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# Detection of Brain Tumor by Using CNN Algoriyhm on Deep Learning and Image Processing Techniques

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**ABSTRACT —**

In this project, classification of three types of brain tumors explained. Brain tumors account for having the lowest survival rate and being the most fatal cancer in the world. This makes detection and early diagnosis of the same to be of utmost importance. Classification of tumors depends on the shape, size. Magnetic Resonance Images (MRI) prove to be the most effective technique for distinguishing tumors. The main aim of the proposed work is to capture the distribution of unique features from the input MRI dataset images. These images are then synthesized using a generative model which classifies the dataset to detect the presence of a tumor in brain. Deep learning algorithms such as Convolutional Neural Network (CNN) help in classification of the different tumors. The proposed model is experimentally evaluated on three datasets. The suggested methods provide for the successful comparison and convincing performance. An accuracy of 98.50 % was achieved with Mobile Net Architecture.

***Keywords— Taxonomy, CNN, Active contour, Machine learning, SVM.***

## I. Introduction

Brain tumors are one of the most dangerous illnesses that can be seen all people in every age. The reason brain tumors are highly dangerous is that they are located in the nervous system. Each year; approximately 12000 people are diagnosed by this disease. According to Davies, between the 20-44 age, while the rate of survival is 50%, after 65 years old the survival rate decreases to 5%. Because of the importance of brain tumors, diagnosing earlier will help to intervene rapidly. In addition, by using machine learning and image processing methods, the missed diagnoses cases can be detected truly. Brain tumor detection is possible by transferring MRI images to digital software. Transferred images can be classified according to tumor size and its location.In this project; We will detect the brain images in our selected dataset using image processing and classify the diagnosed tumors with machine learning techniques by using MATLAB. In literature review part; there are studies about brain tumor detection and classification methods which were useful for this project

## II. LITERATURE REVIEW

Ankitha G,Hafsa Tuba J,Akhilesh J at al[1]The main aim of the proposed work is to capture the distribution of unique features from the input MRI dataset images. These images are then synthesized using a generative model which classifies the dataset to detect the presence of a tumor in brain. Deep learning algorithms such as Convolutional Neural Network (CNN) help in classification of the different tumors. The proposed model is experimentally evaluated on three datasets. The suggested methods provide for the successful comparison and convincing performance. An accuracy of 98.02% was achieved with ResNet50 architecture and 98.32% with Xception architecture .Chandrakanta Mahanty Raghvendra Kumar at al[2]This is generally done by extracting features through a convolutional neural network (CNN) and then classifying using a fully connected network. The proposed work involves the approach of deep neural network and incorporates a CNN based model to classify the MRI as "TUMOR DETECTED" or "TUMOR NOT DETECTED". The model captures a mean accuracy score of 96.08% with f score of 97.3. Muhammad Sharif, Mussarat Yasmin et al[3] Support Vector Machine (SVM) classifier is applied with different cross validations on the features set to compare the precision of proposed framework. The proposed method is validated on three benchmark datasets such as Harvard, RIDER and Local. The method achieved average 97.1% accuracy, 0.98 area under curve, 91.9% identify the tumor more accurately in less processing time as compared to existing methods.

## III. Proposed work

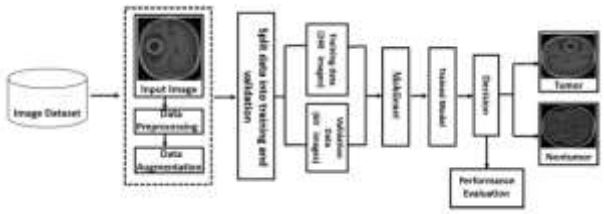


Fig. 1. Systematic Block diagram of Proposed work

Our proposed system is a brain tumor detection system that uses deep learning techniques. The system will take medical images such as MRI scans as input and output the probability of the presence of a tumor. The system will also be able to locate the tumor and provide information on its size and type. The proposed system will use convolutional neural networks (CNNs) to analyze medical images and accurately detect the presence of a tumor.The system will be trained on a large dataset of MRI scans of both tumor and non-tumor patients. The dataset will be preprocessed to normalize the images, remove artifacts, and segment the tumor region. The preprocessed data will be fed into the CNN for training. Once the model is trained, it will be able to analyze new MRI scans and accurately detect the presence of a tumor.

