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Segmentation of Brain Tumor from MRI using Deep Learning

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Abstract: ***In the medical field Brain Tumor Segmentation plays an important role that helps to detect the tumor in brain. Today there are various methods for tumor detection like manual segmentation, but all these methods are time consuming. So, In this paper automatic brain tumor segmentation is been used for tumor detection. There are many steps involved in brain tumor detection. First process is Pre-processing, second method is Feature Extraction and final method used is Segmentation. For the implementation python programming language is used. When a training image is given it will be first scanned for each pixel. In order to detect the area prone to have tissue which may be malignant or benign. This will help to decide if the cell is cancerous or normal. All this is done by image processing. By this the doctors and medical experts can easily get information about tumorous tissue in the brain so the patients can be easily diagnosed from brain tumor.***
Keywords: Malignant, Benign, Pre-processing, Feature Extraction, Segmentation.

I. INTRODUCTION

In these days cancer has become so common that any individual can be prone to it. Brain tumor is one kind of tumor. But early detection and diagnosis can help to heal the cancer. Today in medical field thee are various techniques to detect brain tumor. Segmentation of brain tumor from MRI using deep learning is one of the methods used to detect brain tumor. In this method undergoes brain tumor detection by learning the properties of the cancerous tissues and diagnose the tumor. It will also note whether the condition the of brain is normal or abnormal.

As there is problem in segmentation of brain tumor for multi modal images due to not predicted shapes and size of tumors in brain. Sometimes there are many variations in tumor structures and representations and also the position where the tumor is present, hence we require automatic methods for the purpose of brain tumor segmentation. Some of the operations on these image can be performed by using image processing.

To get enhanced image or in order to retrieve some of the important information from it. Various MR sequences give information about the lesion in the volume. Here in this proposed method it makes use of Convolutional Neural Networks (CNN's). this is used when the number of dataset is large to perform brain tumor segmentation by MR scan.

II. EXISTING SYSTEM

In artificial intelligence system image processing and machine learning is important issue. Existing system makes use of algorithms like clustering algorithms which is used to classify images to different two groups where one group will contain brain tumor and the other group is the one which do not have tumor that is cancerous. Also these existing systems made use of steps like feature extraction that is very important to obtain and retrieve the necessary informations from the data that is original that is done by making use of various techniques that can be used when the size of the image is not in specified range or the image that is large. The next step that is used in the existing system is K-nearest algorithm that will combine the points of K-nearest based on factors like their distance and this will also join into clusters. After this all these clusters will be evaluated before the final step. Now the last step used in the existing system used is C-means algorithm. The main work of this algorithm is to remove the clusters that are empty.

The main drawback of this existing system is that these do not make use of Pre-processing step, because of which this will result into robustness toward the noise. These noise are present in training dataset. When there is large dataset this existing system do not work well. Another disadvantage of this existing system is that the actual shape, size and type of the tumor cannot be predicted.

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III. PROPOSED SOLUTION

In this proposed system initially the user can get the image. Now by this step the user can be able to upload the image this can be done when the user chooses an appropriate brain image. After the image is uploaded by the user, the user can be able to detect the part of the brain that is affected by performing various methodologies. In the proposed system PYTHON programing language is used by the user to process the uploaded image. Next process in brain tumor segmentation is feature extraction where the image processing will be implied on the selected images by the user, in order to extract the important and useful features from those images. which also is required for result analysis. In the next step the segmentation is performed to detect the brain tumor. Finally after all the steps the tumor will be detected on the brain and exact location of the tumor will be seen by user. All these are done by using PYTHON. To keep note on the severity of the tumor this will focus on affected area. If the detected tumor is cancerous then the system will display the entire features of this tumor so that it can be easy for diagnosis and can be helpful to recover the patient as early as possible.

A. System Design

System design is also called as high level design. The main importance of system design is that it will identify all the modules that are involved in the entire system. It also specifies the modules with all its specifications, this will be able to deduce the way the indulge with one another so that they can produce a ultimate output. Decisions on all the necessary modules in the system like file and output formats will be made at the last of the system design.

