**Deep learning approach for detecting and localizing brain tumor from magnetic resonance imaging images**

summarize this text : A brain tumor is the growth of abnormal cells in a human brain. The tumor first attacks a part of the brain cells and then slowly spreads throughout the cells. After attacking the brain cell, the brain cell is damaged. Brain tumor can be cancerous or non- cancerous. Benign is the non-cancerous and malignant is the cancerous which are the type of brain tumors. A primary brain tumor begins in brain cells. on the other hand, secondary brain tumor cancer cell spread into brain from another body part such as lung, breast. Gliomas is called of integral tumor [1]. Basically, gliomas is a brain tumor which can be graded into low grade gliomas (LGG) and high grade gliomas (HGG) [2]. In the recent time most of the patients suffered from HGG. When a patient is diagnosed with HGG, their life is at risk. The patients diagnosed with HGG has lower life expectancy than the patients diagnosed with LGG [3]. Brain tumors make up 1.8% of all the cancer incidents worldwide. The early detection of brain tumors and the correct type of cancer would help doctors in selecting the proper treatments and in further analysis based on how the patients responded to the treatment [4]. Brain tumors are treated based on the age of patients, the type of tumors and the location of tumors. Pictures of brain tumors are captured with magnetic resonance imaging (MRI). It is a difficult work to segment a brain tumor to diagnose by MRI for complex structures and it is time-consuming. It is difficult to diagnose damaged tissue from healthy tissue because of the appearance of the tumor, blurred boundaries. We can use automatic brain tumor segmentation in order to solve this problem using MRI images which can identify the type of tumor and the exact location of the effected cell [5]. Image segmentation can be partitioned from multiple objects/segments to a single object. It performs labeling of pixel level for all image pixels which predicts a single label for the whole image. [6]. Rai et al. [7], proposed transfer learning approach where brain tumors can be graded by combining U-net and ResNet-50. Cinar and Yildirim used InceptionV3 where they removed the last 5 layers. By using this architecture, they got 97.2% accuracy because of adding eight new layers [8].Yusuf Artan combined two of the successful segmentation algorithms named the limited discrepancy search (LDS) and the random walker (RW) and tested the effectiveness of the method from the grabcut and berkeley segmentation database and also was compared with the Raw Walker algorithm to assess the performance [9]. Portela et al. [10] proposed a method where human specialized inspection is not required nor set of labeled training dataset. Nandi [11] used MRI images as the normal MR image analysis are not suitable for the analysis. K-means clustering was used where some abnormality was shown by the detected tumor. Pereira et al. [12] proposed an automated segmentation method on convolutional neural networks (CNN), applied on Brats2013 and 2015 datasets. It was done by creating and fine tuning each tumor grade’s intensity normalization transformation. Manogaran et al. [13] proposed a method which used an approach of upgraded orthogonal gamma distribution-based machine learning. With automatic region of interest (ROI) detection the area of brain tumor was calculated. Siar and Teshnehlab [14] detected brain tumor from the magnetic resonance images also known as MRI. They used convolutional neural network also known as CNN. The softmax, radial basis function and decision tree (DT) were used to classify the images. Two class classifier is implemented using support vector machine with radial bass function (SVM-RBF) kernel. The proposed method can achieve an accuracy of>94% [15]. Khan et al. [16] used deep learning on brats 2015, 2017, and 2018 and claimed a new method called extreme machine learning (ELM). In recent years the brain tumor detection was way better due to some advanced technologies. An automatic MRI brain tumor classification has been presented by Kumar et al. [17]. Preprocessing, feature extraction, classification and segmentation has been done on brain tumor segmentation (BRATS) and Miccai datasets. The images were converted into 3x3 blocks. Rehman et al. [18] presented an encoder-decoder-based model. The model mainly used FE blocks at every encoder stage. Also, the model gets a feature map and defined operation is performed by the model which also tries to preserve information. This feature of aggression helps a lot to get better execution of finding brain tumors. Brain tumors were classified using MRI data analysis in order to help the practitioners. In order to do that they used deep learning methods. VGG19 with k-means cluster was used here [19]. Liqiang et al. [20] developed a unique network fine-tuning technique based on policy value. The datasets BraTS 2016, BraTS 2017, and BraTS 2018 were utilized in their methodology. They also used a number of experiments to show that their proposed strategy may be used in the medical field. This paper focused on image segmentation for classifying tumor from brain MRI images and identifying the exact location of brain tumors. U-Net is used for medical image segmentation. Figure 1 presents the overall concept of our proposed study. The proposed method is a combination of U-net architecture with the encoder ResNet-50. Preprocessing is one of the most important techniques which can be improved image quality before applying method. Classification has been done with ResNet-50 and Inception-V3 which shown that ResNet-50 has given promising result. This may allow for the diagnosis of a brain tumor at an earlier stage. The medical community can help lower the incidence of brain tumors by improving their ability to detect them early. Brain tumors are another possible route for the spread of brain cancer. The sooner the brain tumor is diagnosed, the sooner therapy can begin. Which ultimately leads to a lower incidence of brain cancer.

