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Brain Tumor Detection

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Abstract: *In this paper, we have proposed a novel brain tumor detection method, which uses a convolutional neural network with a transfer learning approach along with the dimensionality reduction method. A brain tumor is a type of cancer that is difficult to detect. A comparative comparison of multiple strategies based on deep learning for brain tumor identification has been offered in this procedure. In addition, several classifier methods are used in conjunction with threshold segmentation algorithms to locate tumors using picture recognition. Magnetic Resonance gray scale images have been discovered to be more suitable for obtaining accurate results because of this method. The deep learning method was proposed using the Convolutional neural network to predict the outcome with high accuracy*

Keywords: Brain tumor, deep learning, Magnetic Resonance Imaging

I. INTRODUCTION

A brain tumor is one of the most critical disease in the medical field. According to the American CancerSociety's brain tumor prediction to be diagnosed in the UnitedStates in 2019, there are 26588 brain tumors [3]. There is a risk that a total of 18532 individuals, out of which 11420 will be maleand 7112 will be female) will die in 2019 from the brain tumors, according to their assessment. Brain tumor survivalrates differ according to tumor type and the patient's age [3] [1]. In medical terms, a brain tumor is an abnormal growth of cellsinside the brain [1]. It induces pressure and influences the normalfunctioning of the brain in the skull region. A brain tumor may beprimary or secondary. A primary brain tumor creates within thebrain or adjacent tissues, such as the cranial nerves while a secondary brain tumordevelops when cancer cells migrate to the brain from other organssuch as the lung, kidney, or breast. Brain tumors can be dividedinto two categories: benign and malignant tumors [4]. The size and resolution of a brain tumor cannot be accurately determined in the early stages of tumordevelopment, making diagnosis difficult [5]. Furthermore, identifying and classifying brain tumors into benign and malignantforms is important for patient treatment and survival. Brain tumors come in various shapes and sizes and can be either malignant or benign. Image processing is the process of examining and modifying a photograph to extract information from it [6]. Various medical image modalities such as Computer Tomography, Positron Emission Tomography, and Magnetic Resonance imaging are used to detect brain tumors [7]. MRI isa non-invasive technique that uses a magnetic field and radiofrequency pulses to reveal the internal structure of the body [9]. Since Magnetic Resonance Image provides a variety of excitation images, Sequences, anddetailed information about brain tissues. It is a useful medical image modality for enhancing diagnosis in the clinic [10]. In this paper, we proposed a novel approach in which we use deeplearning techniques such as the

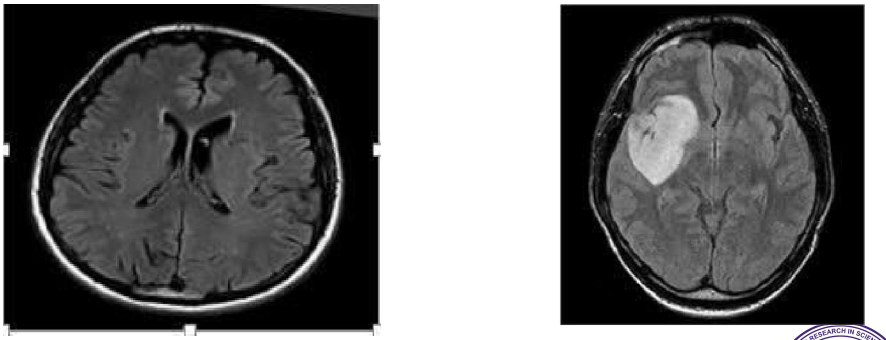

Figure 1: Healthy and Tumor Image

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CNN model with a transfer learning approach for feature extraction. Moreover, the dimensionality reduction method is used to reduce the extracted features and accurately classify the brain tumor.

