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A REVIEW ON BRAIN TUMOR DETECTION FOR HIGHER ACCURACY USING DEEP NEURAL NETWORK AND CNN

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ABSTRACT

Brain is the most important integral organ for a person and any unrecognized aspects in brain affect the whole body. The survival time of an individual with high risk of glioma is up to 1-3 years. The deep learning based architecture improves the life enhancement of the patient. The identification and observation of the tumor can be done using MRI (Magnetic Resonance Imaging). MRI images are the source of input. The proposed system consists of modules: Image Acquisition, Preprocessing, Segmentation, Feature Extraction, Feature Comparison, and Prediction. The predicted output classifies the stages of the brain tumor. The deep learning techniques CNN and VGG16, detect and returns the more accurate results of the brain tumor.

I. INTRODUCTION

A cancer is an abnormal cell growth or tumor in the brain. The human skull, which houses our brain, is a solid structure. Any unwanted cells which emerge inside such a small space can cause issues. There really are two types of brain tumor cells: benign or malignant, benign is cancerous and malignant is noncancerous. When these benign and malignant grows inside the brain This can result in brain damage, which can be fatal. Brain tumors come in a variety of sizes and shapes. There seem to be two types of brain tumors: primary and secondary.

The symptoms of a brain tumor vary based on the tumor's location, size, and shape. Some tumors penetrate brain tissue and cause direct damage, whereas others put pressure on the surrounding brain. Magnetic resonance imaging (MRI) is a form of medical imaging that analyzes the body's interior structure. Magnetic fields and radio waves are being used in MRI scanners to produce images of different organs in the human body. The soft tissues of the brain are clearly seen via MRI. Humans have a difficult time analyzing precise positions and minute differences. Preprocessing, segmentation, and Feature Extraction are examples of digital image processing approaches that can be used to anticipate the presence of a brain tumor. This study used deep learning algorithms to detect brain tumors with a better accuracy rate using MRI scans.

II. LITERATURE SURVEY

G. Raut, A. Raut, J. Bhagade, J. Bhagade and S. Gavhane et al., [1.] This paper was published in the year of 2020. In this paper they have used CNN model for determining the brain cancer. To start, the brain MRI images are supplied to create enough data for deep learning. Then the next step is image preprocessing, this step helps us to remove the disturbance in the input data for the further processes. The output system is well designed for preprocessing the MRI brain pictures and it uses feature extraction to classify the brain MRI scans according to the characteristics of the images. They have used back propogation technique to reduce the errors in the output and generates more accurate results. They have used KMeans algorithm for segmenting the tumor region. KMeans is an unsupervised learning technique.

R. Tamilselvi, A. Nagaraj, M. P. Beham and M. B. Sandhiya et al., [2.] This paper was published in the year of 2020.Technological innovations, if used in combination with established imaging techniques, contribute to enhance brain cancer detection. The majority of brain cancer datasets really aren't available to the masses. BRAMSIT is indeed a tool that the MRI image processing scientific world could use.The BRAMSIT collection is indeed a proposed Magnetic resonance dataset that aims to provide a combination of normal and cancerous brain cancer pictures. The software interprets information like the clinical characteristics and Magnetic axial position.

P. Ganasala, D. S. Kommana and B. Gurrapu et al., [3.]This paper was published in the year of 2020.Mri scan (MRI) is a very advanced healthcare diagnostic tool for visualizing brain abnormalities because of its unobtrusive character, improved tissue comparison, plus lack of radiation exposure. Data produced by the MRI scanners are so huge, this is very difficult for the radiologist analyze the result. It is very time-consuming and difficult job for them. Hence there is a requirement to develop the software that produces more accurate results like classifying the brain cancers according to their characteristics. This software produces more accurate results.

S. K. Baranwal, K. Jaiswal, K. Vaibhav, A. Kumar and R.Srikantaswamy et al., [4.] This paper was published in the year of 2020.The goal of this developed system is to divide the brain tumor images using convolutional neural network (CNN) and Support vector machine (SVM) into three types as, Meningioma, Glioma and Pituitary. Images of the dataset reduces computation and some amount of noise is concatenated to make the system robust and to maximize the datasets. The platforms like Google Colab and Tensorflow does the performance comparison.

