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Review on Tumor Classification Techniques.

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ABSTRACT

The bulky number of Circulating Tumor Cells (CTCs) in blood delivers an inkling of disease catena and tumor response to chemotherapeutic agents. Hence, prosaic detection and itemization of CTCs in clinical blood samples have eloquent applications in prematurely cancer diagnosis and treatment monitoring. In recent years the image processing tactics are accustomed frequently in various medical zones for amending prior detection and treatment rostrum, in which the time span or lapse is very tectonic to figure out the disease in the patient as soon as possible, specifically in various tumors akin the lung cancer, breast cancer. This network initially segments the region of interest (ROI lung) and then anatomize the decouples the captured area for dispose detection in order to catechize the disease. The conventional tack for descrying the tumor diseases in the human MRI brain images is done manually by physicians. Instinctive classification of tumors of MRI images necessitates high delicacy, since the non-accurate diagnosis and holds-off delivery of the refined diagnosis would lead to aggrandize the prevalence of various serious diseases. To elude that, an involuntary classification system is proffered for tumor classification of MRI images.

Keywords: CTCs, Cancer, MRI, Segments (ROI) and classification system.

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INTRODUCTION

Classification is the dynamic and arduous chore in computer science. Classification is footing on the description, texture or similitude items or things. Image classification accounts two approaches -- supervised classification and unsupervised classification. Pixels are the unit depicted in an image Siva Kumar, B., Srilatha, K et al [11]. Classification arrays the pixels in disparate classes. The classification entails -- image acquisition, image pre-processing, image segmentation Melissa, S., Srilatha, K et al [6]. Fathomless and intractable excrescence of cells leads to tumor. The pre-hand diagnosis and decorous treatment of tumors are imperative to avert eternal cripple or even patient death. Veracious data apropos of the position of the tumor and its size are necessitous for potent treatment. Hence, an utterly computerized automatic system to supply accurate tumor data is mandatory for physicians. A **tumor**, also worded as a **neoplasm**, is an aberrant **mass of tissue** which might be solid or fluid-filled Dubey, R.B et al [9]. **A tumor doesn't intend cancer** - tumors can either be benign (not cancerous) or pre-malignant (pre-cancerous) or malignant (cancerous).

Literature Survey

[1] Faster Detection of Microgrid Islanding Events Using an Adaptive Ensemble Classifier- Aziah Khamis, Yan Xu, Zhao Yang Dong, and Rui Zhang,

A novel artifice for spontaneous detection of islanding occurrence in a micro grid is posed in this paper. The scheme coheres of a passive islanding detection process employing an adaptive ensemble classifier. Foremost attributes garnered using phase space method. They are then used to train an ensemble classifier which consists a clot of randomized neural networks known extreme learning machine (ELM).

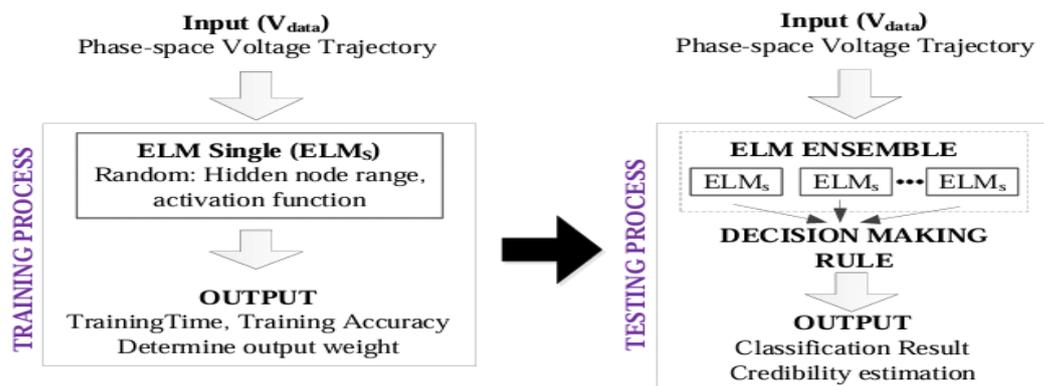


Fig.1: Description of inputs and outputs for the training and simulation data of an ELM-based ensemble classifier