**Data Acquisition:** The data collected had been separated into two categories as healthy and non-healthy ones. Further, the images are of different dimensions so they are converted into the same dimensions of 224*224.

**Pre-Processing:** In this stage noise removal will be done from the MRI images to increase the accuracy of the model. MRI images often consist of noise which will increase the redundancy and hence decrease the accuracy of the model. There is a high chance of a tumor not getting detected because of the noise present on the borders of an MRI. Hence affects the accuracy of the model. Pre-processing was done by scaling, reducing and converting them into grayscale. Image Pre-processing is done to enhance the quality, look and characteristics of the image.

**Image Smoothing:** This is an act of simplifying images while preserving important information. The aim is to reduce unnecessary noise or detail without creating too much distortion to simplify subsequent analyses.

**Feature Extraction:** Feature extraction is the process to extract useful information out of the image. Pixel-based feature extraction is used to extract the information and get it classified into tumor or non-tumor.

**Classification:** Classification of brain MRI images from tumor to non-tumor is done using the Convolutional neural network. The classifier used for classification is done by CNN itself. It is highly accurate while dealing with image related datasets. It is used for classifying tumor or non-tumor MRIs.

### *A. Methodology*

This project is carried over by two machine learning classifiers as following

#### *1. Convultional Neural Networks*

Artificial Neural Networks (ANN) are capable of learning and may thus be trained to recognize patterns, develop solutions, predict future occurrences, and classify data. The use of ANN for traffic-related activities is well established. The way its separate computing parts are coupled, as well as the intensities of these connections or weights, determine how neural networks learn and behave. These weights can be automatically modified by training the network according to a learning rule until it completes the task appropriately. These well-known parameters assist the ANN in making predictions. The fundamental components of a training dataset are input data and their response values. The greatest strategy to increase predictive power and the ability to generalize across several new datasets is to employ larger training datasets. The back propagation algorithm can be used to classify. Back propagation is a typical way of training artificial neural networks to reduce the goal function to the smallest possible value. It is a generalization of the delta rule and is a supervised learning method. It necessitates a training set that contains a dataset of the intended result for a variety of inputs. It's perfect for feed-forward networks. The phrase is an acronym for "error propagation".

Steps in CNN algorithms:

Step 1: Randomly initialize the weights and biases.

Step 2: feed the training sample.

Step 3: Propagate the inputs forward; compute the net input and output of each unit in the hidden and output layers.

Step 4: back propagate the error to the hidden layer.

Step 5: update weights and biases to reflect the propagated errors. Training and learning functions are mathematical procedures used to automatically adjust the network's weights and biases.

Step 6: terminating condition.

some characteristic or computed feature, such as colour, intensity, or texture, each pixel in a region is comparable.. In image processing, segmentation is the most crucial step. A fence divides a complete image into many portions, making it more meaningful and easier to process. The complete image will be covered by these many portions that have been linked together.

## IV. Conclusion & Future work

The aim of this paper is to create a model with high accuracy to determine brain tumors from the MRI images. The dataset used consists of 253 brain MRI images and was sufficient to check the performance of the model. The model is based on the machine learning algorithm CNN (Convolutional Neural Network). It helps to predict just by reducing and resizing the image without losing any important information that will be used for predicting. The created model achieves an accuracy of 97.79% when applied to the training set and an accuracy of 82.86% when applied to the validation set. The loss gradually starts decreasing with the increase in the number of epochs. The model loss is very less when applied to the training set whereas it is high when applied to the validation set.In future, different datasets would be applied to this model, to further increase the overall accuracy.

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