Deep Learning – Case Study

Title: Brain Tumor Detection using Image segmentation

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Enrollment Number: 19012012011

Batch: DL2

Area: CNN

Model: U-net

1. Introduction

This project is performed for detecting brain tumor in human brain. This project will help any individual fresher in this line to rectify true prediction probability whether the decisions which are made by them to identify this disease are accurate or not.

2. Tools & Libraries

In this project tools and libraries that will be in use are mentioned below with usage.

No	Tools & Library Name	Usage
1	Keras	We are using for deep learning tasks like creating model, predicting the object etc.
2	os	Pillow we are using for preprocessing the images of our datasets.
3	CV2	Open-CV provides a real-time optimized Computer Vision library, tools, and hardware. It also supports model execution for Machine Learning (ML)
4	Numpy	We are using it for the Image matrix handling.

3. Architecture, Datasets & Workflow

❖ **Architecture: -** The ***UNET*** was developed by Olaf Rosenberg et al. for Bio Medical Image Segmentation. The architecture contains two paths. First path is the contraction path (also called as the encoder) which is used to capture the context in the image. The encoder is just a traditional stack of convolutional and max pooling layers. The second path is the symmetric expanding path (also called as the decoder) which is used to enable precise localization using transposed convolutions. Thus it is an end-to-end fully convolutional network (FCN), i.e. it only contains Convolutional layers and does not contain any Dense layer because of which it can accept image of any size.

➔ The network consists of a contracting path and an expansive path, which gives it the u-shaped architecture.

➔ The contracting path is a typical convolutional network that consists of repeated application of convolutions, each followed by a rectified linear unit (ReLU) and a max pooling operation.

➔ During the contraction, the spatial information is reduced while feature information is increased. The expansive pathway combines the feature and spatial information through a sequence of up-convolutions and concatenations with high-resolution features from the contracting path.

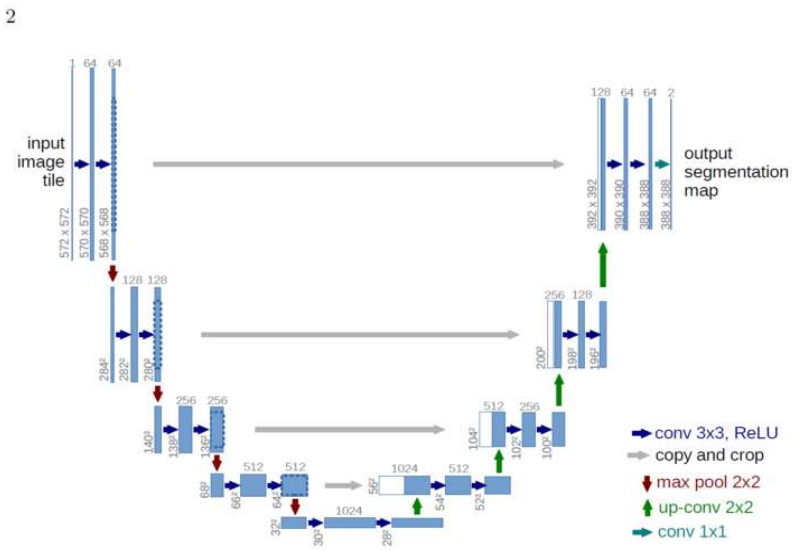


Figure 1. U-net Architecture

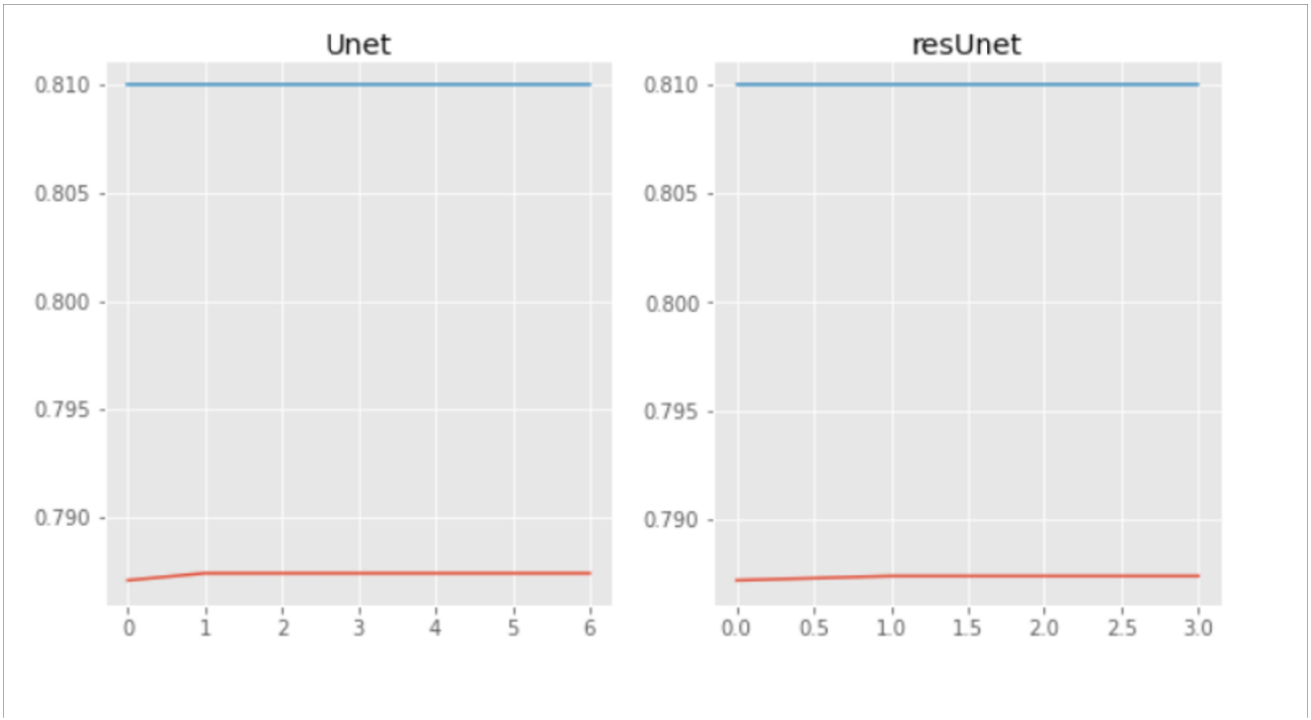
- **Dataset: -** For this I have collected images from various sources. This dataset have 4 classes, and almost 100s images for each class so we can say we have upto 500 training images.