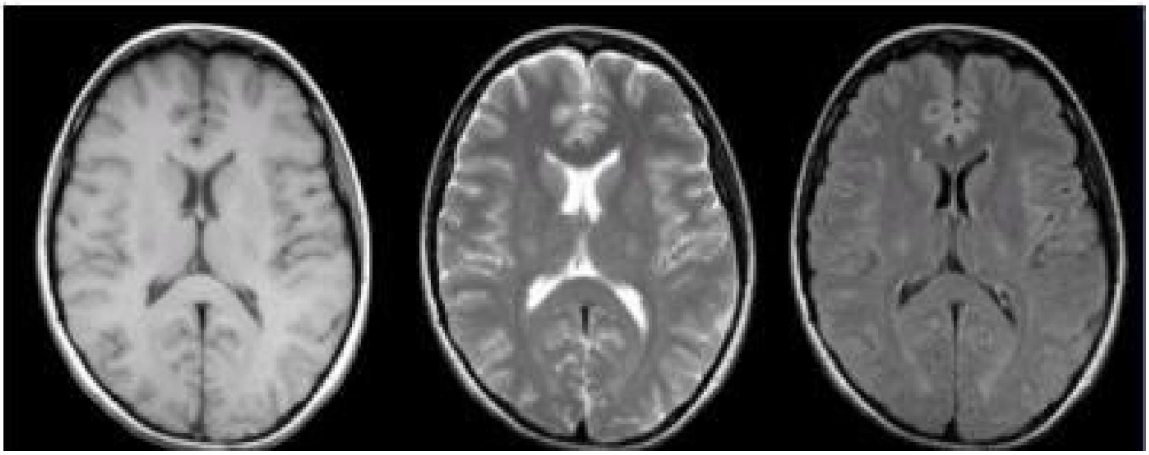

Figure 2: Different MRI Sequence

Proposed Methodology

This section explains the detailed approach for classifying brain tumor MRI images into normal and abnormal categories. The goal of this study is to use deep learning algorithms and a transfer learning (TL) strategy to extract the effective features from the MRI images and along with dimensionality reduction method to present the effectiveness of the proposed model by achieving remarkable accuracy in the detection of tumor from brain MRI images.
The detailed description of each stage of the proposed system is described as follows:

Dataset description

The dataset contains 5234 total samples from which 2520 positive samples and 2520 negative samples are available. The dataset has been divided into 73:27 ratio for the training and testing purpose in this research work.

Image Preprocessing

Pre-processing is the process of transforming data before giving it to the model.

Feature Extraction

The process of extracting the most important information from raw data is known as feature extraction. Because it aims to extract the key information that identifies each class, feature extraction is a critical stage in the building of any classification task. By extracting essential features from images, feature vectors are formed

II. REVIEW OF THE DIFFERENT PAPERS

The 2016 WHO i.e. world health organization on classification of tumor of central nervous system is an conceptutional as well as pertain overview of predecessor. The WHO classification CNS tumor which is used molecular parameters for its diagnosis structure. Further than 2016 CNS WHO presence the new diffuse glomas and other tumor and defines the new feature like both histology as well as molecule [1].
The fourth edition of the world health organization classification of tumor of central nervous system published in 2007.there are several new titles and information list including glioma, papillary, glioneuronal tumor etc. the histological variants are capable of different edge distribution, location, symptoms and the behaviours or clinical [2].
Fuzzy clustering is method which widely used biomedical to detect the image. The effective fuzzy clustering algorithm is used in abnormal MR brain image segmentation. By using clustering in brain tumor segmentation we can diagnose accurately the region of cancer.to provides better identification of brain tumor magnetic resonant images is applied [3].

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Now a day's brain tumor is one of the most hazards diseases so its detection should be fast and accurate. It can be achieved by automated tumor detection techniques on medical images and one of the automated tumor detection techniques is MRI images .which defines the tumor growth region and the edges detection. As compare to other techniques with this is gives more accurate as well as clear and advantages of automated tumor detection techniques is used for removal of tumor if needed [4].

The neural networks is a new technology has been discovered .the neural network are an "HOT" research area, like a cardiology, radiology, oncology etc.to solve highly complex problem three is combination of neurons into layers permits for artificial neural network. In an medical applications the neural network are like ANNs etc. and the medical application the neural network are used to map an input into a desired output [5].

