

BRAIN TUMOR SEGMENTATION USING CONVOLUTIONAL NEURAL NETWORKS

Dr .T. Kameswara Rao¹, V. Sena Sowseelya², T. Praneeth³, V. AnjiBabu⁴, S. Sai Krishna⁵

¹Ph.D ,Professor,Computer Science and Engineering , VVIT, Andhra Pradesh, India

²³⁴⁵Student, Computer Science and Engineering ,VVIT ,Andhra Pradesh ,India

ABSTRACT

Brain tumors also are called gliomas. They're the foremost common and ends up in short life expectancy. To boost the standard of life of oncological patients, treatment planning plays a significant role. To assess these gliomas, MRI based image segmentation is widely used. Performing manual segmentation is difficult, so during this paper we are using an automatic segmentation method supported Convolutional Neural Networks(CNN). The most focus is applied on the tumor segmentation when there are tumors that are comparably larger to the tumors that are present in majority. The size and scale of tumor affects the expected region for existence of tumor and thus a improved approach is applied antecedently

Keywords: - Gliomas ,MRI ,CNN

1. INTRODUCTION

Brain tumors first start within the brain include meningioma and glioma. These can be spread to other parts of body. Metastatic brain tumors, also are called secondary brain tumors, are malignant tumors that originate as cancer elsewhere within the body and so metastasize (spread) to the brain. Image segmentation is one amongst the foremost important tasks in medical image analysis and is commonly the primary and the most important step in many clinical applications. Inside the brain MRI analysis, we use image segmentation to calculate and visualize the brain's anatomical structures, for researching brain changes, for delineating pathological regions, and for surgical planning and image-based interventions.

2.MODEL ANALYSIS

2.1 EXISTING APPROCH

K-means is one of the unsupervised learning algorithms for cluster. In the K-means algorithm initially the number of cluster has to be defined. Then k-cluster center are chosen randomly. The space between the each pixel to every cluster centers are calculated. Distance formula is used to calculate variation between single pixel to its clusters. The pixel is moved to the actual cluster which has shortest distance among all. Then the centroid is re-estimated. The process continuous until the middle converges.

- 1) Let the number of cluster values as k.
- 2) Choose the k cluster centers in random manner.
- 3) Calculate the center point of the cluster.
- 4) Calculate the distance between each pixel to each cluster center.
- 5) In case distance is near to the center then move to that cluster.
- 6) Or else move to the following cluster.
- 7) Re-estimate the middle.

Repeat the process until the point of center does not move

2.2 PROPOSED APPROACH

To segment the tumor for Bio Medical Image Segmentation ,we implement deep learning models on the dataset. A residual neural network (ResNet)is an artificial neural network (ANN). It is a gate-less and open-gated variant of the HighwayNet, the first working and deep feedforward neural network with hundreds of layers, more deep than previous neural networks .Typical ResNet models are implemented with double and triple layer skips that contain nonlinearities (ReLU) and batch normalisation in between.

3.MODEL STUDY

3.1 DATASET

LGG Segmentation Dataset: This dataset contains brain MR images along with manual FLAIR abnormality segmentation masks. The photographs were obtained from The Cancer Imaging Archive (TCIA). They correspond to 110 patients included within The Cancer Genome Atlas (TCGA) lower-grade glioma collection with a minimum of fluid-attenuated inversion recovery (FLAIR) sequence and genomic cluster data available. Tumor genomic clusters and patient information is provided in a csv(coma separated values) file.

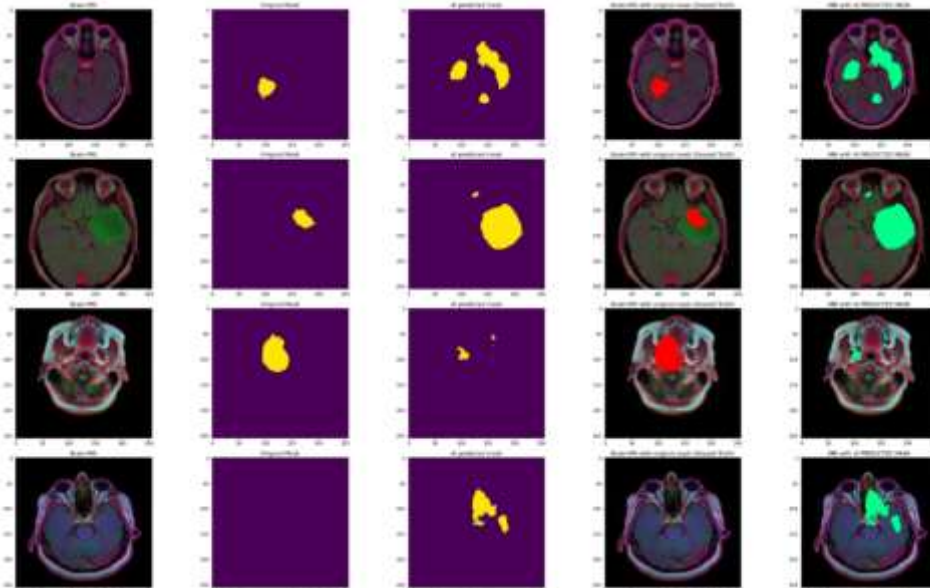
3.2 CLASSIFIER

ResNet9 For our implementation, the ResNet could be a series of convolutional blocks that encapsulate: a convolutional layer, normalization of the information, a nonlinear activation function (RELU) and in some steps a max pooling layer.