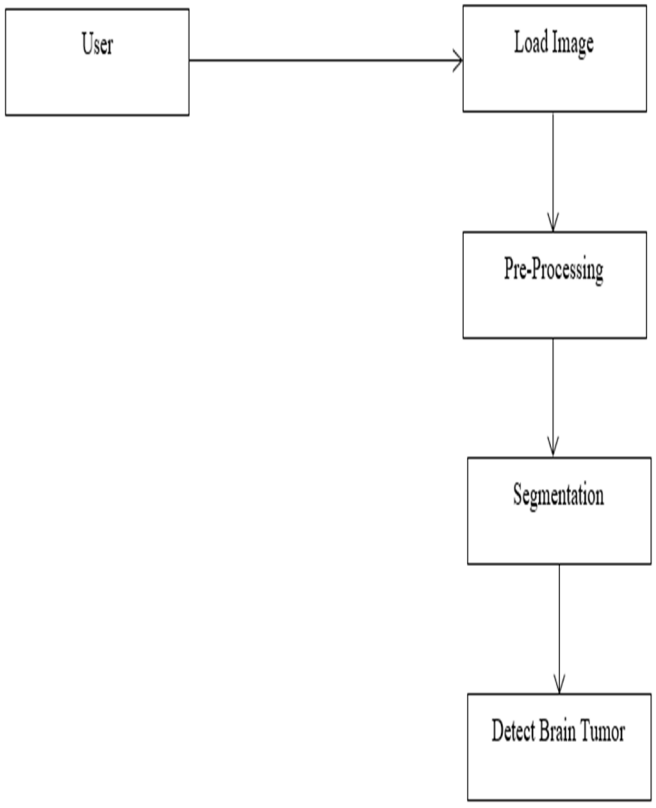

Fig1.System Architecture

The above figure 1 is the system architecture of the proposed system which will show the segmentation of brain tumor from MRI using deep learning. The first module is the user who will load the image of the brain from the dataset. After the image gets loaded by the user the next step pre-processing where the noise is removed from the image. After pre-processing the final step is segmentation where pre-processed image in previous step is been segmented. Finally after segmentation the tumor in brain is detected for further diagnosis of the cancer.

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B. Flow Chart

Workflow or process of any system implementation is represented by a flowchart. Flowchart is also called as algorithms diagrammatic representation. It is also a step by step approach of solving a problem or a task. The steps is shown as boxes of various types. They are connected to one another by using arrows. These flowcharts are mainly used to analyze, design and document a process or also any program.