It is a new technique of detection of brain tumor and for very good result and accuracy. The watershed method is combined with edge detection operation. The color brain MRI images can be obtained by this algorithm. In this the RGB image is converts into on HSV color image so that the image is separated in 3 regions which are known as hue, saturation and intensity. The canny edge detector is applied is applied to an output image for rebuilt process of edge occurs in this .at last combining the three images and the final resultant brain tumor segmented image is obtained. This algorithm is applied on 20 brain MRI images for excellent result [6].

In an MRI image the highly irregular boundaries of tumor tissues is seen. For a segmentation of medical image, the deformable modes and region base methods are used. The main problems are there in MRI images like undefined location of tumor are unseen boundaries or data loss at boundaries and a silent edge not extended. By using this algorithm the silent edge is extended and found boundary of tumor location or area and once the boundary or location of tumor is seen clearly. Then removal of tumor can be take place [7].

Author	Year	Paper Name	Technique	Result
S. Das	2016	The new WHO classification of brain tumors	Brain Pathology	It gives different edge distribution, Syptoes.
D. N. Louis	2017	The 2007 WHO classification of tumors of the central nervous system	Detection of CNS(Central Nervous System)	The molecular parameter is used for its diagnosis structure.
M. Siar	2019	"Effective Fuzzy Clustering Algorithm for Abnormal MR Brain Image Segmentation	Abnormal MR Brain Image Segmentation	It gives abnormal MR brain image segmentation accurate region of cancer and better identification of branch i.e. stage of cancer.
D. Joshi	2020	Implementation of an improved cellular neural network algorithm for braintumor detection	Neural network	It solves high complex problem and it is used to map an input into a desired output.
S. Deepak	2021	A new method for brain tumor segmentation based on watershed and edge detection algorithms in HSV color model	watershed and edge detection algorithms in HSVcolor model	It gives color brain MRI image foe very good accuracy result.
V. K. Lakshmi	2022	An efficient brain tumor detection by integrating modified texture based region growing and cellular automata edge detection	Automated and efficient brain tumor detection	The proposed method efficient in treatment of brain tumor and also in removal of tumor.
Y. Bhanothu	2023	Performance Analysis of Fuzzy C Means Algorithm in Automated Detection of Brain Tumor	Fuzzy C Means Algorithm in Automated Detection of Brain Tumor	The boundary of tissues can be seen clearly.

TABLE I : COMPARISON OF REVIEW PAPER

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III. RESULTS

PROJECT PARAMETERS					
S.NO	CLASSIFIER OR MODEL	ACCURACY	PRECISION	RECALL	SPECIFICITY
1.	K-Nearest Neighbour	89.39	0.933	0.949	0.428
2.	Logistic Regression	87.88	0.918	0.949	0.286
3.	Multilayer Perception	89.39	0.894	1.000	0
4.	Naive Bayes	78.79	0.959	0.797	0.714
5.	Random Forest	89.39	0.983	0.983	0.167
6.	SVM	92.42	0.935	0.983	0.428
7.	CNN MODEL	95-97	96-98	93-96	95-98

IV. CONCLUSION

In this paper, we have proposed different techniques to detect and segment Brain tumor from MRI images. It can be seen that detection of Brain tumor from MRI images is done by various methods, also in future work different automatic methods achieve more accuracy and more efficient. A Brain Tumor MRI image is applied to preprocessing and after that tumor is extracted morphological and watershed segmentation processes. The medical image segmentation has difficulties in segmenting complex structure with uneven shape, size and properties. For accurate diagnosis of tumor patients, appropriate segmentation method is required to be used for MRI images to carry out an improved diagnosis and treatment. The Brain Tumor detection is a great help for the physician and a boon for a medical imaging and industries working on the production of MRI images

CONFLICT OF INTEREST: The authors confirm that there is no known conflict of interest associated with this publication.

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