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Current Trends On Deep Learning Models Based On Brain Tumors

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***Abstract*: Out of many in Medical Science, a meticulous disease is BRAIN TUMOR. A Brain Tumor is an abnormal growth of cells inside the brain. As a result, tumors started growing from the brain tissue itself. As the analysis goes on with the data provided by health, it has been recognized that DEEP LEARNING has a major application in the fields of brain tumors. Deep Learning has a significant role in the area of computer vision; its application helps in the recognition of brain tumors to get a highly accurate vision as minute errors may cause disaster to our lives. So, for these reasons, BRAIN TUMOR SEGMENTATION has become a vital challenge for medical purposes. Earlier, several methods have been tried for this illness, but they all lack accuracy. But now, Deep Learning presents a solution to this problem through the concept of Brain Tumor Segmentation. Upon this work, studies were undertaken in different areas of brain MR images, and applied different networks for segmentation. The Results in using these networks of segmentation for MR images can be analyzed by comparing these results with a single network. At the first stage, nonlocal devices and methods have been applied to avoid noises. On the second stage, MR images (cranial) were classified. And at last, the tumors will be segmented. As per studies, the accuracy of cranial MR images is around 97%. Experiments prove that this method is efficient enough to use in computer aided brain tumor detection.**

***Keywords*: Deep Learning, Convolutional Neural Network (CNN), Artificial Intelligence.**

1. Introduction

Now, technology and human intelligence have improved diversely. But people are still suffering from diseases in an unpredictable manner. The Brain Tumor is a cancer that forms in the brain cells. When the tumor grows, it can change the function of brain tissue that will lead to illness like headaches, nausea and balance issues. It is a severe state of condition that could affect human intelligence and decision making ability. As per the survey in the USA, almost 23,000 patients were suffering from brain tumor cancer in 2015. Later the disease was identified in both adults and children in a uniform manner. the commonly seen tumors were meningioma, gliomas and pituitary tumors. And other types include malignant, medulloblastoma and lymphomas. Latest Brain Tumor methods depend on Segmentation Concept of Deep Learning to analyze and detect Brain Tumor Cancer. Deep Learning Strategies has been improved by generating results with less data valuation, but with more accuracy. Hence use of such models extracts information from images for analysis.

2. Existing Methodology

A. Convolutional Neural Network

Convolutional Neural Network or CNN is a deep learning neural network. It mainly designed for processing structured arrays of data such as images. The convolutional neural network most widely used in computer vision and can be used in image classification and segmentation. An approach towards CNN is self-driving cars.

The self-driving car's computer vision system is capable of localization, obstacle avoidance and path planning. Also the convolutional neural network used in image analysis and many other areas of machine learning. CNN commonly applied to analyzing visual imagery.

B. Classic Neutral Network

The Classic neutral network is also known as a fully connected neural network. It was developed by Fran Rossblat, an American psychologist in 1958. In this model involves the fundamental binary inputs. It includes functions like linear function, nonlinear function. It works most effectively in any table dataset which has rows and columns formatted in CSV. It also works in any model with the highest flexibility.

C. Recurrent Neural Network

Recurrent neural network is a deep learning approach which is designed to predict sequences. It helps in achieving short term internal state network. Some types of RNN designs that help in analyzing problems are: LCTMS - useful in the production of data in time sequences using memory and it has three gates namely input, output and forget. Gated RNN - Useful in data prediction of time sequences.

It has two Gates - Update and Reset. This approach is mainly used in language translation, conversation, modeling etc.

D. Self-Organizing Maps

The self-organizing maps or SOMS is a type of deep learning technique. This type operator with the help of unsupervised data that minimizes the number of random variables in a model and also, the output dimension is fit as a two dimensional model. It works efficiently in creative projects in music, videos and text with the help of AI.

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E. Auto Encoders

Auto encoders are the most commonly used deep learning technique. It operates automatically based on its input before taking a final output decoding or on an activation function. The type of auto encoders is Sparse, denoising, contractive and stacked. The auto encoders work on feature detection and also used to add features to large datasets.

3. Literature Survey

[1] Yi Ding et al., (2019), In this study Brain Tumor Segmentation has a critical role in diagnosing tumors. For making the analysis more efficient, a combination of residual networks with dilated convolution was proposed, that is the deep enlarged network with middle management (RDM-net).

The RDM-net consists of different blocks such as spacial fusion block, the middle supervision block. In spacial fusion is designed in such a way to collect the detailed information about tumors in minor regions. Instead the middle supervision block, combines the loss of intermediate proposal in the middle layer and the prediction of the output layer to achieve the effect of middle supervision. This method of analyzing will effectively show a detailed view of each layer and contribute to the medical image recognition. The valuation is based on BRATS-2015 dataset.

The dataset is classified into two categories: - Low Grade Gliomas (LGG) and High Grade Gliomas (HGG). In this LGG is relatively good prognosis and HGG is a malignant tumor with poor prognosis, and it is more aggressive and infiltrate than LGG. Hence precise brain tumor segmentation can be achieved b clinical diagnosis and treatment planning.

[2] Yi Ding et al., (2019), In this study proposes the midst of all these problems caused due to brain tumors, it was a big relief that was caused due to the introduction of a framework named SMCSRNET- "Stack Multi Connection Simple Reducing-Net."