The parameter distinguished by evolutionary computation. The simulation upshots depicts that the proposed scheme that can make accurate decisions at preempt earlier times, which attains a good equipoise between efficiency and accuracy in magnifying the islanding events. Currently, the penetration degrees of distribution generation (DG) in distribution systems have been significantly raised with the construction of microgrids. N-Numerous aid of the DG can be provided in look-out of environmental benefits, network reliability, power loss reduction, and power quality. Any-how, one of the substantive technical consequences in a microgrid is unintentional islanding. These techniques can be broadly classified into central (remote) and local (residential) types. Remote methods are in need of an exhaustive communication infrastructure instead local methods are based on local information merely. The local technique can be foster assorted into three types: passive, active and hybrid ones .Amid all the techniques, one of the most frugal and fruitful methods for detecting the islanding is the amalgam of passive technique and artificial intelligence, which is benignant for less complicacy and high calculus efficiency with high accuracy and solidity. Then a probabilistic neural-network (PNN) model is refined to branch the islanding events. The division models are then evolved using classification and regression tree (CART), where it especially classifies the optimal threshold setting into four system parameters. The scheme comprises of phase-space features extraction and also an adaptive ensemble classifier.

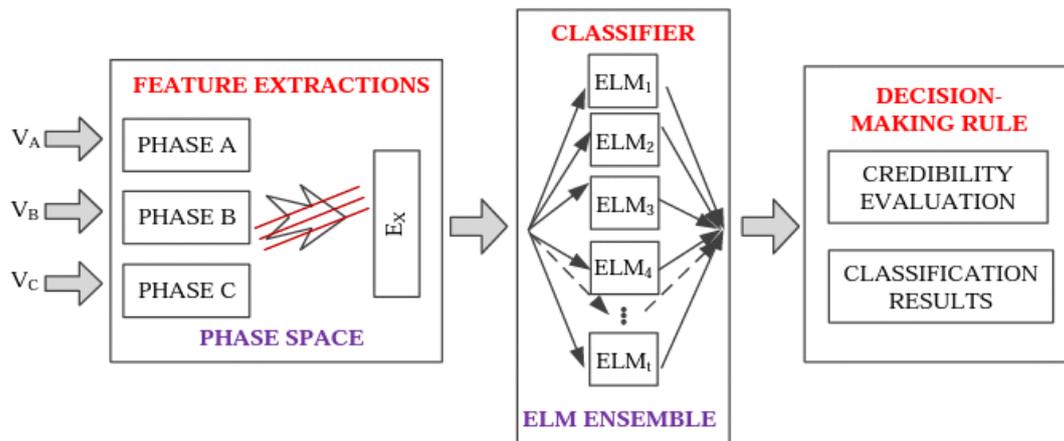


Fig.2: Structure of the phase space based ELM ensemble classifier

The proposed adaptive classifier works advancing with more incoming inputs, and the aim is to adaptively acclimate the fidelity response and make the right deliverance in an earlier time. The posed adaptive ensemble classifier can recognize the islanding events much dizzier while preserving a high accuracy.

[2] Classification of Brain Cancer Using Artificial Neural Network- Dipali M. Joshi, Dr.N. K. Rana and V. M. Misra.

The islanding detection artifice in this study is a passive technique. A functioning technique such as Sandia voltage shift (SVS) and Active frequency drift (AFD) warping on adaptive ensemble classifier can be deliberated. The image processing techniques such as histogram equalization, image segmentation, image enhancement, morphological operations and feature extraction have been employed for detection of the brain tumor in the MRI images of the tumor contrived patients. The extraction of texture features in the detected tumor has been developed by using Gray Level Co-occurrence Matrix (GLCM). Finally a Neuro-Fuzzy Classifier has been achieved to recognize various types of brain cancers. Therapeutic cancer has been a very major goal of medical researchers for long decades. Science may yet find the cause root of all cancers and unfold safer methods for shutting them down brain tumors are benign and can be before they have a chance to crop or circulate. Magnetic Resonance Imaging (MRI) has become a broadly utilized method of very high quality medical imaging, specifically in brain imaging where MRI's soft tissue contrast and noninvasiveness is an advantage. MRI provides an inimitable view in the inner human body.