B Kokila[1], M S Devadharshini[1], A Anitha[1] and S Abisheak Sankar[1], et al., [5.] This paper was published in the year of 2021.Analyzing and classifying the brain tumor as of its grade. Tumor space and the parts of the tumor has been located by ideological effort of the diagnosis using magnetic resonance imaging (MRI). The convolutional neural network (CNN) classifies the multi-risk orientation of the cancer. The segmenting of the tumor determines the location of tumor using convolutional neural network (CNN).

Irmak, E et al., [6.] This paper was published in the year of 2021.This paper was published in the year of 2021.The goal of this article is to use a convolutional neural network (CNN) to multi-classify brain tumor for prior diagnosis. Three different categorization tasks uses three different CNN models.CNN architecture classifies the brain tumor into 5 types: normal, glioma, meningioma, pituitary, and metastatic of an accuracy of 92.66 %. The hyper parameters of CNN uses grid search optimization algorithm to describe the models.

C. Someswararao, R. S. Shankar, S. V. Appaji and V. Gupta et al., [7.] This paper was published in the year of 2020.The anomalous detection of cells in brain result in brain tumor which may lead to destruction. The rate of this destruction can be decreased by advance noticing of tumor. Most regular method to determine the tumor in brain is to utilize the Magnetic Resonance Imaging (MRI). MR images are examined because it presents a apparent structure of the tumor. In this paper we have proposed an new mechanism for discovering tumor from MR scan by appealing Machine Learning Design extremely with CNN Model.

D. Divyamary, S. Gopika, S. Pradeeba and M. Bhuvaneswari et al., [8.] This paper was published in the year of 2020.The goal of this study is to create an effective method for early detection of brain tumors. Noise removal, morphological operations based on segmentation, feature extraction, and the Naive Bayes classifier are some of the processes in the project. Initially, the patient's brain picture is obtained. Pre-processing of the captured image is carried out, followed by feature extraction and classification. As a result, we use the Naive Bayes classifier approach to accurately predict brain tumors.

K. S. Rani, K. M. kumari, T. Nireekshna, D. V. Shobana, N. Kavitha and B. B. Sri et al., [9.] This paper was published in the year of 2021. In MR images, the existence of tumor vary notably because of the dissimilarity in the tissue cells. A absolute segmentation method must be determined to discrete the tumor tissue to take out exact volume models. This analysis describes an effective method for volume supplying of brain from 2D MR segment. For medical analysis, the estimation of the pre-operative volume of tumor is exceedingly necessary.

B.M et al., [10.] This paper was published in the year of 2021.This research work provides an automatic segmentation architecture that describes the involvement of 3 x 3 bits on CNN. The system uses a less part for planning deepest engineering than constructive report above over fitting, which determines very less amount of weights. It utilizes the depth normalizing technique for preprocessing which is not CNN-dependent segmenting technique used in brain MRI images.

M. Swami and D. Verma et al., [11.] This Paper work uses radiograph CT and MRI images to analyze the brain tumor by using algorithm that uses image processing and segmentation. The source for the database is from open source website of google. It consists of four sections: image processing, state of art literature, gives the details of the system, analysis of the section. An accuracy of 87.50% has been achieved by the implemented algorithm. The system is cost effective for the medical purpose.

M. F. I. Soumik and M. A. Hossain et al., [12.] This paper focused on the drawbacks of the other systems which uses convolutional neural network (CNN) that is used for classification of the images and detection of the tumor. The convolutional neural network (CNN) uses MRI images which lacks precision and it is a slow process. So, they have used Deep neural network (DNN) for the best utilization to build the model which improves the accuracy of the system. The deep neural network uses feature extraction and segmentation for the high contrast of accuracy and efficiency. This model is proposed with higher accuracy with less processing time.

Z. Sobhaninia, S. Rezaei, N. Karimi, A. Emami and S. Samavi et al., [13.] This paper gives us that the low accuracy in the segmentation is the major drawback that leads to development of the more accurate ones. In this paper they have implemented using a deep learning technology to improve the accuracy of tumor using MRI images. The approach for local and global views is used with cascade of multiple scale to get maximum accuracy. It shows the advantages of using multiple scales with two cascade network.

