BRAIN TUMOR CLASSIFICATION AND DETECTION USING MRI SCAN IMAGES

Under the guidance of
A.SIREESHA
Assistant Professor
Department of CSE
Teegala Krishna Reddy Engineering College
Hyderabad,India

Sulam Tulasi
Dept of Computer Science Engineering
Teegala Krishna Reddy Engineering College
Hyderabad, India
sulamtulasi08@gmail.com

Narra Ramya Reddy
Dept of Computer Science Engineering
Teegala Krishna Reddy Engineering College
Hyderabad, India
ramyareddynarra123@gmail.com

Syed Saad
Dept of Computer Science Engineering
Teegala Krishna Reddy Engineering College
Hyderabad, India
syedsaadmom@gmail.com

Abstract- A Brain tumor is considered as one of the aggressive diseases, among children and adults. Brain tumors account for 85 to 90 percent of all primary Central Nervous System(CNS) tumors. Every year, around 11,700 people are diagnosed with a brain tumor. The 5-year survival rate for people with a cancerous brain or CNS tumor is approximately 34 percent for men and 36 percent for women. Brain Tumors are classified as: Benign Tumor, Malignant Tumor, Pituitary Tumor, etc. Proper treatment, planning, and accurate diagnostics should be implemented to improve the life expectancy of the patients. The best technique to detect brain tumors is Magnetic Resonance Imaging (MRI). A huge amount of image data is generated through the scans. These images are examined by the radiologist. A manual examination can be error-prone due to the level of complexities involved in brain tumors and their properties.Application of automated classification techniques using Machine Learning(ML) and Artificial Intelligence(AI) has consistently shown higher accuracy than manual classification. Hence, proposing a system performing detection and classification by using Deep Learning Algorithms using Convolution Neural Network (CNN), Artificial Neural Network (ANN) would be helpful to doctors all around the world.

Index Terms- Brain Tumor classification, Machine learning techniques, Convolution Neural Network

I.INTRODUCTION

Medical imaging refers to several techniques that can be used as non-invasive methods of looking inside the body. The main use of medical image in the human body is for treatment and diagnostic purposes. So, it plays a significant role in the betterment of treatment and the health of the human. Image segmentation is a crucial and essential step in image processing that determines the success of image processing at a higher level. In this case we have mainly focused on the segmentation of the brain tumour from the MRI images. It helps the medical representatives to find the location of the tumour in the brain easily. Medical image processing encompasses the utilization and exploration of 3D image datasets of the physical body, obtained most typically from computed tomography (CT) or Magnetic Resonance Imaging (MRI) scanner to diagnose pathologies or guide medical interventions like surgical planning, or for research purposes. Medical image processing is applied by radiologists, engineers, and clinicians to understand the anatomy of either individual patients or population groups highly. Measurement, statistical analysis, and creation of simulation models which incorporate real anatomical geometries provide the chance for more complete understanding, as an example of interactions between patient anatomy and medical devices.

There are three basic types of tumors: 1) Benign; 2) Pre-Malignant; 3) Malignant (cancer can only be malignant).

In this project we are exploring Malignant brain tumours and it's types. They are mainly Glioma, Meningioma, pituitary tumors.

Scope of the Project

The scope of the project is to detect the brain tumor and its classification by considering the dataset with some features which include the major types of tumors. The given MRI scan image is considered as an input and preproccess the data ,further the model is trained by using the Convolution Neural Network. The output provides the classified result of the brain tumor of the provided MRI scan image. Python is used as a platform for the progress of the required output in this project.

II. LITERATURE SURVEY

Brain Tumour segmentation methods can be divided as three parts. Manual methods, Semi-automatic methods and Absolute automatic methods. We can determine it according to the level of user interaction required.

Manual segmentation methods

It needs a medical specialist to use the different information picturize by the MRI images along with anatomical and physiological knowledge achieve through training and experience. This procedure requires the medical specialist going through multiple slices of images part by part, analyzing the brain Tumour and manually cropping the tumour regions carefully. It's a time consuming task as manual segmentation is also doctor dependent and segmentation results are subject to large intra and inter ratter variability. Although, this is widely applied to execute the results of semi-automatic and fully automatic techniques.

