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Medical Image Segmentation

Sahil Vethekar[1], Shivaprasad Shetty[2], Shreyas Birajdar[3], Deepti Lawand[4]

[1-3]*Student, Department of Information Technology, Pillai College of Engineering, New Panvel, Maharashtra, India*
[4]*Professor, Department of Information Technology, Pillai College of Engineering, New Panvel, Maharashtra, India*

Abstract - *Nowadays, the development of computer and image segmentation technology for medical image segmentation has become an important part of detection using computers. Brain tumor segmentation for mri images is important task in image processing for medical field, Manually Segmentation done by the doctor would consume a lot of time and results would vary according to different doctors. Whereas, automated segmentation will help a doctor to make quick decisions and output can be produced in a short amount of time, which improves quality of treatment planning. Detecting tumor in brain at early stage is important because accordingly doctors would provide treatment, to detect tumor in brain there are various techniques that have been used such as Neural Networks, Support Vector Machine etc. But deep learning provides result more accurate as it is able to handle difficult structures and can also process huge amount of MRI based brain images with consuming less time. In these paper swe will be working on brain tumor segmentation firstly we have introduced image processing, segmentation and its type what is been used. In next section, we have survey regarding existing papers, later we have proposed system where various techniques involved for training purpose. In next section implementation is shown how to test the system. Brats 2013 and 2015 data us been used.*

Key Words*:* **Pre-Processing, Segmentation, Semantic Segmentation.**

1.INTRODUCTION

Image processing is a method where certain operations are performed on the image so that we can get a proper image and also certain useful information from it. In this process we pass image as an input and from output we get certain features and characteristics from it. In today's world image processing is most rapidly growing technologies. The motive of image processing is to look the objects that are not visible, to create a better image, seek for the image of interest, Measures various objects in an image and Distinguish the objects in an image. Various steps are involved here such as Image Acquisition, image enhancement, segmentation, morphological, image restoration, object recognition etc.

Image segmentation is considered the most essential process as it change the view of an image into much easier form which is easy to analyze. It is basically used to locate lines and curves in image here they assign label to pixel and each of them have certain characteristics. There are various groups of segmentation such as instance and semantic segmentation. There are various methods involved in it and also certain applications involved in it are Locate tumors and other pathologies, face recognition, fingerprint recognition etc.

Semantic segmentation is the process in which every pixel of an image is labelled with respect to the class in which it is presented. These may include a person, bus, fruit, piece of woods etc. For example, an image that contains various numbers of cars, in these it would label all the various cars as car objects. semantic segmentation is considered to be very crucial because it helps models to know the environment in which they are going to work. There are various primary applications in interaction between human and computer, robots, medical images, automatic working vehicles, tools editing pics etc.

Android studio is an Integrated Development Environment for development of Android Application and developed by Google. The Programming languages supported are JAVA and Kotlin. Android studio helps to build and manage android apps efficiently and fast. Android studio has auto generated code editor support which means that developers need not code from scratch. One can run an android app from android studio by connecting android phone via USB or can use Android emulator to run and debug the android app.

2. LITERATURE SURVEY

In paper [1] author has discussed various pre-processing techniques which would be useful for correctness of system, also various feature extraction and features reduction techniques have discussed. further various segmentation methods have discussed and different deep learning algorithms have been covered, later comparison is done with existing work and challenges that come across during it. They have used around 200 images of brain for this process. In paper [2] author has used OTSU along with swarm

optimization to determine the threshold value and filtering technique is been applied on mri brain images to remove the noise and also improve the quality of images. The data or features that gets extracted are used for training the cnn and by doing this it get accuracy of 98% which is far more than already existing system. In paper [3] they have proposed semantic segmentation based on convolution neural network for brain tumor segmentation using brain images. They have used U- net architecture and Dense Net blocks to move information from the input to the output. In order to increase the speed of the training process they have added segmentation blocks at the end to generate the final output of the network and they have used Brats 2018 datasets for training process and provides the result with much higher accuracy. In paper [4] author has tried to improve the structure of U net which is useful for brain tumor segmentation. The improvised version is SrNet which mainly consists of four down and upsampling operations. The advantage of this improvised version is that the number of parameters have reduced than the u net and also the training time gets reduced. They have proposed a series of connection among network to improve the loss of information. Used Brats 2015 for training the model and this modified model has the capability to provide boundary of brain tumor which would benefit the quality along with higher efficiency.

