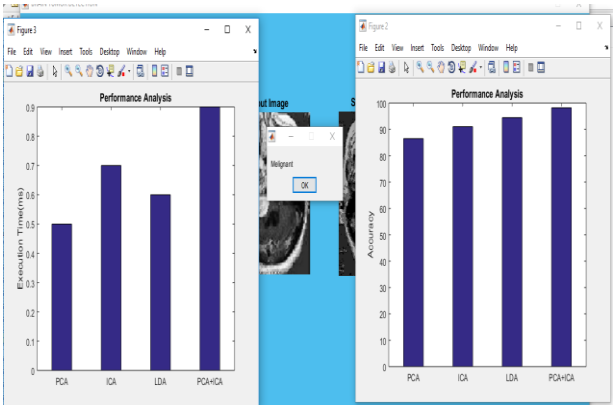

Figure 4: Results after Classification

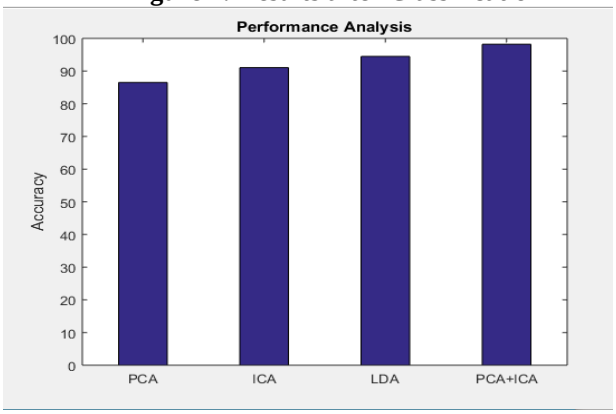

Figure 5: Accuracy graph for the different methods.

The time required to measure perform the feature extraction by different methods are listed in the below graph. Here also the combination of PCA and ICA is going to consume the lesser time to accumulate the features (As shown below).

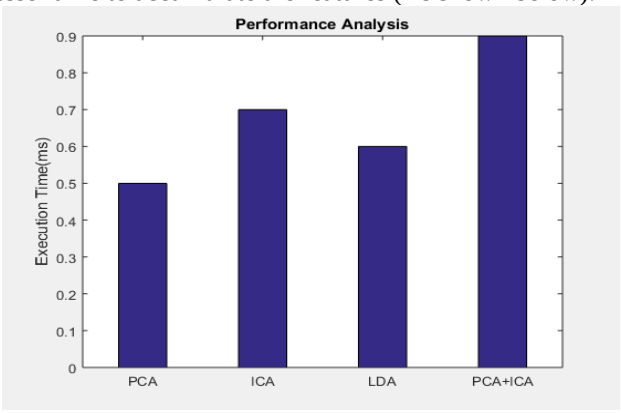

Figure 6: Time elapsed by the different methods.

In our method, execution time is increased as compared to other methods previously given but for tumor detection matters more than time as it needs to be detected more accurately. So, has to be tradeoff between accuracy and execution time.

Table 4.1: Descriptive Statics between the SVM and KNN

Method	KNN	SVM
Computation time	More (because need to provide distance between neighbor, parameter k	Lesser (no need as hyperplane is selected automatically by machine
Accuracy	86%	92.10%
Training time	Less	More
Tuning	Careful need to change value of K	Hyper plane selection is automatic

The table 4.1 states the difference between the KNN and SVM. The advantages of both methods are discussed by observing the above parameters we can conclude that SVM is better in terms of accuracy and time consumption[33][34].

V. CONCLUSION

In this paper, an optimal way for the detection of tumor from brain MRI scan has been devised which on successful detection classifies the type: benign or malignant. The entire procedure consists of four stages namely: anisotropic filtering, morphological operations, feature extraction and classification. The proposed model is capable of detecting tumor by conducting morphological operations on input MRI images by employing the image filtering scheme using histogram equalizer, for feature segmentation PSO (particle swarm optimization), PCA and Independent Component Analysis (ICA) used for feature reduction and finally Vector Machines are easily used to absorb the tumor or it is bad or bad. With these analyzes, it may be concluded that for detection of the brain, the correct rate is 92% higher than the existing algorithms.

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