Semi-automatic segmentation methods

It needs the reaction of the user for three main purposes; initialization, intervention or feedback response and evaluation. Initialization is mainly executed by defining a region of interest (ROI), restraining the estimated Tumour area, for the automatic algorithm to process. Parameters of pre-processing technique can also be balanced to fit the input images. In addition to initialization, automated algorithms can be directed towards a necessary result throughout the procedure by receiving feedbacks. This process also provides the adjustments in response. Again, user can estimate the results and change or repeat the procedure again if not satisfied. Hamamci et al. proposed the “Tumour Cut” method. This method comprised applying the algorithm separately to each MRI modality (e.g. T1, T2, T1-Gd and FLAIR). Then we combine the outcome to obtain the final tumour volume. A current semi-automatic method applied to a novel classification approach. In this technique segmentation problem was converted into a classification problem and a brain tumour is segmented by training and classifying within that same brain only. Commonly, a machine learning classification technique, for brain tumour segmentation, needs a large quantity of brain MRI scans images (with checked answers) from different cases to train. This outcome in a necessity handles intensity bias correction and other noises. Although in this approach, user initializes the procedure by sort out a subset of voxels linked with each tissue type, from a single case. For these subsets of voxels, algorithm extracts the intensity values along with spatial coordinates as features and trains a support vector machine (SVM) that is used to classify all the voxels of the same image to their corresponding tissue type. Semi-automatic brain tumour segmentation approach not only takes reduces time than manual method but also it can maintain efficient results but still prone to intra and inter-rater user variability. Therefore, recent brain tumour segmentation research is mainly focused on fully automatic methods.

Absolute automatic segmentation methods

In this approach user does not need any interaction. Most importantly, artificial intelligence and preparatory knowledge are merged to solve the segmentation problem.

Automatic segmentation of gliomas (A type of tumour that occurs in the brain and spinal cord) is a very tuff and important problem. Brain tumour MRI data obtained from clinical scans or synthetic databases are naturally complicated. The devices for MRI and protocols that are using for acquisition can vary significantly from scan to scan imposing intensity biases and other variations for each different part of image in the dataset. Several modalities need to significantly segment tumour sub-regions even adds to this complexity.

III. METHODOLOGY

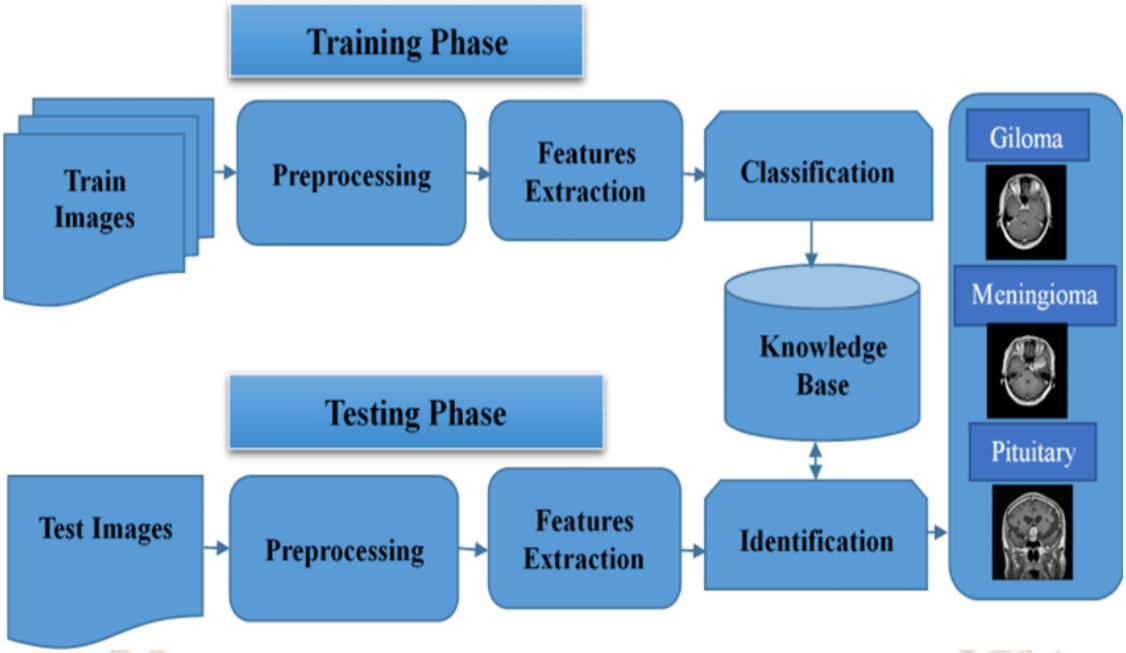
Deep Learning algorithms like Convolution Neural Network and Artificial Neural Network are used in this project for training and testing the model.

