

Detection and Classification of Brain Tumor

Daya Thange¹, Nikhil Sutar², Ankita Takkar³, Dhanashri Bhopatroa⁴

¹Daya Thange, Dept. of Computer Engineering, G.V. Acharya Engineering College, Maharashtra, India

²Nikhil Sutar, Dept. of Computer Engineering, G.V. Acharya Engineering College, Maharashtra, India

³Ankita Takkar, Dept. of Computer Engineering, G.V. Acharya Engineering College, Maharashtra, India

⁴Professor, Dhanashri Bhopatroa, Dept. of Computer Engineering, G.V. Acharya Engineering College, Maharashtra, India

Abstract - The brain is one of the most complex organs in the human body that works with billions of cells. A cerebral tumor occurs when there is an uncontrolled division of cells that form an abnormal group of cells around or within the brain. This cell group can affect the normal functioning of brain activity and can destroy healthy cells. Automated and accurate classification of MRI brain images is extremely important for medical analysis and interpretation. Over the last decade numerous methods have already been proposed. We presented a novel method to classify a given MR brain image as normal or abnormal. The proposed method first employed wavelet transforms to extract features from images, followed by applying Principle Component Analysis [3] (PCA) to reduce the dimensions of features. The reduced features were submitted to a Kernel Support Vector Machine (KSVM) [5]. The strategy of K - fold [4] stratified cross validation was used to enhance generalization of KSVM.

Key Words: brain, classification, denoising, detection, support vector machines, tumor, wavelet transforms, PCA

1. INTRODUCTION

This project presents the event of computing in medical field. Our system is developed using Matlab software which concerns more about patient neurological disorder. The system needs just an input of the brain MRI images of the patient subsequently the system identifies the tumor highlighting particular area of the tumor also it specifies its dimensions and other characteristics with displaying the type of tumor i.e. Benign / Malignant. This helps doctor further patient to appear at the tumor effectively and helps them to need suitable action immediately in step with its severity which saves time also the lifetime of the patient. This technique is meant to think about the tumor detection accurately and assign its type by performing classification. The system is accurate, time-saving also costless hence it's efficient system for detecting tumor

2. LITERATURE SURVEY

MRI is that the foremost vital technique in detecting the tumor. during this paper processing methods are used for classification of MRI images. a brand-new hybrid technique supported the Support Vector Machine (SVM) and fuzzy c-means for tumor classification is proposed. The purposed algorithm is also a mixture of support vector machine (SVM) and fuzzy c means, a hybrid technique for prediction of tumor. during this algorithm the image is enhanced using enhancement techniques like contrast improvement, and mid-range stretch. Double thresholding and morphological operations are used for skull striping. Fuzzy c-means (FCM) clustering is utilized for the segmentation of the image to detect the suspicious region in brain MRI image. Grey level run length matrix (GLRLM) is utilized for extraction of feature from the brain image, after which SVM technique is applied to classify the brain MRI images, which give accurate and more practical result for classification of brain MRI images[1]. The resonance Imaging (MRI), and X-radiation (CT) provides scanned images for neoplasm detection. Growth of abnormal cells in uncontrolled manner is tumor. the present paper proposed the classification and identification many neoplasm by using k-NN algorithm which relies on training of k. during this work Manhattan metric has applied and calculated the gap of the classifier. The algorithm has been implemented using the Lab View [2].

3. PROPOSED SYSTEM

The Proposed system overcomes the matter of the prevailing system. This project comprises of three important stages. Initial stage consists of Image Pre-processing [3] which includes Feature Extraction [4] and have reduction [3]. Here the feature extraction is allotted by using Wavelet Transform & the feature reduction is allotted by using PCA [3] [Principal Component Analysis] and tools. Step 2 consists of coaching the kernel SVM [2] [Support Vector Machine]. Step 3 consists of Submission of recent MRI brains to the trained kernel SVM, and eventually prediction of output using algorithm is implemented to detect the tumor with its type & states is structure dimensions.

The proposed system is implemented on the Matlab platform using above discussed method that proves to be efficient and more useful for treating patient immediately plenty of to avoid wasting lots of his/her life.

4. SYSTEM ARCHITECTURE

The System processes are often separated into three working modules within which the pre-processing has two major methods. They're Feature Extraction & Feature Reduction. Feature Extraction is most conventional tool of signal analysis using Short Time Fourier Transform (SIFT), Feature Reduction is created using PCA then the training of KSVM is completed and database is created, finally the small print of tumor is presented by the system as shown in below diagrams.