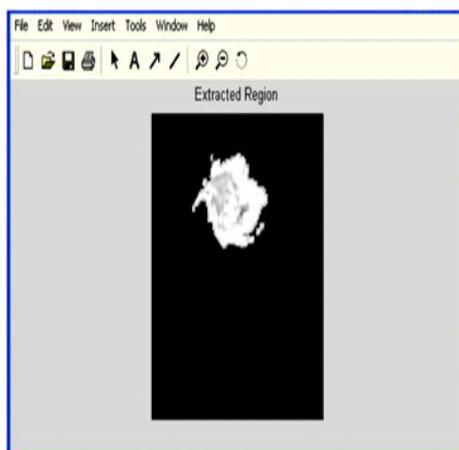


Fig.3: Extracted region without outer skull

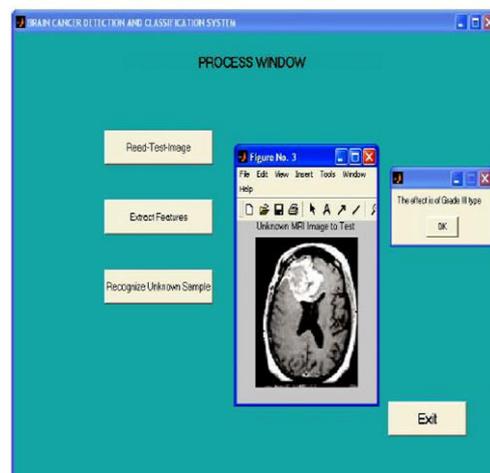


Fig.4: Result of classification

Calculable and blister detection and classification of brain cancer are of major technical and lucrative importance for the doctors. The designed system is an efficacious system for Detection and Classification of

Brain Cancer from a given MRI image of cancer feigned patients. The system also clips adequate usage under Cancer Detection in the area of medical sciences such as Computer Aided Diagnosis and Mammography etc. Brain cancer is a complicated disease, branched into 120 various types. They are so called non-malignant (Benign) brain tumors can be just as life-hover as malignant tumors, as they mash out normal brain tissue and disintegrate function. There are various types of Brain Cancers but among various types of Brain Cancers the most conventional and common is Astrocytoma. At present the accessible systems can only detect location and size of tumor but do not furnish any lore about the genre of tumor. Various cancer forms can only be diagnosed after a piece of debatable tissue has been flanged and tested (biopsied). Pathologists prospect pathologic tissues, generally with brig field microscopes, to detect the degree of normalcy versus disease. This course is time arresting, and frazzling. The beget exhaustion invoked by this process may chip in to diagnostic errors. Brain Cancer Detection and Classification System are tooled using Artificial Neural Network. The contemplate based on Image processing Techniques, Artificial Neural Network and Graphical User Interface was thriving completed and utilized in the system to Determine and Classify the Tumor. The sketched Brain Cancer Detection and Classification System use ideally bare Classification method using the Neuro Fuzzy logic. The system can be plotted to classify the other types of cancers.

[3] Hybrid Approach for Brain Tumor Detection and Classification in Magnetic Resonance Images- Praveen G.B. Anita Agrawal

Computerized methods are accustomed in medical imaging to clone the internal parts of the human body for medical diagnosis. Image segmentation frolics a vital role in diagnosis, surgical planning, navigation and multiple medical evaluations. A hybrid approach for brain tumor detection and divisions through magnetic resonance images has been proffered. Initial phase of the bounced approach trades with image preprocessing which comprises of noise filtering, skull detection, etc. The upcoming phase trades with feature extraction of MR brain images using gray level co-occurrence matrix. Proceeding phase trades with classification of inputs into normal or abnormal using Least Squares Support Vector Machine classifier with Multilayer perceptron kernel. At last, the final phase is the segmentation of the tumor part from the brain using fast bounding box. A mass of un-necessary cell development in the brain or central spine canal leads to brain tumor. Primary brain tumors and metastatic brain tumors form the two basal classes of tumors. Primary brain tumors startle and sustain in the brain itself whereas metastatic brain tumors start as cancer in various parts of the body and then hap to the brain. Clarification of brain tumor patients is accomplished by imaging modalities. The two max eloquent and constantly used imaging modalities are Computed tomography (CT) and Magnetic Resonance Imaging (MRI). The course policy of brain tumor characterization demands a fain baroque guesstimation of the multiple MR images and spectra features and is generally negotiated by experienced radiologists. Semi-automatic methods claim user intercedes for the brain tumor detection.