- **Workflow: -** In this firstly the working is proper with arround 80% accuracy. In this dataset are divided in 8:2 ratio for train and test. For the output one need to input image or video file (That will be image or output from MRI), After the providing input the Image or video in our system will do the task automatically.

4. Code

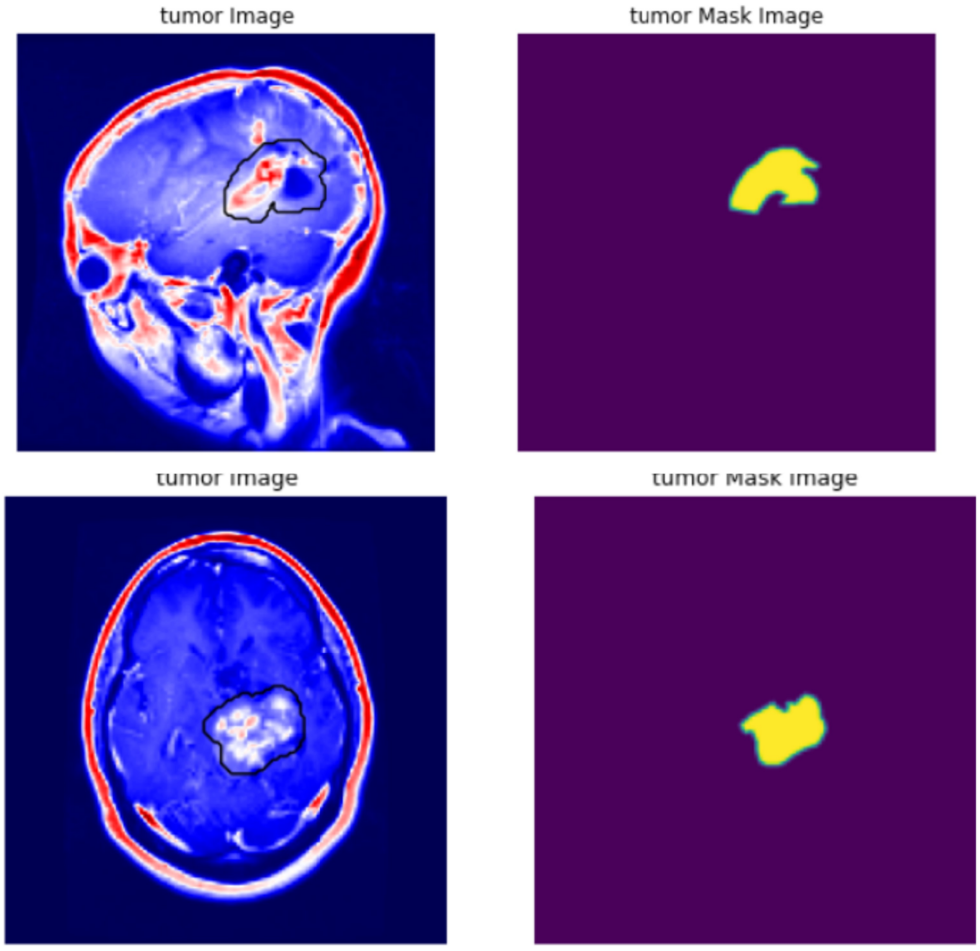
Code is open source and published into GitHub with read-me file.
https://github.com/GoradiaNishant/Deep-Learning/blob/main/UNet_(Brain_Tumor_Image_Segmentation).ipynb

As of these project was performed under two model U-NET and resUnet (U-net with res block) so it doesn't seems much improvement in accuracy for this complex data. So for this project only U-net is put-up.



5. Output

Some screenshots of our working application.



Conclusion – U-net give much better performance in image segmentation. Also compare to this one step ahead the resUnet model is proven even more accurate. Also there are several models better than U-net like U-net++, and more combinitions.