3. PROPOSED SYSTEM

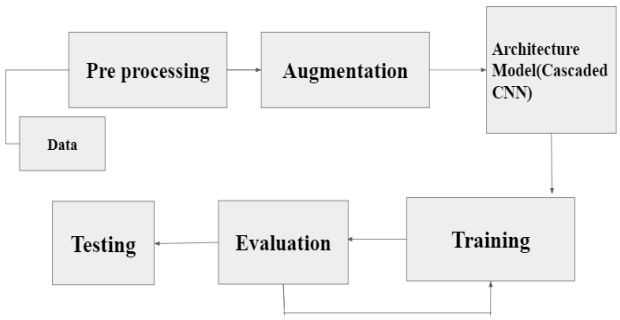

Fig.1 Proposed System

Firstly, data is passed to the pre processing stage, it is the first step for starting the process and it is important step that helps to improve the quality of data so that it will be helpful to extract valid features from the data. It is also referred as a technique which converts raw data into logical format which is useful while training the model. After pre-processing next step is augmentation, it is techniques used to increase the size of data by slightly updating the data that is already present or newly created data from previous data. It is mostly used when we have less amount of datasets. The next is architecture model, our model processes image in a sequence where pixel of each image is associated in different manner means, T1, T2, T1C and FLAIR. Several layers are involved in this model which include Convolution layer , Max pooling, Dense layer and also optimizer is been used. convolutional layer is main building block that is used to construct a CNN architecture.

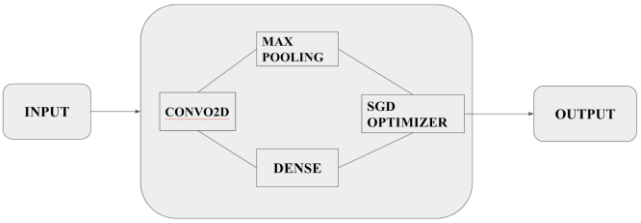

Fig.2 Architecture model

Convolution2D is used to make the convolutional network that deals with the images convolutional layer creates a feature map. Max Pooling basically reduces the number of parameters. Dense layer is the most common and frequently connected neural network layer. Optimizers are used to change the attributes such as weights and learning rate in order to reduce the losses. stohastic gradient descent optimizer is used which is extension of gradient descent.

The next stage is training where we have trained the "mha format" images of the brain .The MHA file type is basically graphic data files that contains information about ITK. ITK means Insight Segmentation and Registration Toolkit. It is a royalty free, cross-platform system. It was designed for the purpose of providing developers with an extensive suite of software tools. ITK provides tools for image analysis. We have then passed these images through our trained model and we get the output denoting where the tumor is present in the brain .afterwards evaluation is done where the output of it is again passed to training. There were around 3200 images that were trained through our model which comprised of different subsets of tumor present in the brain. We have used Brats 2013 for training and testing purpose and also Brats 2015 for testing. The output of the evaluation is again passed through the training process to produce the best result.. The final stage is testing here we will test the images of brain which are in mha format. For this we have used BRATS2013 and BRATS 2015 which were part of the MICCAI conference to get the desired output.

4. IMPLEMENTATION PROCESS

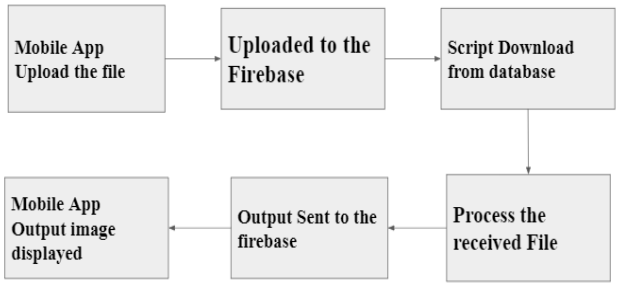

Fig.3 Implementation process

For Implementing the process, firstly we need to upload the file i.e. image of the brain which is in .mha format, after uploading the image it will be uploaded to the firebase there script will be downloaded that script contains the model which we have trained earlier, then that image would be processed through that trained model and the output would be send to the firebase and from there the output would be passed to mobile application where the image would be displayed containing tumor region where it is present in the brain. For implementing these we need to follow certain setup steps before, so the steps involved to achieve the desired result are listed below:

1. Ngrok Server
   Here we firstly would be starting ngrok server in order to connect our system and android device together for further working. ngrok application that helps developers to find a local server to the Internet with less effort.

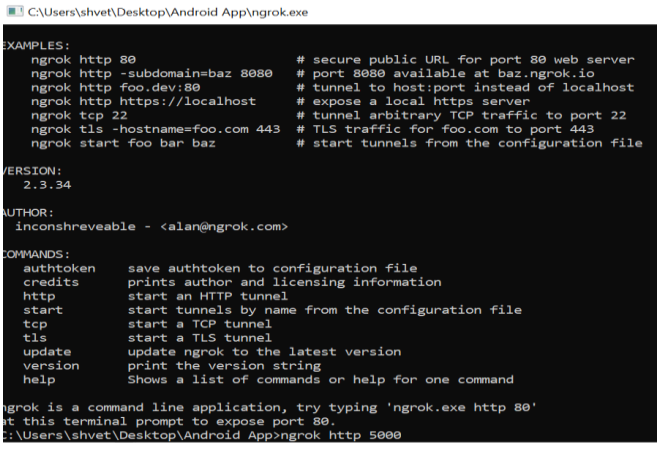

Fig.4 ngrok server initiation

After starting the server here, we get a code which we would be entering in the Android Studio where we have created our mobile application.