Table1: Classification accuracies of RBF and MLP kernel functions according to our proposed methodology

| Kernal | Method | Specificity | Accuracy | Area Under Curve | Standard Error |
|--------|--------|-------------|----------|------------------|----------------|
| RBF | LS-SVM | 40.0% | 61.80% | 0.93 | 0.023 |
| MLP | LS-SVM | 81.33% | 96.63% | 0.94 | 0.021 |

For greater delicacy and diagnostic capabilities in the pathological classification of brain tissues, computer abet diagnosis systems have been developed. Level Sets approach warrants primary curves identification and will bow beggared outcomes when there is asymmetrical placement of the curves with respect to object boundary. Heterogeneous tumors can't be segmented using MRF since it is only actionable to homogenous tumors. KNN is very delicate to extraneous or superfluous features and they have destitute run-time performance. Disbenifit of Region growing method is that it evolves a primer seed point selection. Hanging on predefined conditions, this methodology eliminates every pixels linked to the Preliminary seed. Initially segment the brain to douse skull from the image followed by symmetry property to recognize the part of the brain contrived by the tumor region. Proceeding, we take up Fast bounding box approach for detection of the region of tumor, which will shtick as an input ROI for texture feature extraction method. Once the features have been retrieved, classification of tumor or non-tumor MR images is undertaken.

Computer adjunct detection system has become vital research stream in medical imaging and diagnostic radiology. Hybrid approach i.e. comprisal of region based and texture based methodology for brain tumor detection and classification has been posed. GLCM have been utilized as texture based method for

feature extraction from the MR images. LS-SVM classifier along with MLP kernel function is utilized to classify the tumorous and non-tumorous images. Fidelity bounding box algorithm is employed as region based method for tumor segmentation. The posed methodology is very much efficacious than the subsist methods and segmentation accuracy is good.

[4] Recognition of Fear from Speech using Adaptive Algorithm with MLP Classifier Rashmirekha Ram, Hemanta Kumar Palo and Mihir Narayan

Limpidity and fathom ability in speech signal claims elimination of noise and crimp-crimp consorted with the signal at the source. In this work taken a novel step to ameliorate the emotional speech signal before adaptive signal.

The very most popular adaptive algorithm such as Least mean square (LMS), Normalized least mean squares (NLMS) and Recursive least square (RLS) has been put to sample test to retrieve enhanced speech emotions. Neural network based Multilayer perceptron (MLP) classifier is used to analyze fear speech emotion as against upon neutral voices using effective Linear Prediction coefficients (LPCs). The delicacy has amended to approximately 77% with flourished signal. Rapid development and applications in the area of speech signal processing suffers due to inherent noise in accordance with the source of voice pick-up. Post-processing at the receiver side of the channel uses some cast of adaptive filtering algorithm to enrich the speech signal factitious with noise. As overall removal of noise from a signal is impossible, it disguises a consequential challenge for speech researchers to rejuvenate makeshift methodology in the area of speech enhancement for better audibility. Few speech enhancement algorithms as spectral subtraction (SS), Least mean square (LMS), Normalized least mean squares (NLMS), Time varying Least Mean Square (TVLMS), Recursive least square (RLS), Fast Transversal RLS have been quite effectual in delivering enhanced speech to some termination. Single channel SS method of speech enhancement is capable due its unsophistication.

LMS algorithm approaches noise omission adaptively, using stochastic gradient descent method. It is easy and robust algorithm but perceptive to the scale factor used in its input. The downside of LMS can be cancelled to some extent by normalizing the input power in NLMS algorithm. Adversely, the RLS algorithm provides optimum interpretation in a vigorous environment. It recursively précises the weighted linear least squares cost function of the input signals to gains the hankered adaptability with faster confluence. A new speech enhancement method was posed coupling the statistical models and non-negative matrix factorization (NMF) with Kullback–Leibler divergence.

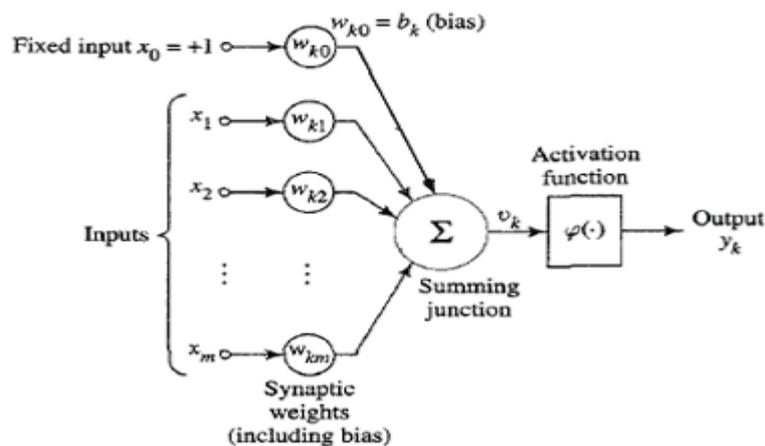


Fig.5: Basic MLP circuit

In time-contrasting noise circumstance, both the speech and noise bases of NMF were undertake with the aid of the evaluated speech presence probability to get the much better-enhanced speech. Speech when pigmented with sense of feel will be associated with additional noise due to variability in expression and environment at which it is exhibited. Assignees such as hiss, restive and other physiological components during