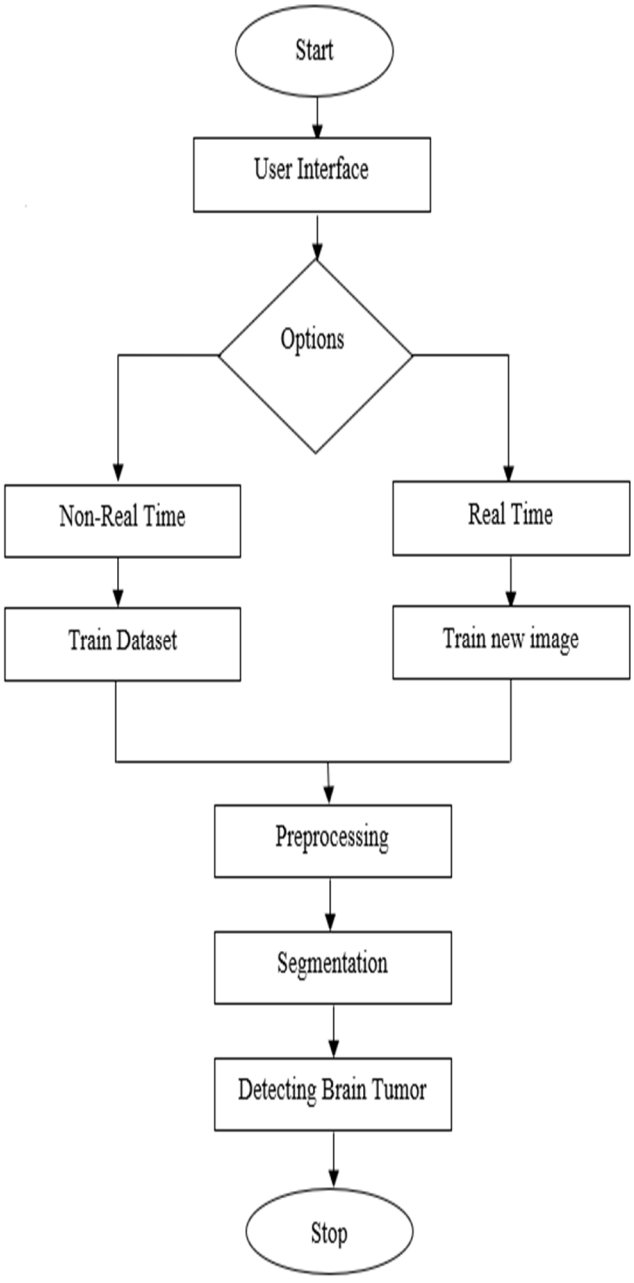

Fig 2 .Flow Chart

The above figure 2 is the flowchart of proposed segmentation of brain tumor from MRI using deep learning. This flowchart represents symbolically how the data will flow around and throughout the system. In the user interface user can select the option on real time or nonrealtime. Then the user will be able to input the image, in next step the process of pre-processing will take place on this input image. Finally segmentation will take place where the brain tumor will be detected.

IV. SYSTEM IMPLEMENTATION

Working system is generated from theoretical design in system implementation, replacing an existing manual, or automated system and it may be a major modification into an existing system. The system is implemented using ANACONDA NAVIGATOR and data set.

A. ROI (Region of Interest) Detection

These are samples which will be within the dataset that is used for particular purpose. It will be used the area of applications. ROI will be used to point in the are of interest nothing but in tis application the area where tumor is present.

B. Normalization

In MR images normalization is important process. This will enhance the quality of the images and removes noise from the images.

C. DenseNets for Semantic Segmentation

When each of the layer in the network will be connected with other layer in the feed forward fashion the will be substantially more accurate which will have less number of parameters. Each pixel in the voxel in the image will be assigned to the corresponding anatomical region.

D. Loss Function

In this loss function the parameter values in the neural network model will be optimized. This function will map the set of parameters value with scalar value that will indicate how this parameters perform the task that the network will have to do.

E. Feature Extraction

In this process the initial set of the raw data will be reduced into manageable groups by using dimensionality reduction.

V. EXPECTED RESULTS

The will be allowed to select image of brain and insert it. the image is selected from the specific folder where the image is stored in dataset. The steps of pre-processing , feature extraction and segmentation will take place by selecting the image of brain. The sample image in the dataset will e train by resizing image. After segmentation the detect tumor is used to display the tumor region on the brain.

VI. CONCLUSION AND FUTURE WORK

Automatic segmentation of the brain tumors is a challenging to detect the tumor if it is cancerous or not. The detection of tumor must be early in order to diagnose at earliest. As the Manual segmentation of the brain tumor for cancer diagnosis is time consuming. Hence to overcome this it uses automatic brain tumor image segmentation. Pre-processing, feature extraction and classification are the steps involved in brain tumor detection. The system provides a review of MRI based Brain tumor segmentation methods based on the state-of-the art methods. Deep learning methods are considered as the current best state-of-the-art for brain tumor segmentation. The method used is Convolutional Neural Networks which have advantage of automatically learning complex features for tumor tissues directly from the multi-modal MRI images and it will also display the region of tumor present the brain.
Future improvements in CNN architectures and addition of complementary information from other imaging modalities can be used. Magnetic resonance spectroscopy will improve the current method, this will lead to the development of clinically used automatic brain tumor segmentation methods for better tumor detection purpose and will be helpful to the doctors in fast and easy diagnosis of brain tumor .

