Brain Tumor Classification

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Abstract **- The brain tumor, are the most common and deadly disease, leading to a very short life span in their highest grade. Thus, planning treatment is a key stage to improve the life span of the patients. Generally, various image techniques such as Computed Tomography (CT), Magnetic Resonance Imaging (MRI) and ultrasound image are used to evaluate the tumor in a brain, lung, liver, breast, prostate etc. Especially, in this the MRI images are used to diagnose tumor in the brain. A huge amount of data is generated by MRI scan through manual classification of tumor vs non-tumor in a particular time. But they are having some limitation therefore, an accurate measurement is provided for limited number of images. They are trusted and automatic classification scheme are essential to prevent the death rate of the affected person. The brain tumor classification is very challenging task in the large structural variability of surrounding region of the brain tumor. In this brain tumor detection is proposed by using Convolutional Neural Networks (CNN) classification. The deepest architecture design is performed by using small kernels. The weight of the neuron is given tiny.**

Index Terms **- Brain tumor, CNN, MRI, neuron.**

1.INTRODUCTION

Brain tumor is an unpredicted growth of cells in the brain region. Its detection at the early stage ensures the survival of the patient. There is a large quality medical practitioner, due to the hectic and challenging schedule of the medical practitioners, especially in rural areas. With respect to speed up the diagnosis and to serve as second decision for neurologists, this defined method has been proposed. This classification process undergoes the following steps like pre-processing which includes resizing of the MR image and adding salt noise to image, also, geometric calculations are done to increase the dataset size. Then, the images from each type of tumor are messed and are divided into the training (60%) and validation (20%) and testing (20%) of dataset. Since the bio-medical images are difficult to analyze so here the CNN and SVM are chosen for the classification based on depth of feature extraction. CNN does the classification using convolution layers and the depth increases the level of feature higher. The SVM, features are extracted based on the type of texture or pattern in the image and classes which have similar features, they can be classified easily. therefore, CNN and SVM based architectures are selected to train dataset and then this trained model is tested using various testing. Finally, the accuracy of the classifier models is calculated, and conclusion is done.

2.PROPOSED SYSTEM

The first NN is to classify brains into no-tumor brain or brain with the tumor while other NN used to classify brain with tumor as benign or malignant. The neural network has been trained using Levenberg-Marquardt algorithm.[5][6] Drawback with this method is that, it detect tumor if system is 75% sure. Berkeley wavelet transformation (BWT) used to improve the model and reduce the complexity while doing the segmentation of the medical image, and to improve the accuracy of SVM based classifier, first and second order statistical features are taken with an accuracy of 96.51%. For brain tumor image classification, feature extraction can be done by discrete wavelet transforms (DWT) and SVM is used to segment and classify the tumor as normal, benign and malignant with the accuracy of 86%. In this paper, the dataset is taken from public available dataset of 3064 MR images and features are extracted based on ROI and statistical feature of images. Performance analysis for two major classifiers: Convolutional Neural Network and Support Vector Machine are conducted.[10]

3.MODULES

3.1 Dataset Processing

For training and testing the model, 'Brain Tumor Dataset' which consist of 3064 brain scanned image slices are taken from 233. All three kinds of brain tumors: Meningioma, Glioma, and Pituitary, respectively. Total images for each category of tumor is: 708 images for Meningioma, 1426 images for Glioma and 930 images for Pituitary tumor [7][9]

3.2 Pre-processing

In MR imaging technique, specific image appearances are given by setting some parameters such as radio frequency pulses and gradients.[1][2] T1 and T2 are the most common MRI sequences, and each provides particular details about tissues that occurred in brain. T1 images are being in this study, for normal cases. In order to reduce the number of normal brain images, there are six sections with approximately equal intervals have been selected from MR images of each normal person. In the gadolinium enhanced T1 MR images, due to the injection of a contrast agent called Gadolinium, tumor boundaries can be better identified [8].

3.3 CNN Training

CNN Convolutional Neural Network (ConvNet or CNN) well known neural network for specially image recognition and classification. CNN is highly excellent in extracting complex features for classifications. CNN consist of neurons where weight and bias can be learned. Each neuron receives some input; weighted sum is taken then given to the activation function. CNN uses successive convolution layer and nonlinear ReLU function to extract valuable feature with specific dimension.[3][4] Maxpooling layer is used to downsize the feature map. In Fully connected layer, each neuron is connected to every other neuron of previous dense layer. Back- propagation and gradient descent are used while training the network. Softmax function is probability distribution to limit all class output value between 0 and 1. CNN provides feature maps which helps neural network to learn small features of the image depending on the depth of hidden layers[11][12].

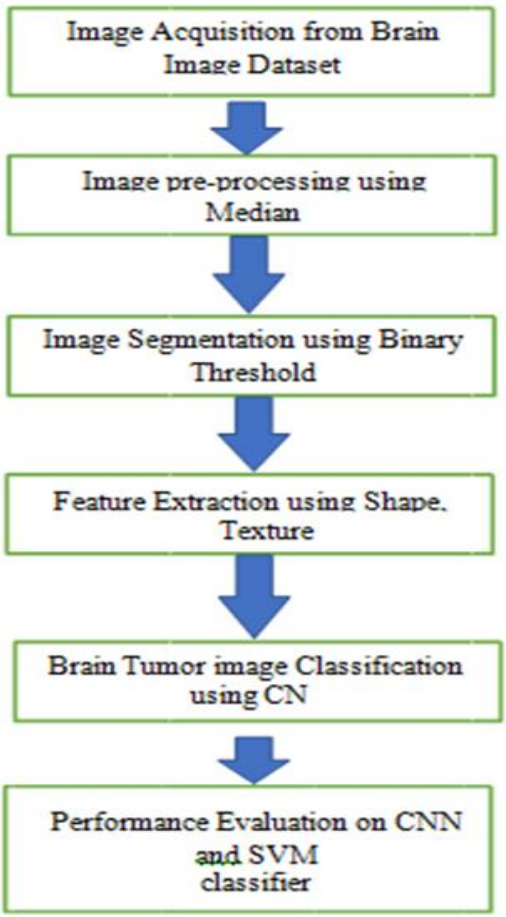

Figure 1: Architecture Diagram

3.4 SVM Classification

SVM Support vector classifier is a supervised learning algorithm that works on the feature matrix taken from the input images, recognize the patterns and finally find the maximum separated hyperplane three types of tumor. By combining the binary classification decision function; this classifier classifies three different types of tumor in brain [9].

4.CONCLUSION

In this summary, we propose a CNN-based method for segmentation of brain tumors in MRI images. There are several existing techniques are available for brain tumor segmentation and classification to detect the brain tumor. There are many techniques available to represent a study of existing techniques for brain tumor detection and their advantages. To overcome these limitations, we have proposed a Convolution Neural Network (CNN) based classifier. The CNN

based classifier used to compare the trained and test data, from this get the best result.

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