P. Wu and Q. Chang et al., [14.]Utilizing heterogeneous MRI data, they provide a deep learning-based methodology for brain tumor segmentation in this research. For the segmentation of brain job, a 3-dimensional U-net oriented deep learning model was developed. Gliomas seem to be the most prevalent fundamental stage brain cancer. For diagnostics, therapeutic approach, and health risk detection, efficient and consistent cancer separation is critical. The encoder and decoder comment section are coupled through with a number of layered, compact skipped routes in our design, which is effectively a heavily trained convolutional network. The information BraTS 2019 is used to train our system.

Somnath, S. Negi, P. C. Negi and N. Sharma et al., [15.]Cancer separation is among the most important issues in medical vision based and medical treatment. Timely identification of cancerous tissue cells helps in preventive care plan and increases the participant's survival chances. Automated tumor cell separation in MRI Image is getting difficult, and it also necessitates experience in the field. They demonstrate a strong Base Convolutional Network built with the Tensor framework that can help implement classification jobs in healthcare pictures in this research. A input

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vector of 225 individuals' brain MRI scans is employed, while a different dataset of consecutive patients is being used to evaluate the cable network effectiveness.

III. METHODOLOGY

A. Image Acquisition

The brain picture will be in MRI format, followed by the creation of a color transformation structure for the brain image, and finally the application of an independent color space transformation for the color transformation structure.

B. Pre-processing

It is a process of converting the initial input data into understandable format. It is difficult to work with raw data. Hence there is a need for preprocessing. For using any learning algorithms the input data must be preprocessed.

C. Segmentation

Image segmentation is a technique for simplifying a digital image by splitting it into several segments. This simplification aids in the examination of images for subsequent study.

D. Feature Extraction

Feature extraction is a process selecting the useful features from large dataset by eliminating the unwanted features. So that it will be helpful for the further analysis, otherwise it will be very difficult to proceed with next step with large unwanted datasets.

E. Feature Comparison

We are employing a trained support vector classifier in this phase to detect and classify the brain tumor detection.

F. Predictions

The final step is displaying the results. Deep learning algorithms will display more accurate results.