It is built upon the blocks of the so-called SRNet, "Simple Reducing – Net ". It consists of down sampling and up sampling options. The main merit of SRNet is parameters amount is reduced to 4/5th of the original unit. Here the proposed method has been evaluated on the BRATS-2015 dataset. In this, each MRI images has 4 modules such as T1, T1C, T2 and other fair which where the four process in network. The BRATS-2015 dataset have been further divided into two; they are low grade gliomas(LGG) and High Level Gliomas(HGG).

By evaluating the paper on BRAT-2015, it has been identified that network segmentation we prefer has the ability to uproot the tumor partition as to obtain high recognition quality.

[3] Neelum Noreen et al., (2020), Concatenation approach for valuation of brain tumor is based on the features using pretrained models. Mainly it proposes a method of multilevel features extraction and concatenation for early verdict of tumor: The following two models help in the scenarios of brain tumor detection - InceptionV3, DensNet201.In this brain dataset, comprises of 3064 T1 - weighted contrast MR images of 233. The three types of tumors such as Meningioma, Pituitary, Glioma are existing in this dataset.

[4] Hossam H Sultan et al., (2019), Brain tumor classification can be considered as a factor to evaluate tumors and make treatment decisions. Several imaging techniques have been used to detect and classify the tumors. In this paper, Hossam H sultan proposes Multi-classification of brain tumor images by deep neural network. Here the tumors are classified based on two available datasets. First one classifies tumors into meningioma, glioma and pituitary tumor. The three glioma grades include: Grade II, Grade III, Grade IV. The data set includes three different views such as axial coronal and sagittal views.

Second dataset is obtained from cancer imaging Archive (TCIA) public access Repository. In this, the images are selected on T1 weighted contrast in hands that include different grades of glioma. Hence it will be able to provide a best accuracy of images and the results indicate the Efficiency of the method for Brain Tumor Classification.

[5] The brain tumor image segmentation generates highly accurate image from the multimodal MRI scans.

It proposed a method of generating brain tumor segmentation using Deep Neural Networks that aids in treatment of the disease and managing the patients efficiently. Accordingly, the dataset was used as the 2019 BRATS dataset; with this, the training set employed to train the models and the validation set for the evaluation of the proposed ensemble. In this, the multi-institutional dataset contains multimodal MRI scans of each patient namely T1, T1 Contrast-Enhanced (T1CE), T2-Weighted (T2) and fluid Attenuated Inversion Recovery (FLAIR), from which the tumoural sub regions are segmented.

[6] Yibo Han et al., (2020), The deep learning assisted image interactive framework for brain image segmentation is a proposed framework that can contribute for a better performance in brain tumor segmentation. Earlier, as per the previous records, the outcomes from other methodologies were not approx. and specific. So, concept named Deep learning assisted image interactive medical image segmentation(DL-IIMIS) was proposed. This approach used to find out the difficulties by using the algorithm convolutional neural networks (CNN). The CNN further uses bounding pipeline and scribble- based methodologies.

Earlier when we adapted a CNN model, it proposed image tuning and some other transformations such as supervised and unsupervised. But in this frame two implementation methods are used:

1. 2-D Multi - Magnetic Resonance (MR) segmentation.
2. 3-D Segmentation. These methods work well with previously unseen artifacts. Hence with less user interaction and less time, DL-IIMIS achieves higher accuracy.

[7] Wu Deng al. (2020) In deep learning a new method for the segmentation has been introduced with the help of the following methods: 1. Conditional Random Fields (CRF) 2. Heterogeneous Convolution Neural Network (HCNN).

These methods are the proposed segmentation networks for brain tumors. They are performed in a step-by-step manner where the whole network has been adjusted with image slices. When the segmentation is completed, it is used for tumor

segmentation in image slices. In HCCN, the networks are distributed across every map and every smaller output. The CRF method has high energy Optimization. Both the methods have high sensitivity, while MRI processing with the same modality; they provide similar information on image sensitivity. Hence in comparison with other models, this strategy develops a structure to recognize and order the tumor type.

The 2013 challenge BRATS segmentation dataset is with voting fusion technique. In this segmentation, results proven that HCNN and CRF can enhance spatial segmentation efficiency and accept accuracy. The HCNN, CRF and Post-Processing can minimize false positive results.

[8] Ming Li et al., (2019) According to the problem of brain tumor it can be improved by introducing an association of multi modal information fusion and CNN detection methods for brain tumors called Multi-CNNS.

The brain tumor accuracy is performed by both dimension detection network and single mode brain tumor. As per patient data set provided by the BRATS-2018, 220 people have advanced glioma and 54 have lower gliomas and each patient has four modal MRI images, namely FLAIR, T1, T1C, and T2. By brain tumor detection method, there is a good improvement obtained.

4. Conclusion

Our review is to be aware about the diagnosis of the brain tumor that requires accurate treatment without any deviation. An efficient method of brain tumor has been proposed with DL, brain tumor segmentation needs to be urgently proposed, to improve the segmentation accuracy and achieve automatic segmentation. For that, we suggest Deep Convolutional Neural Network. It can help to estimate fast and cost effective diagnosis techniques. So, the best way to achieve Brain Tumor Segmentation is through Deep Learning techniques and their potential is yet coming to be explored.

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