IMAGEPROCESSING IN DEEP LEARNING FOR TUMOR DETECTION

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ABSTRACT

Brain Tumor is to be considered one of the deadliest diseases which occur in the human brain and can destroy someone's ability to perform tasks well, read, write communicate, think and much more as brain is the main part of a human body which helps in functioning and giving orders to the other parts and organs of the body. The detection and extraction If the tumor region from the MRis the main concern and it is a very lengthy task depending on the radiologist. Hence the role ofcomputers and other electronic devices readily available or invented out there comes into play to improve the performance and reduce the complexity in the segmentation process. Astherole of machines are there, following it the prediction and detection would be there done by machine learning and deep learning. This task can be performed with various machine learning techniques such as SVM, random forest, regression etc but for getting a better accuracy the neural network shave be enused. The main motive of the paper is to provide a better accuracy. This shows a higher degree of overlap between the automated(machine) derived tumor zone and the manuallyextracted tumor region by radiologists. In compared to state-of-the-art methodologies, the simulation results demonstrate the significance in terms of quality parameter sand accuracy.

Index Terms— Analysis, machine learning, braintumor prediction, deep learning, artificial neuralnetwork

I.INTRODUCTION

Brain, being the controller of the entire body, plays the most important role in making a body function properly The disease that can occur in brain is known as the brain tumor which is nothing but basically a mass growth of abnormal cells in the brain. The disease is very harmful as there are various types of brain tumors, some of them are non-cancerous while some of them are cancerous. These can also be known as benignwhich are non-cancerous and malignant which are cancerous [5]. They generally occur in the brain, and also they are so harmful that they start spreadingto the other parts of the brain. The main problemis how quickly the tumor can grow is thedetermining Factor for the functioning of the nervous system.[2] The treatment is varied as depends on the type of the tumor as well as the location of the tumor as where it is happening. Some of the symptoms and signs of this tumor scan be difficulty with balance, speech difficulties,feeling very tired after doing a small work, unable to follow what one says etc. There have been many cases where the cause of tumor isn't clear, hence some of the ways it can occur is through exposure to radiation or if the family has brain tumors and it is transferred through the genes. Now the Detection is easy as there are modern computerized [3]. Techniques such as machine learning and deep learning techniques which play a very crucial role in detecting the disease and helps in the prediction at an early stage where the brain tumor can be avoided and kept to be a benign one.

II. LITERATURE OVERVIEW

Much work has been done in this following field and some of it are, in [1] the main was to prove the results that had been obtained which was an average of 0.82 dissimilarity index and it was better because it indicated

better overlap between the extracted tumor region with manually extracted tumor by the radiologists. In[2] the author tests different deep learning methods which are ResNet, DenseNet, MobileNet and after researching all and performing the model she got an accuracy of 91.8, 92.8, 92.9 respectively [3]. In The image segmentation has been performed through TKmeans clustering to detect the tumor. The results that have been show in that has better accuracy and a very reduced execution time than the other existing schemes. In [4] The main is to calculate the region of the tumor with different ensemble methods like KNN-RF-DT combined together and made into vote which make a good voting method. With a dataset of 2556 images they have received anaccuracy of 97.3%.

III. METHODOLOGY

A. DATA PREPARATION

Data Being the most important part of the entire model that needs to be performed needs to be carefully collected or taken [8]. As the collection process is not an easy task, it is better to take a data set readily available. The dataset that is taken is from Brain MRI images for brain tumor detection [10]. The dataset consists of high-qualityimages of the MRI scan acquired from the patients and the classification out there in thedatabase is based on the two classes no tumor-0or tumor-1. In figure 1we can see the glimpse of the dataset with two classes-tumor and no tumor. May have some noises and variationswhich need to be figured out and improved to make it a perfect dataset [21]. In the data set used by the authors data augmentation technique is usedto increase the size of the dataset images which would be beneficial for the model.

B. DATA PREPROCESSING

The preprocessing plays an important role in determining the output of the model, i.e. the accuracy of the model [12]. The features/attributes may have some noises and variations whichneed to be figured out and improved to make it a perfect dataset. In the dataset used by theauthors data augmentation. This technique is used to increase the size of the dataset images which would be beneficial for the model to get the features from the images and perform better [11]. Mainly, data augmentation is used to increase the amount of the data, which in our case is to increase the dataset image size by slightly modified copies of the existing or newly created data. It also plays a role as regularize and helps reduce