Result

The text discusses brain tumors, which can be either cancerous or non-cancerous growths of abnormal cells in the brain. Magnetic resonance imaging (MRI) is used to capture images of brain tumors, but accurately diagnosing and segmenting a tumor is complex and time-consuming. Many researchers have proposed automated methods for brain tumor segmentation using various techniques such as deep learning and clustering algorithms. Early detection of brain tumors is crucial for successful treatment and improved outcomes in patients.

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Improved ability to detect brain tumors at an early stage can help lower the incidence of brain cancer, which also has the potential to spread to other parts of the brain. The proposed method discussed in the text uses a combination of U-net and ResNet-50 architectures for medical image segmentation and classification, with preprocessing techniques applied for image quality improvement. The ResNet-50 classifier showed promising results in detecting brain tumors, and the proposed method could facilitate early diagnosis and treatment. Overall, advances in technology and research offer a pathway to better diagnosis and treatment of brain tumors, with the potential to save lives and improve outcomes for patients.

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It is important to note that brain tumors make up a relatively small percentage of all cancer incidents worldwide, but they can have a devastating impact on patients and their families. According to the text, patients diagnosed with high-grade gliomas have a lower life expectancy than those with low-grade gliomas, suggesting the importance of early detection and treatment. Automated brain tumor segmentation using MRI images is one potential solution to improve the accuracy and efficiency of diagnosis, but further research is needed to refine these methods and optimize their effectiveness.

The text also highlights some of the specific techniques and algorithms that have been used in brain tumor segmentation research, including U-net, ResNet-50, K-means clustering, and convolutional neural networks (CNNs). These techniques utilize various machine learning approaches to identify and classify different types of brain tumors, with the aim of improving accuracy and reducing the need for human interpretation. As the field of medical imaging continues to evolve and advance, it is likely that these techniques will play an increasingly important role in the detection and treatment of brain tumors and other diseases.

In conclusion, the text provides an overview of the challenges and opportunities involved in brain tumor segmentation using medical imaging technology. While brain tumors remain a significant health concern, continued research and innovation offer hope for early detection, more accurate diagnosis, and better outcomes for patients.

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Final thoughts from the text suggest that the medical community can play a crucial role in reducing the incidence of brain tumors by improving their ability to detect them early. By integrating advanced imaging techniques and automated segmentation methods, doctors and other medical professionals can provide more accurate diagnoses and effective treatments for patients with brain tumors. Additionally, future research should focus on developing new and more efficient methods for brain tumor segmentation that can be used in clinical practice, as well as exploring the potential of emerging technologies such as artificial intelligence and machine learning.

Overall, the text highlights the importance of brain tumor detection and the potential of automated medical imaging techniques to improve outcomes for patients. As technology continues to advance and research continues to evolve, it is likely that we will see further improvements in brain tumor diagnosis and treatment, with the ultimate goal of improving the lives of those impacted by this devastating disease.