Existing System

- Manual inspection of the MRIs.
- Human written report.

Proposed System

- Our proposed system is deep learning model which detects and classifies the type of brain tumor.
- Since it is automated, the time taken for diagnosis is very less.
- There is the less chance of misdiagnosis.
- Human error is reduced as there will be no human written report.



System Architecture

IV. ALGORITHMS

Convolution Neural Network (CNN):

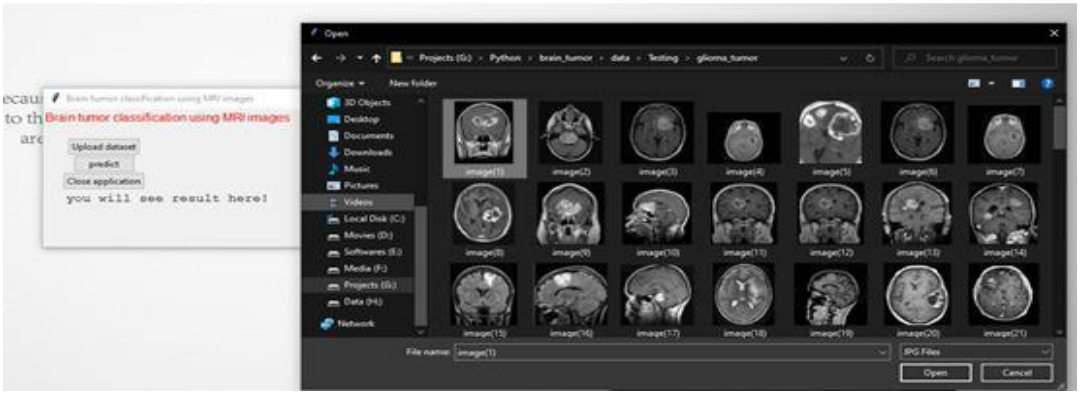
Convolution Neural Network is used for image analysis tasks like image recognition, objection detection and segmentation. CNN has three layers: Convolution layer, Pooling layer, Fully-Connected layer. The filtration of type of tumors is done using CNN as it has labelled scan images loaded at first for filtration process.

Artificial Neural Network (ANN):

ANN is a digital model connected with large number of interconnections. A neural network, with one input and one output and many hidden layers. Here in our project, ANN is used for the progression of the input scanned images into the trained model and provides the output.

V. RESULTS

The Output Screen



Uploading the dataset(input MRI scan image)

CLASSIFICATION OF BRAIN TUMOR

VI. CONCLUSIONS

Various methods have been proposed for brain tumor detection, segmentation, and classification. Our work is focused on major types of tumors for classification. To diagnose and treat the brain tumor, we have to find whether it is malignant or benign, its location, grade, type. A few existing methods are using different models for detection and classification, which results in more computational complexity. We have proposed the method addressing these two key issues. Our model uses the Convolutional Neural Network. In the method, all the results required to diagnose are obtained by using brain tumor classification and brain tumor identification modules. This method will be suitable for classifying major tumor types as the diagnosis can be done as early as possible.CNN is considered as one of the best technique in analyzing the image dataset. The CNN makes the prediction by reducing the size the image without losing the information needed for making predictions. ANN model is used for providing more image data. The model developed here is generated based on the train and test method. We have achieved a fully functional model that efficiently detects and classifies brain tumors.

VII. REFERENCES

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