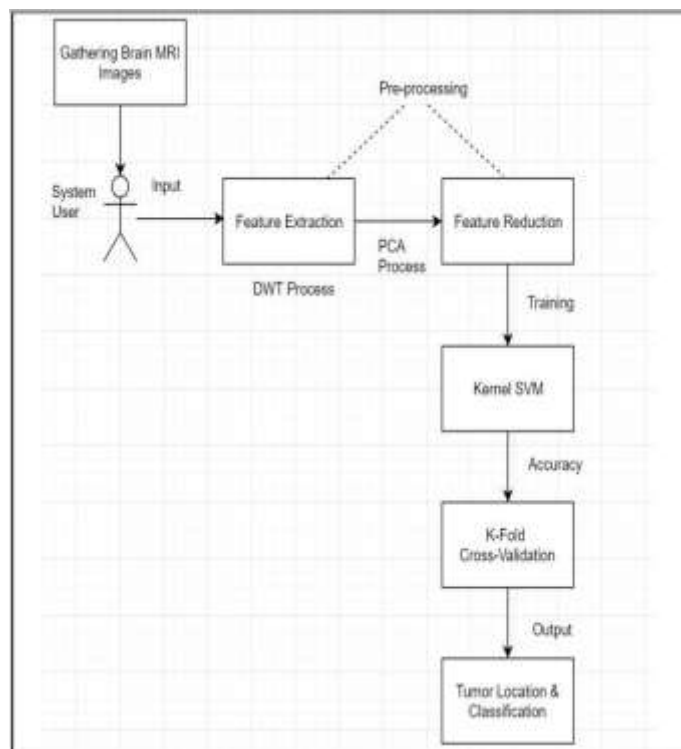


Fig 4.1: System Architecture

4.1 Feature Extraction

In machine learning, pattern recognition and in image processing, feature extraction starts from an initial set of measured data and builds derived values (features) intended to be informative and non-redundant, facilitating the following learning and generalization steps, and in some cases leading to better human interpretations. Feature extraction involves reducing the amount of resources required to clarify an oversized set of knowledge.

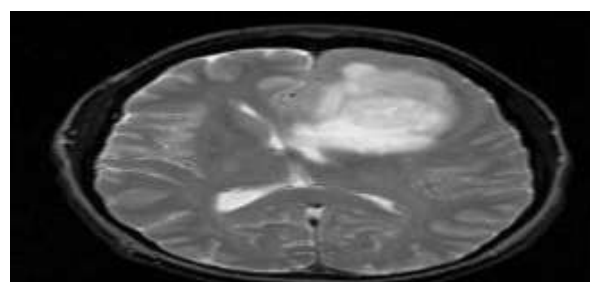


Fig 4.1: Feature Extracted Image

4.2 Feature Reduction

In statistics, machine learning, and data theory, dimensionality reduction or dimension reduction is that the method of reducing the number of random variables into consideration [1] by obtaining a set of principal variables. Feature Reduction which has the code of Principal Component Analysis [PCA].

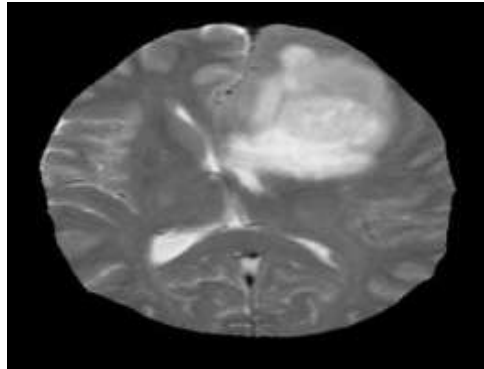


Fig -4.2: Feature Reduced image

4.3 Kernel SVMs

Kernel Rule Used for Training

$$K(\bar{x}) = \begin{cases} 1 & \text{if } \|\bar{x}\| \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

Fig -4.3: Kernel Formula

This value of this function is 1 inside the closed ball of radius 1 centered at the origin, and 0 otherwise. As shown in the figure below

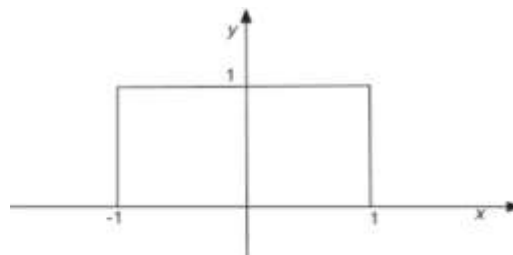


Fig- 4.4: Applied KSVM Rule

4.4 K-Fold Cross Validation Method

Sample Cross-validation may be a resampling procedure needed to judge machine learning models on a limited data sample. The given dataset is trained to the classifier; therefore, the classification accuracy is high for this trained dataset compared to other datasets. To escape from over fitting, we utilize cross validation process in our model. Thanks to which there'll not be any increase in the final word classification accuracy. However, classification reliability is improved and will be added to other independent datasets. There are three validation methods: "K-fold cross validation, Random subsampling validation, and leave-one out validation". The properties of the first validation method are simple and simple to use, and complete data is utilized for "training and validation" by researchers. To create a K-fold partition of the whole dataset, K times it's to be repeated to use "K-1 folds for training and a rest for validation, and eventually average the error rates of K different experiments". During this method, as K folds are often randomly partitioned, but variety of the folds could have different distributions compared to other folds. Where each fold has almost the identical sort of distribution figure give the basics structure of "k-fold cross validation method".



Fig 4.4: Basic Structure Of K-Fold Cross Validation Method

5. CONCLUSION

A new system is developed for detecting tumor & classifies its type in step with its dimensions & characteristics. The system takes the JPEG format of MRI Image of Brain as input then using Image Pre-processing which comprises of Feature Extraction & Feature Reduction. The output is present by the system by detecting the tumor with its characteristics & its type. This technique also requires scanner for displaying the tumor which has been detected within the MRI images, because the factors of inaccuracy and noise interruption is removed by the proposed system focuses on human health life because it helps doctor to look at the patient tumor in but a moment and also helps to require decisions related tumor surgery immediately.

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