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Brain Tumor Segmentation Using Deep Learning

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Abstract: ***Now a day's tumor is second leading cause of cancer. Due to cancer large no of patients are in danger. The medical field needs fast, automated, efficient, and reliable technique to detect tumor like brain tumor. Detection plays very important role in treatment. If proper detection of tumor is possible then doctors keep a patient out of danger. Various image processing techniques are used in this application. Using this application doctors provide proper treatment and save tumor patients. A tumor is nothing but excess cells growing in an uncontrolled manner. Brain tumor cells grow in a way that they eventually take up all the nutrients meant for the healthy cells and tissues, which results in brain failure. Currently, doctors locate the position and the area of brain tumor by looking at the MR Images of the brain of the patient manually. This results in inaccurate detection of the tumor and is considered very time consuming.***
Keywords: feature selection, image classification, CNN, segmentation, feature extraction, training and testing.

I. INTRODUCTION

The human body is made up of many organs and brain is the most critical and vital organ of them all. One of the common reasons for disfunction of brain is brain tumor. A tumor is nothing but excess cells growing in an uncontrolled manner. Brain tumor cells grow in a way that they eventually take up all the nutrients meant for the healthy cells and tissues, which results in brain failure. A Brain Cancer is very critical disease which causes deaths of many individuals. The brain tumor segmentation and detection system is used so that it can be diagnosed at early stages. Cancer classification is the most challenging tasks in clinical diagnosis. This project deals with such a system, which uses computer, based procedures to detect tumor blocks and classify the type of tumor using Convolution Neural Network Algorithm for MRI images of different patients. Detecting Brain tumor using Image Processing techniques its involves the four stages is Image Pre-Processing, Image segmentation, Feature Extraction, and Classification. Image processing and neural network techniques are used for improve the performance of detecting and segmentation of brain tumor in MRI images. A tumor is a mass of tissue it grows out of control. We can use a Deep Learning architectures CNN (Convolution Neural Network) generally known as NN (Neural Network to detect the brain tumor. The performance of model is to predict image tumor is present or not in image. If the tumor is present, it return yes otherwise return no.

A. Objective Of Project

To provide doctors good software to identify tumor and their causes. Save patient's time. Provide a solution appropriately at early stages. Get timely consultation.

B. Limitations

1) *Lack of Annotated Data:* Deep learning models require a large amount of annotated data to achieve optimal performance. However, collecting and annotating medical images for brain tumor segmentation is a time-consuming and expensive process, which can limit the availability of such datasets.
2) *Computational Requirements:* Training and evaluating deep learning models for brain tumor segmentation can require significant computational resources, such as powerful GPUs and large amounts of memory. This can limit the accessibility of deep learning-based methods to smaller research labs and clinical settings with limited resources

II. IMPLEMENTATION

The proposed system has mainly five modules. Dataset, Preprocessing, segmentation, Split the data, Build CNN model train Deep Neural network for epochs, and classification. In dataset we can take multiple MRI images and take one as input image. In pre-processing image to encoded the label and resize the image.

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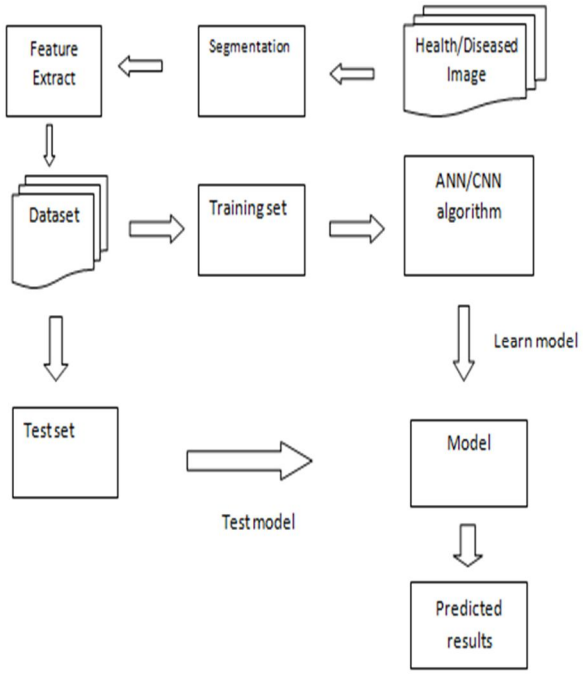


Fig.1(Data flow diagram)

In split the data we set the image as 80% Training Data and 20% Testing Data. Then build CNN model train deep neural network for epochs. Then classified the image as yes or no if tumor is positive then it returns yes and the tumor is negative the it returns no.

