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BRAIN TUMOR CLASSIFICATION USING CONVOLUTION NEURAL NETWORK (DEEP LEARNING)

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Abstract- Astrocytoma is the most common and serious disease with a high grade and short life expectancy. Therefore, planning effective therapy is crucial to enhance patients' quality of life. Malignancies in different organs, such as the brain, lung, liver, chest, and libido, are usually diagnosed using image procedures like computed tomography (CT), magnetic resonance imaging (MRI), and computerized tomography. Among these techniques, MRI is considered superior in diagnosing brain tumors. However, the identification of tumors by humans in a specific time period is difficult due to the enormous amount of data generated by an MRI scan. Moreover, MRI has limitations as quantitative data is not commonly available for all images.

I. INTRODUCTION

The brain is the most important organ of the body, composed of billions upon billions of cells. When cells divide incorrectly, it can result in the formation of abnormal cell groupings known as tumors. Brain cancer can be categorized into low-grade (grades 1-2) and high-grade (grades 3-4) Tumors. A low-grade Tumor is also referred to as a "benign" Tumor.

The term "carcinogenic" is used to describe more severe forms of cancer. It is important to note that a non-cancerous Tumor is not the same as a benign Tumor, as it does not spread to other parts of the brain. A malignant Tumor, on the other hand, can be classified as a cancerous Tumor, as it quickly spreads to other parts of the body and can result in immediate death. Brain MRIs are commonly used to locate Tumors and simulate their growth patterns.

This information is crucial in identifying malignancies and developing treatments for them. Compared to CT or ultrasonic images, MRI images can provide more detailed information on a patient's medical condition. An MRI examination can provide substantial information about the structure of the brain and detect abnormalities in brain tissue.In recent years, researchers have developed various automatic methods for identifying and categorising different types of brain cancer through brain MRI scans. These methods may potentially be used to diagnose and categorise brain Tumors. Neural Networks (NN) and SVMs (SVM) have been the most successful approaches used to facilitate implementation.

Problem Statement

A study found that the leading cause of death worldwide is brain tumors. The symptoms include hormone changes, blood clots, weakness, shaky gait, slurred speech, mood swings, vision loss, etc. The location of the tumor determines the type of tumor, and a timely diagnosis may increase the patient chance of survival. Benign tumors are non-cancerous growths that do not penetrate the tissue around them. They can be completely erased and are quite unlikely to reappear. Benign brain tumors cannot invade neighboring tissue, yet they can still cause excruciating pain, permanent brain damage, and even death. Malignant brain tumors lack distinct boundaries. They can quickly expand and spread outside of their original location in the brain or spinal cord, applying increasing pressure inside the brain. It is highly rare for malignant brain tumors to have spread outside of the brain.

Aim

Clinical professionals still find detecting a brain tumor to be a very difficult and time-consuming process, despite substantial advances in medical technology. Early and correct diagnosis of brain tumors may help with their successful and efficient treatment. Higher levels of predictability might improve the efficiency and precision of the automatic identification and therapy of brain tumors.

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II. RELATED WORK

1. "Deep Learning-Based Brain Tumor Detection and Classification in Magnetic Resonance Imaging (MRI)"
This research paper explores the application of deep learning models, particularly convolutional neural networks (CNNs) and recurrent neural networks (RNNs), for the detection and classification of brain tumors in MRI scans. It discusses the use of large datasets, model architectures, and optimization techniques to achieve high accuracy in brain tumor diagnosis.

2. "Advanced Imaging Modalities for Brain Tumor Detection: A Comparative Study"
This study presents a comparative analysis of various advanced imaging modalities, such as MRI, CT, PET, and functional MRI (fMRI), for brain tumor detection. It evaluates the strengths and weaknesses of each modality in terms of sensitivity, specificity, and diagnostic accuracy, aiding in the selection of the most suitable imaging technique.

3. "Machine Learning Approaches for Early Detection of Brain Tumors in Pediatric Patients"
Focusing on the early detection of brain tumors in pediatric patients, this paper investigates machine learning algorithms and features extracted from neuroimaging data. It discusses the challenges specific to pediatric cases and explores methods to enhance the early diagnosis and treatment of brain tumors in children.

4. "Brain Tumor Segmentation and Localization Using 3D Convolutional Neural Networks"
This research paper introduces a 3D CNN-based approach for brain tumor segmentation and localization in 3D MRI volumes. It discusses the benefits of 3D CNNs in capturing spatial information and outlines the pipeline for accurate tumor delineation and localization within the brain.

5. "Radiomics-Based Brain Tumor Classification: Bridging Imaging and Machine Learning"
This study bridges the gap between medical imaging and machine learning by employing radiomics, a technique that extracts quantitative features from medical images. It demonstrates how radiomics features can be used for brain tumor classification, aiding in the differentiation of tumor types and guiding treatment decisions.

III. EXISTING SYSTEM

Brain tumor segmentation is a technique used to identify and locate brain tumors. "Mixed brain-tumor segmentation" is a new and more effective approach to this method. It involves combining different feature extraction methods to achieve better results than previous techniques. One of the main challenges of this method is its complexity.

There are various types of brain tumors, and different segmentation techniques can be used to identify them. Some of these techniques include geographical area segmentation, threshold-based segmentation, fuzzy C Mf segmentation, Atlas-based edge detection, Margo Random Ground (MRF) segmentation, deformation models, and geometric deformable models. Each technique is evaluated based on its accuracy, robustness, and validity. To diagnose the sickness, a mixed classification approach with the reward for excellence is used.

