Brain MRI images with manual FLAIR abnormality segmentation masks

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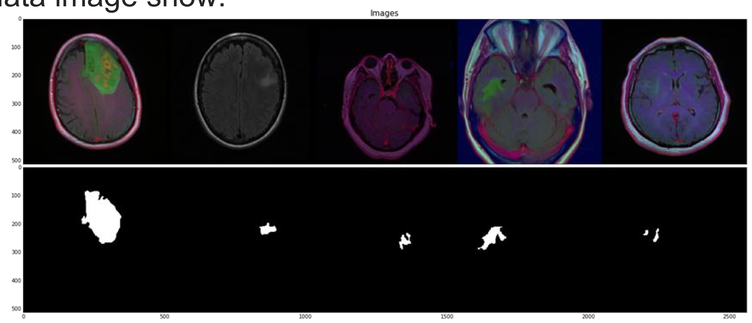
Abstract

Image segmentation is one of the most important tasks in medical image analysis and is often the first and the most critical step in many clinical applications. In brain MRI analysis, image segmentation is commonly used for measuring and visualizing the brain's anatomical structures, for analyzing brain changes, for delineating pathological regions, and for surgical planning and image-guided interventions. In the last few decades, various segmentation techniques of different accuracy and degree of complexity have been developed and reported in the literature.In this project, we use FPN and U-net networks on brain MRI segmentation, discuss their advantages and disadvantages, and compare the performance of each network.

Introduction

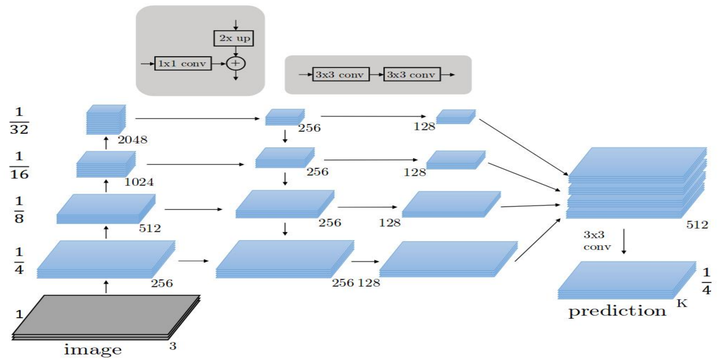
dataset source: ***LGG Segmentation Dataset***
and 110 patients in ***The Cancer Genome Atlas (TCGA)*** lower-grade glioma collection with at least ***fluid-attenuated inversion recovery (FLAIR)*** sequence and genomic cluster data available.

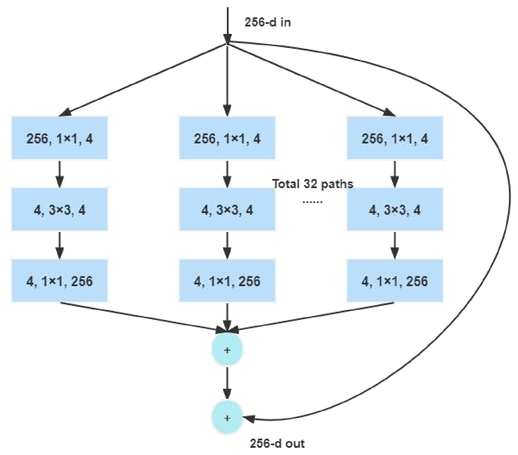
data image show:



Method

The 1st column & the 2nd column : U-Net like FPN → Using every layer in the 2nd column to predict 3rd column → Stacking together for ***final prediction***.





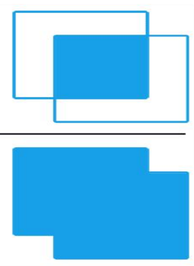
Metrics

$$LOSS = BCE - \ln(DICE)$$

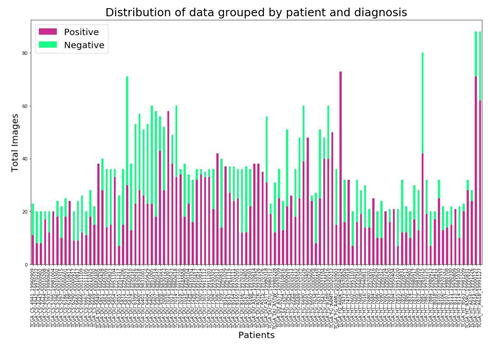
$$BCE = -\sum_i \left(y_i \ln(p_i) + (1 - y_i) \ln(1 - p_i)\right)$$

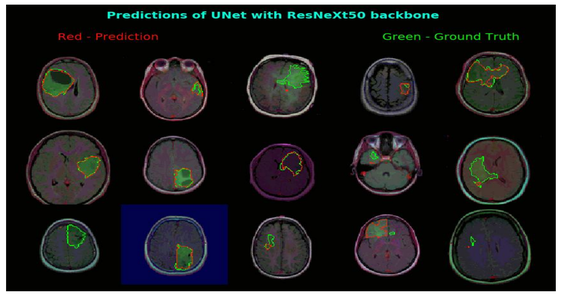
$$DICE = 2\frac{\sum_i y_i p_i}{\sum_u y_i + \sum p_i}$$

$$IoU = \frac{\text{Area of Overlap}}{\text{Area of Union}}$$



Result





Conslusions

It can be seen that the image segmentation of Brain MRI has achieved good results on ResNxt50

References

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3.Buda, M., Saha, A., & Mazurowski, M. A. (2019). Association of genomic subtypes of lower-grade gliomas with shape features automatically extracted by a deep learning algorithm. *Computers in biology and medicine, 109, 218-225.*