emotional speech encounter makes the speech decomposed. Hence, we have undertaken a step to eliminate unwanted noise from fear speech emotions recorded in a real life situation along with neutral voice.

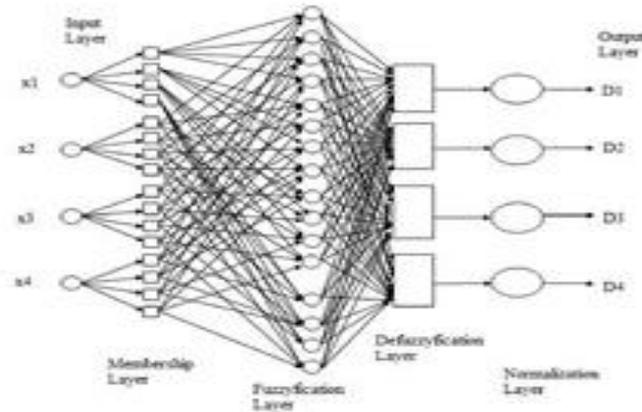


Fig.6: Neuro fuzzy classifier

A contrast between the noisy emotional speech and enhanced emotional speech has been made basal on Signal to noise ratio (SNR), Mean square error (MSE) both at the filter end and classification stage. Speech enhancement has improved the classification sharpness due to improvement in SNR for fear speech in this work. At last, the MSE is also decreased. Among all the tested algorithms RLS delivered a much better performance in terms of MSE and classification accuracy followed by NLMS for their positivity explained earlier. This has been found valid for both enhancement and classification models.

[5] Dialect Identification from Assamese Speech using Prosodic Features and a Neuro Fuzzy Classifier - Mousmita Sarma and Kandarpa Kumar Sarma

Dialect identification is the chore of branching speech on the basis of dialect, which comes in the Automatic Language Identification problem. In this paper a neuro fuzzy classifier is used to analyze dialect of speech from a vowel sound. Vowel sounds occur in an acoustic speech signal more continually and with gained energy. Hence, prosodic feature of vowel sounds can be utilized to peep dialect dependent characteristics. Fuzzy based systems are able to trace minute variations in an environment invested with distrust. Minute variation of feature vectors is very well branched by the neuro fuzzy classifier (NFC), which combines fuzzy classification with the learning capability of neural network.

A similarity of NFC with Feed Forward Neural Network (FFNN) based classifier is also done. It is noticed that NFC provides around 23% enhancement in the correct classified rate compared to FFNN for the top feature set, which states the potentness of NFC for dialect identification. The improvement of productive and securable language technology tools with regional and native frontage shall enable a diverse yet drawback segment of speakers with dialectal attributes to use speech based human computer interaction (HCI) systems in a better form. Dialect refers to the dissimilarity of a group of particular language among various groups of the speakers of the language. In order to model the diversity of such dialectal speech, discriminative training of data is important and hence the learning process of soft computational tools like Artificial Neural Networks (ANN), Fuzzy systems or the hybrid forms namely Neuro Fuzzy System (NFS) and Fuzzy Neural System (FNS) appears to be more effective and efficient than GMM or HMM.