3.3 NEURAL NETWORKS

ResUnet could be a convolutional neural network that we are going to be utilized as a state of the art image classification model. The Resnet models we are going to use in this tutorial have been pre-trained on the ImageNet dataset, a big classification dataset. Tiny ImageNet alone contains oversized 100,000 images across 200 classes.

3.4 VISUALIZATION



4.DEVELOPMENT ENVIRONMENT

4.1 ANACONDA AND JUPITER

Anaconda Repository - features over 8,000 open-source data science and machine learning packages, Anaconda-built and compiled for all major operating systems and architectures. Conda is open-source package and system that manages environment that can run on Windows, macOS, and Linux. Conda can be quickly installed, run, and also updates packages and package dependencies. It also easily creates, saves, loads, and swaps between environments on your local computer. It absolutely was created for Python programs, but it can package and distribute software for any language.

The Jupyter Notebook is that the original web application for creating and sharing computational documents. It offers a simple, straight forward , streamlined, document-centric experience. Kernels are processes that run interactive code in a very particular artificial language and return output to the user. Kernels also answer to tab completion and introspection requests.

4.2 TENSORFLOW

TensorFlow is open source platform for end-end applications involving machine learning. It's a comprehensive, flexible ecosystem of tools, libraries and community resources that lets researchers push the state-of-the-art in ML and developers easily build and deploy ML powered applications.

4.3 LIBRARIES

Seaborn ,pandas ,numpy ,zipfile , opencv ,skimage, sklearn ,os ,glob ,Ipython, plotly.

5.RESULTS

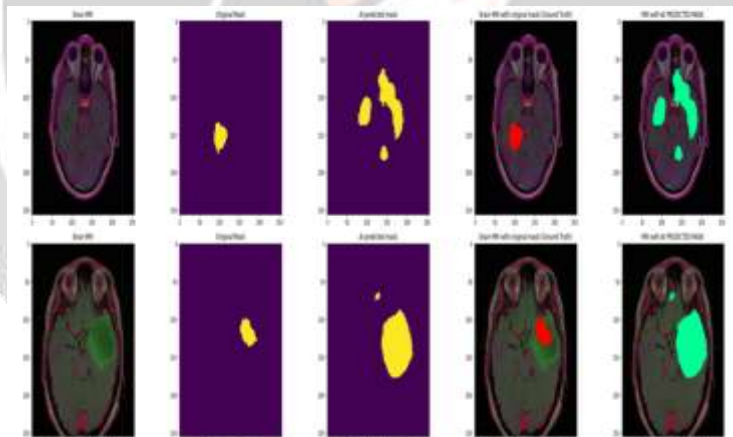


Fig: Segmented a part of Brain tumor

6.CONCLUSIONS

Six networks with different numbers of encoding/decoding blocks,input patches and different weights for loss were trained together by averaging the ultimate prediction probabilities.The results showed improvements with the ensemble model compared with any of the one models.For the survival prediction task,we extracted six simple features from the segmentation labels and a multivariate statistical regression by combining them with non- used imaging clinical features like age and resection status.In terms of network ,we found it very difficult to choose the best model

As well as simplest model and/or hyper-parameter set since most models perform very similarly.The comparison between U-Net and Dense-Net showed that it is hard to pick a clear winnerfor the network structure. The complete

segmentation process involves image analysis with different modalities and dot product of different modalities to urge an optimized tumor region

7.FUTURE SCOPE

As medical image segmentation plays a key role in the field of image guided surgeries .By using Three Dimensional(3D) anatomical models from individual patients ,training ,planning and computer guidance surgery is improved .This technique can be applied for ovarian ,breasts ,lung ,skin ,tumors .This technique can be developed to classify the tumors based on feature extraction.

7. REFERENCES

- [1].<https://www.analyticsvidhya.com/blog/2021/06/brain-tumor-detection-and-localization-using-deep-learning-part-1/>
- [2].<https://github.com/Issam28/Brain-tumor-segmentation>
- [3].<https://towardsdatascience.com/an-overview-of-resnet-and-its-variants-5281e2f56035>
- [4].<https://vijayabhaskar96.medium.com/tutorial-on-keras-flow-from-dataframe-1fd4493d237c>
- [5].https://www.researchgate.net/publication/317547838_A_Review_Paper_on_Brain_Tumor_Segmentation_and_Detection