C. MODEL ARCHITECTURE

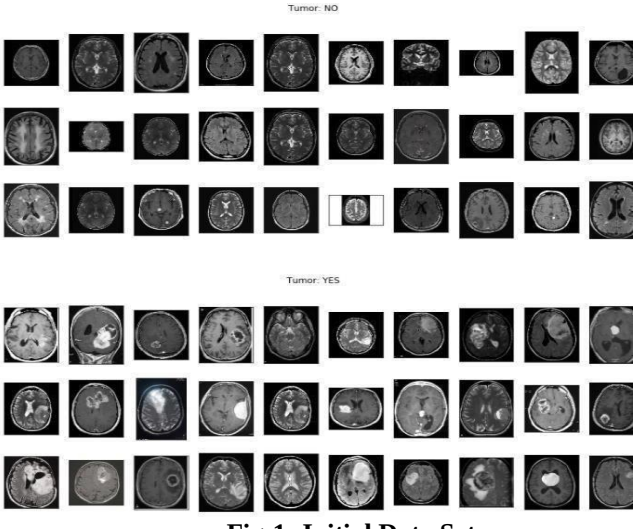

Fig-1: Initial Data Set

ANN stands for Artificial Neural Network, and it is built of the structure and function of the biological neural network, which is the primary reason for the construction of the Artificial neural network architecture. It is often made up of neurons that are arranged in layers and neurons that are comparable to those found in the human brain. The input signal is absorbed by a processing unit, while the output layer provides network output. In these linked configurations, the input and output layers are always present, as they are in all network topologies [6]. The Hidden layer is the third layer, and it keeps neurons out of the input and output layers. These neurons are hidden from anyone engaging with the system and behave as a black box. The system's computing and processing capabilitiescan be increased by adding more hidden layers containing neurons, but the system's training phenomena grow more complicated at the same time. Tensor Flow is used to execute the ANN; tobegin, we would use the sequential function to initialize the ANN [5]. After it, we'd add levels to it, starting with the input layer, which would contain an activation function called 'relu.' The activation function is used to determine if theoutput of a neural network is yes or no. It translates numbers ranging from -1 to 1 or 0 to 1, and so on. The procedure would be repeated for the four hidden layers, and then the sigmoid would be used as the activation function for the output layer. The ANN is then compiled, with Adam optimizer as the loss function, binary cross entropy as the loss function, and accuracy as the metrics [4] overfitting when training the model. In figure2 a glimpse of the augmentation done of 1 image is done. After that the next step would be to divide the dataset in to training dataset and testing dataset. The main aim for doing so is to train the algorithm better so it can show actual results onthe unknown data which is presented to themodel in the form of testing data

D. FEATURE ENGINEERING

Features/attributes are the main components on which the model that has been used works as if there are no features the models won’t be having a deciding factor for prediction as a result the accuracy would be very less hence more features means more the accuracy and better the model will perform [18]. Visualization plays an importantrole in this as it helps to know which feature/attribute has a more weightage in determining the success of the model. In the figure 3 entire step of feature extraction has been displayed, in first step the original image is taken, followed by step 2 in which the biggest contour is found and then the extreme points are collected and finally cropping is done.

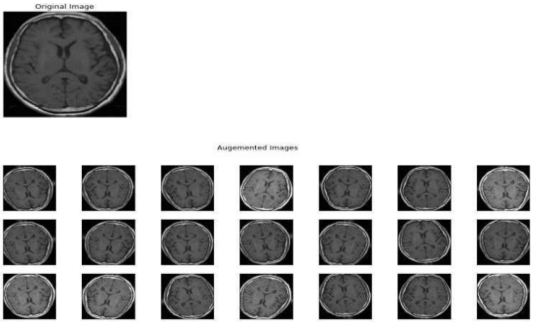

Fig-2: Augmentation Example

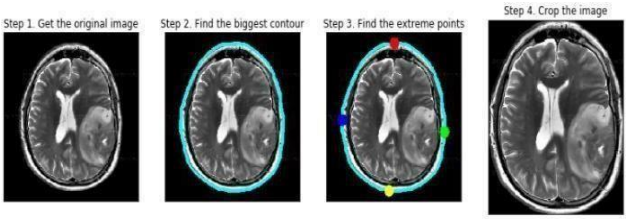

Figure 3: Feature extraction step

IV. EXPERIMENTAL RESULTS

From collecting or taking the dataset from the MRI images of the patients to augmenting the images to make the dataset clear for the algorithm imposed and then applying the deep learning neural networks i.e. Artificial neural networks and performing 100 epochs gives us anaccuracy of 97 percent after the 100th epoch. As we know more the epochs, more it will be able to train the dataset well and then finally the testing of the dataset on the remaining test cases which were removed from the dataset gives us the accuracy of the model. After that a confusionmatrix of the testing data is created which tells us about how the algorithm has performed and it is good aspect in terms of analysis.

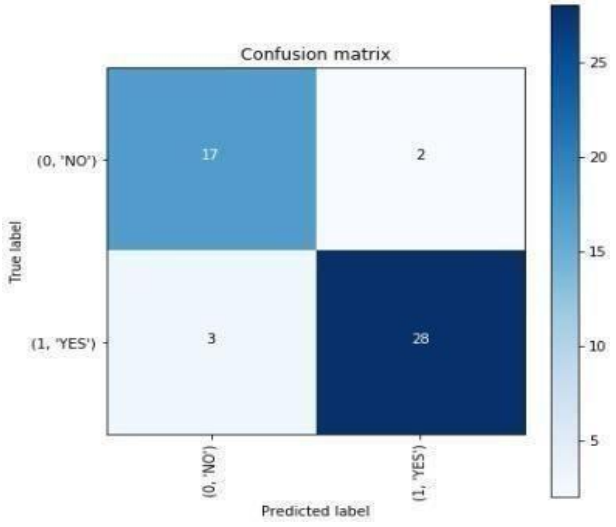

Fig-4: Confusion Matrix

V. CONCLUSION

The Brain tumor detection decision support system assists and helps doctors in making the best, most accurate, and quickest decisions possible while al so reducing total treatment costs. By predicting strokes at an early stage, the suggested technique lowers treatment costs and improves quality of life. We were able to attain a stunning 97 percent accuracy on a specific dataset by using Artificial Neural Networks, which is a tremendous outcome in terms of science and segmentation in very less time than the techniques which are already present in the brain tumor research.

VI. FUTURE SCOPE

This topic has played an important role in the research and the medical advancement that is happening out there in the world; hence it should be researched more by taking a real time dataset of different human beings and then analyzing it on the basis of the model by doing the preprocessing and all. The next step would be to try the databases on different ensemble models, which can be used to get a better accuracy and can be helped in reducing the complexity of the segmentation in very less time than the techniques which are already present in the brain tumor research. By predicting strokes at an early stage, the suggested technique lowers treatment costs and improves quality of life. We were able to attain a stunning 97 percent accuracy on a specific dataset by using Artificial Neural Networks, which is a tremendous outcome in terms of science and creativity and will help us have fewer people die from malignancies and offer required aid at an early stage.

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