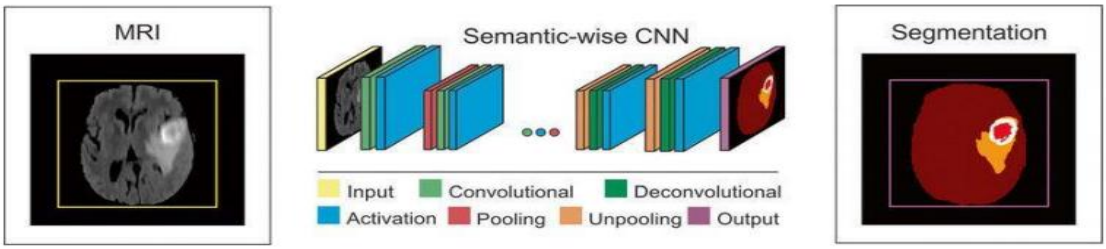

Figure 1: Brain Tumor Detection Methodology

IV. FLOWDIAGRAM

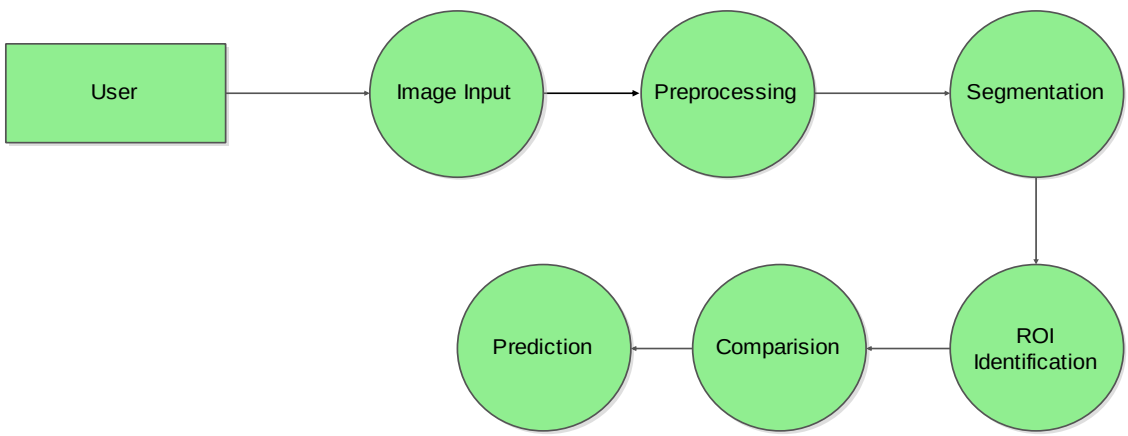

Figure 2: Flow Diagram of our project

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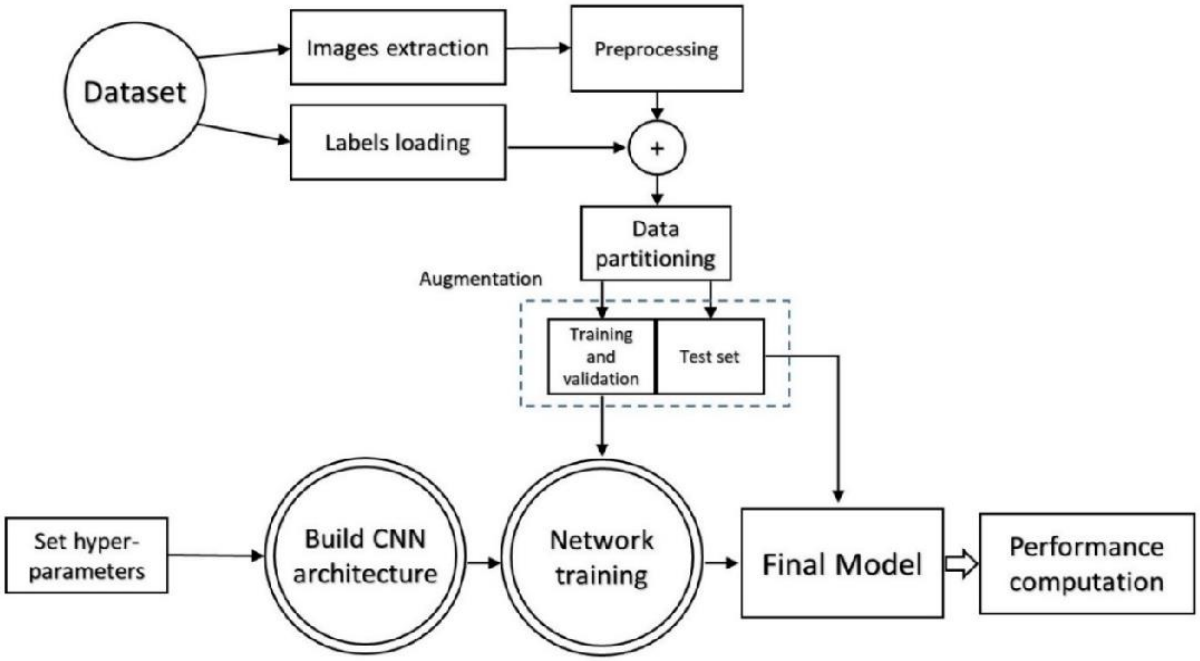

Figure 3: Multi Classification of Brain Tumor images using deep neural network

V. CONCLUSION

Different methodologies available for the determination of the tumor from MRI images. These methods gives more abstract and accurate results than manual identification. A comparitative job is done based on the performance of the categorization of the MRI images. The abnormal images are compared with the normal images for the detection of the tumor. The reliable and precise conclusion can be done for the optimal performance of the system. Purpose of the project is to detect the tumor in tumor in the brain by processing the image and extracting the Region of Interest based on the data segmentation. We further implement the more important and powerful network methodologies and pre-processing technologies to improve the performance. We think that the result would be more promising with the modification.

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