Fig.5 ngrok connection

2. Android Studio Connection

   In Android Studio we would have the features required for uploading the images and also how our application would be looking and there we will be entering the code which we got from ngrok and install the app in our device.

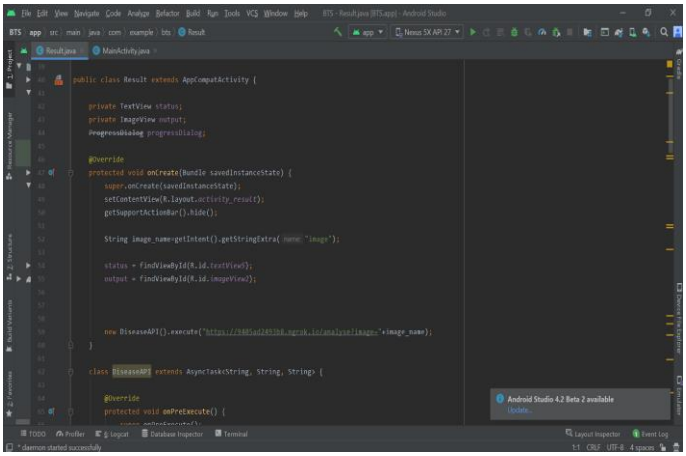

Fig.6 Android Connections

3. Home Screen of Application

   After installing the app the home screen of the app would contain upload and submit button. By selecting choose button we need to select the images of the brain ie.mha format images and click on upload for the further processing of image where the image would be passed through the trained model and we would get the region where tumor is been present.

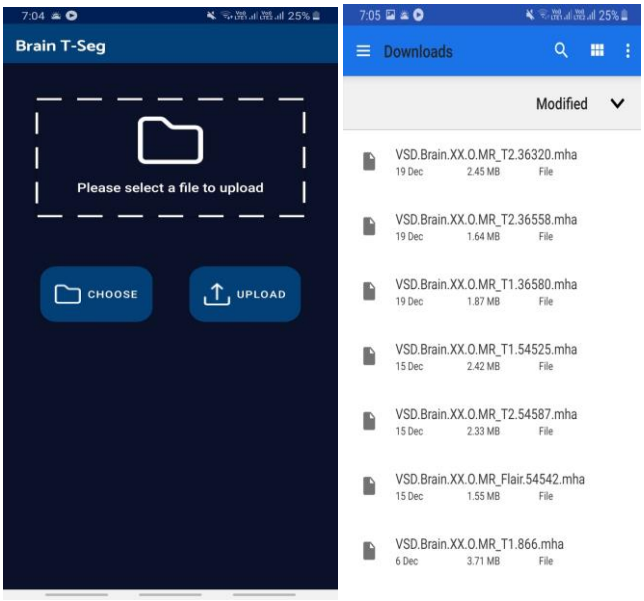

Fig.7 Uploading of an Image (. mha format)

4. Final Output

After uploading the image, it would pass through the trained model and we would get tumor region present in the brain, the purple patch present in brain would be the tumor region.

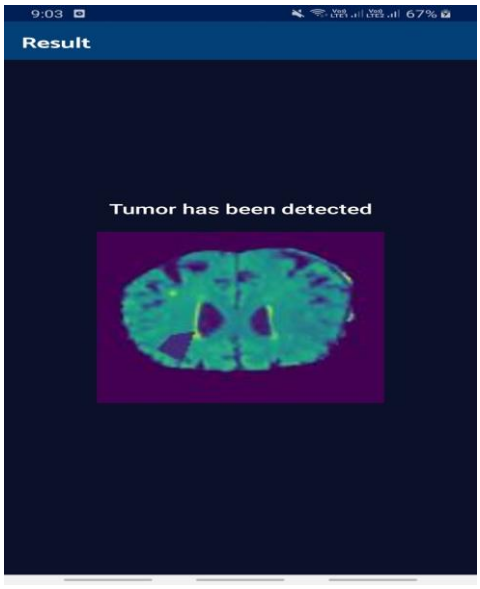

Fig.8 Output Screen

5. FUTURE SCOPE

The Application performs certain functions, but there are different area which could be improved as there is lot for expansion. There are many features that could be included in the project such as:

I. Here only mha format images can be tested but user may have normal image so even normal format of image can also provide the result to user.

II. The ngrok server is available for seven to eight hours so the application must have continuous availability to user so that it could be operated whenever they need.

III. There are different kinds of tumor present in brain so along with the region of tumor what type of tumor is present could also be classified.

6. CONCLUSION

In this paper, we presented, Medical Image Segmentation for brain tumor using Brats2013 and Brats2015 our model provides the region in brain where tumor is present. This application is useful for people to check whether they have a tumor or not. They can easily check by using their device. Instead of manual work this would give more quick output and could operate at their own flexible time.

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