III. ARCHITECTURE

A. Layers of CNN Model

1) *Convolution 2D:* In the Convolution 2D extract the featured from input image. It given the output in matrix form.
2) *MAX Poolig2D:* In the MAX polling 2D it take the largest element from rectified feature map.
3) *Dropout:* Dropout is randomly selected neurons are ignored during training.
4) *Flatten:* Flatten feed output into fully connected layer. It gives data in list form.
5) *Dense:* A Linear operation in which every input is connected to every output by weight. It followed by nonlinear activation function.
6) *Activation:* It used Sigmoid function and predict the probability 0 and 1.

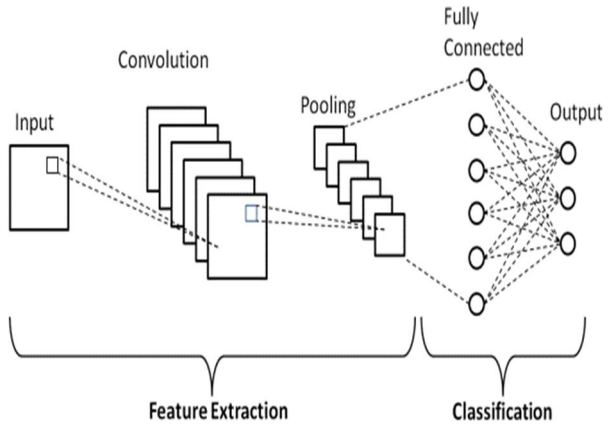


Fig.2 (CNN Architecture)

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B. CNN Based Image Segmentation

This method is currently the state of art technique in image segmentation field . It works on images which are of 3 dimensions i.e. height, width and number of channels. First two dimensions tell us the image resolution and third dimension represents the number of channels or intensity values. Usually images which are fed into the neural network are reduced in dimensions which reduce the processing time and avoid the problem of under fitting. Even though if we take an image of size 224*224*3 which when converted in to 1 dimension willmake an input vector . So, this input vector is still too large to be fed as input to the neural network.

IV. RESULTS

First image to predict
actual label: yes
1/1 [==============================] - 0s 262ms/step
predicted label: yes
accuracy: 0.8800



Fig.3 Identification of tumor using segmentation process



Fig.4 Segmented part (tumor detection)