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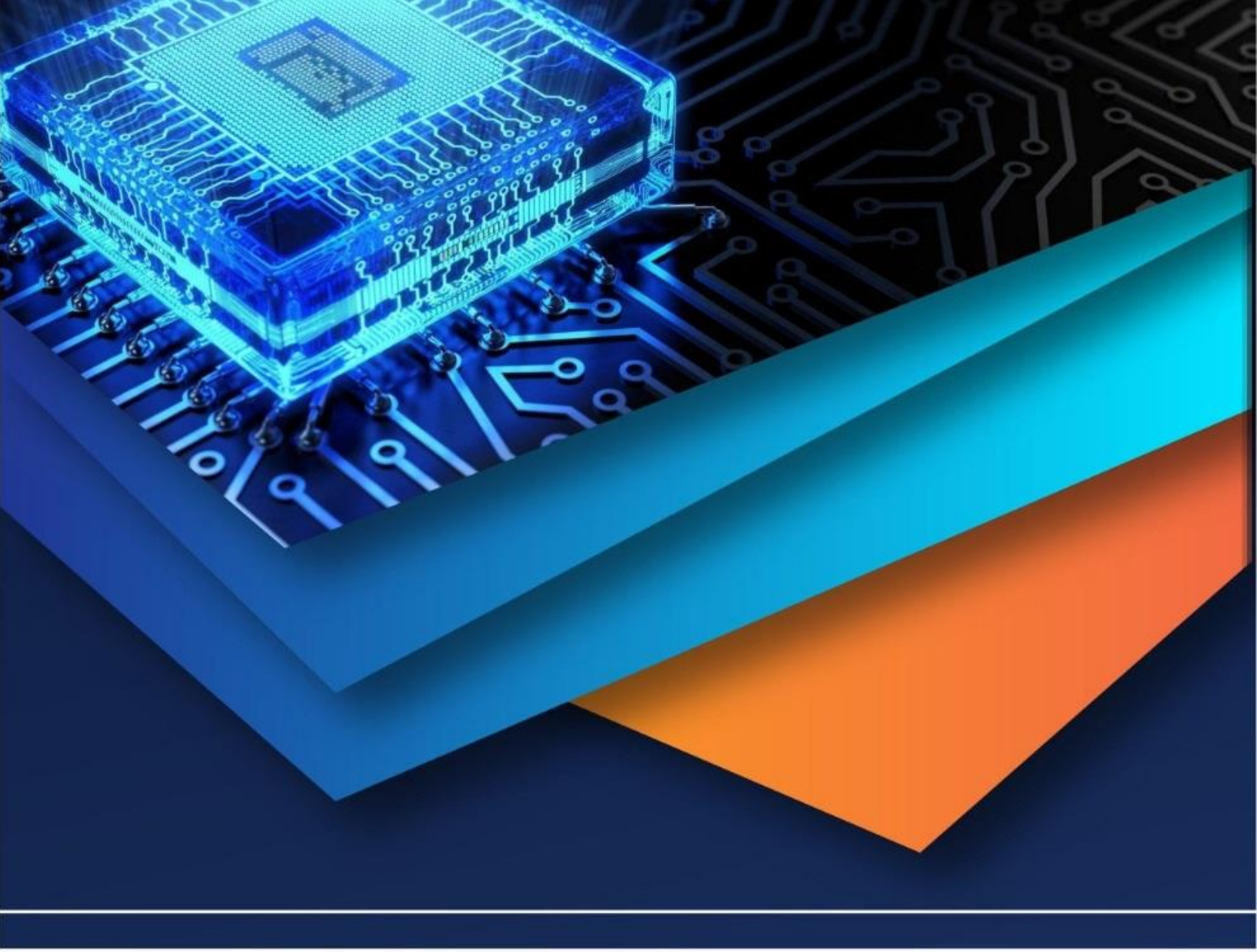

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