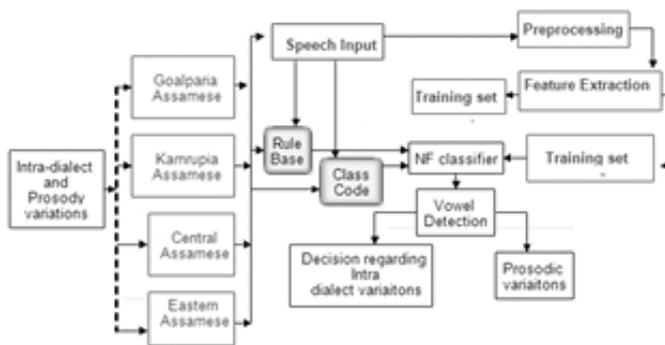


Fig.7: NFC based design based flow of the proposed system

This is because of the fact that these tools use many artificial neurons in connectionist mode to ensure efficient adaptation, learning and retrieving of the know-how about each and every input feature vector and generate nonlinear calculus similar to the human brain. As a result fuzzy based systems are determined to be suitable for tracing minute dissimilarities in input patterns and provide expert level decision making for uncertain processes like speech recognition. In this work, we have initialized a Neuro Fuzzy Classifier (NFC) for classification of dialectal speech from a vowel sounds. An enquiry on vowel formants is done and employed to create acoustic phonetic feature vectors for the classifier. A NFC designed using Gaussian membership function and Surgeon fuzzy model and trained with Scaled Conjugate Gradient (SCG) algorithm is adopted for the work.

In order to know the comparison of the result, plotted a Feed Forward Neural Network (FFNN) basal classifier trained with the SCG algorithm and a comparative analysis of the efficiency of both the classifiers is reported. The main intension of this work is to expose how a NFC can be used to vary dialect specific characteristics taking positivity of prosody level sound variations between speakers.

[6] Melanoma Detection and Classification Using SVM Based Decision Support System Diwakar Gautam and Mushtaq Ahmed

Melanoma is quite a uncertain form of skin cancer. The malignant skin tumor much denotes benign nevus, mole or dysplastic naive. Color images of melanoma are conveyed to branch them among malignant and benign classes using Support Vector Machine (SVM) enhanced by Sequential Minimal Optimization (SMO). As a portion of the preprocessing step, an elucidation compensation based segmentation algorithm is discriminated. The segmentation procedure is hanged by the posed iterative dilation method to eliminate noise from a lesion. Melanoma is a consideration of skin cancer especially named as malignant tumor of melanocytes.

Melanocytes give-out melanin the dark pigment, which undertakes color of skin. These cells occur in the skin but are specified also in other parts of the body including eyes. The probability of melanoma gets more bodacious due to a dissimilar operation of melanin-producing cells (melanocytes) that will handle our skin color). Normally, skin cells enhances in a controlled and segmented way; new nutritious cells exert worn out cells out of your skin’s surface, where they die off. After a vast research and medical testing, one can find a doubt that exposure to UV. People who absorb a lot of UV exposure from these sources are at a greater problematic healing of skin cancer including melanoma (UV) radiation from sun, tanning lamps and beds leads to the cause of melanoma. Moles do not present right from birth in humans but they start in children and adults in later stages. Moles do not create any nut but the person with many moles is more likely to develop themselves in melanoma. They are often gigantic in size than other moles and forms abnormal shape or color. The lesions may appear on skin that is exposed to the sun as well as on skin that generally remain packed, such as the scalp or on the buttock.

The growing risk may be because of family lifestyle indulging frequent sun exposure or inclusion of factors. It may also be due to genetic changes that are among one of the reason in a family. Men have an

increasing rate of melanoma compared to women. Before the age of 40 there is a higher risk for women, after an age of forty the risk is higher in men. The work invoked in this article includes SVM with SMO as classifier to investigate malignant melanoma from color images of skin. Some preprocessing step based on background illumination compensation and iterative dilation based noise cancellation is deployed to extract lesion features more perfectly. SVM constraints are regularized using sequential minimal optimization method to give a much better results.

Table 2: Performance Measure of SVM based Classification

| Parameters | Performance (m=1) | Performance (m=10) |
|-------------|-------------------|--------------------|
| Sensitivity | 87% | 90% |
| Specificity | 94% | 75% |

The output result proves that supervised learning method based on SVM provides a profitable classification of a melanoma sample test.

CONCLUSION

Classification is a significant process in improvement image analysis and computer vision and it is continuing research area while a dense works is existing. A survey Paper is highlighting various Classifier in which use image processing techniques like image preprocessing, enhancement and segmentation and also computerized automatic system to give precise tumor data is needed for physicians. Using Back Propagation Neural Network, PCA with BPNN, Principle Component Analysis and SVM Based Decision Support System can be done in an effective way. Finally comparing the other algorithm bring up in this survey paper, SVM Based Decision Support System is the leading to find out tumor in efficient way either be benign, pre-malignant and malignant. The generally results illustration that the proposed approach performs relatively well compared to the previous approaches.

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