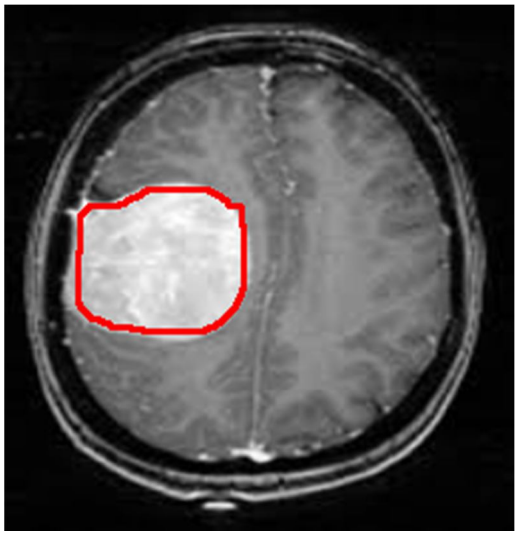


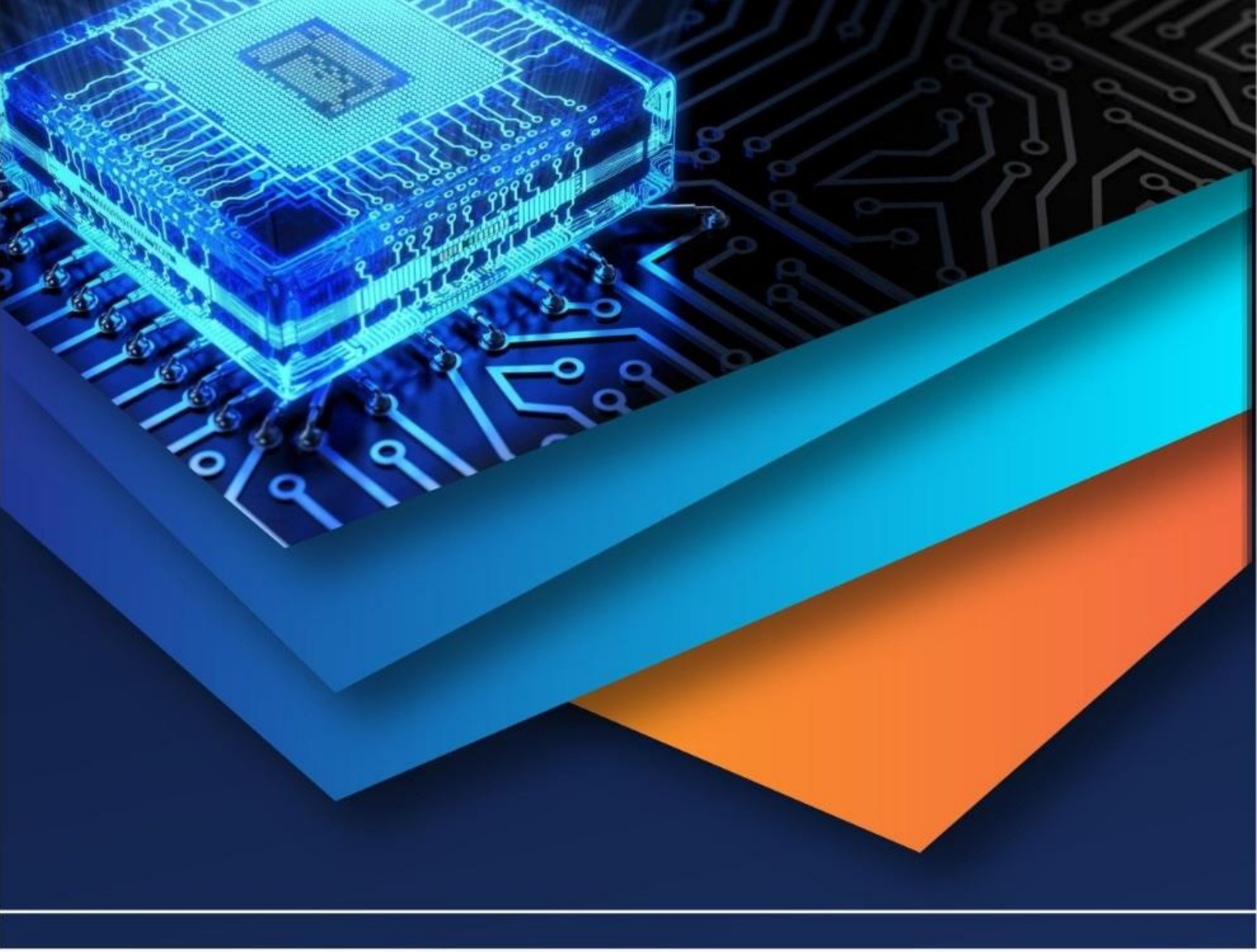
Fig.5 (detection of tumor boundary)

V. CONCLUSION

A fully automatic and accurate process is shown in this project, using a deep convolution neural network with well-known medical image architecture for the detection of entire brain tumors and intra-tumor regions. The CNN model built has been trained with the BRATS dataset to detect the tumors. BraTS'2018 training and challenge validation data sets have been tested and quantitatively trained. The different tests have shown that the detection results have been quite successful with higher accuracy with CNN models and evaluation actions have confirmed that our results are very comparable ,however the proposed approach can be further enhanced. We present a CNN architecture which differs from those traditionally used in computer vision. Our CNN exploits both local features as well as more global contextual features simultaneously. Also, different from most traditional uses of CNNs, our networks use a final layer that is a convolutional implementation of a fully connected layer which allows a 40 fold speed up.

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