However, one disadvantage of using Support-Vector-Machines (SVM) is that they have limitations in applying new methodologies. On the other hand, Deep Learning (DL) models have become popular in recent years because they can efficiently express different interrelationships without requiring a large number of nodes as in surface-level recognition.

IV. PROPOSED SYSTEM

Our proposed system is designed to train the application to identify brain tumors and mark them on MRI images. This is especially helpful when the MRI scans are not clear enough to easily identify the location of the tumor. Our application helps users and doctors easily locate and mark the tumors on the MRI images for precise identification.

We utilize the Convolution Neural Network Algorithm to detect the tumor on MRI images from different patients. To ensure efficient performance, the system needs to be trained using different sets of images. We use image processing and neural network techniques to improve the accuracy of detecting and classifying brain tumors in MRI images.

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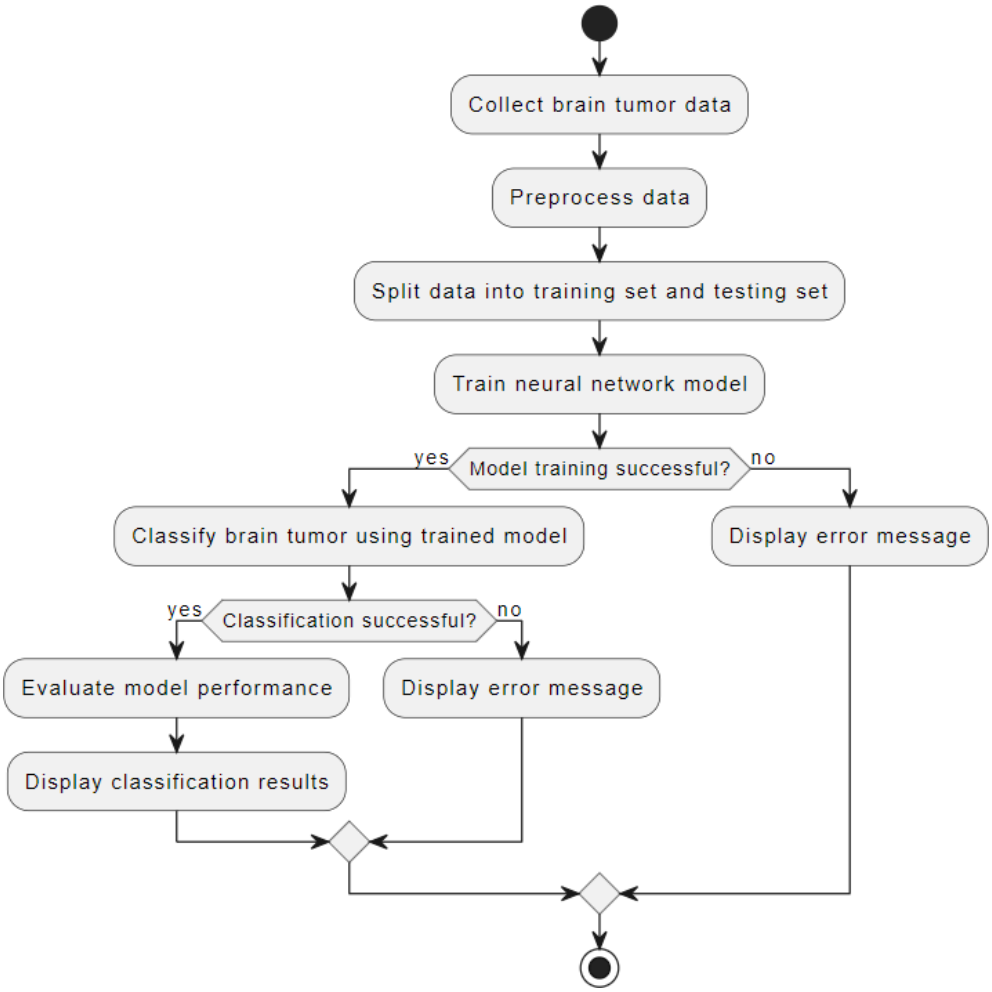

V. CONCLUSION

The goal of these projects is to create an automated and precise method for diagnosing brain tumors that is highly efficient and has minimal issues. Traditional methods of classifying brain tumors involve extracting roughness and contour features, using Fuzzy C-Means (FCM) for segmentation, SVM, and DNN for classification.

However, these methods are not very accurate due to extensive processing. A proposed procedure using Convolutional Neural Networks (CNN) has improved the accuracy and reduced the computing complexity. Tests have shown that this procedure can identify malignancies in brain images. The CNN uses a multi-layer computational intelligence approach, and Python is used for building the model. It is a classification model.

FUTURE ENEHANCEMENT

Continue to advance deep learning techniques, such as convolutional neural networks (CNNs) and recurrent neural networks (RNNs), to enhance the accuracy of brain tumor detection. Develop models capable of handling multi-modal data (e.g., MRI, CT, PET) and different types of brain tumors.

REFERENCES

[1]. Heba Mohsen et al, “Classification using Deep Learning Neural Networks for BrainTumors”,Future ComputingandInformatics,pp1-4(2017).
[2]. Stefan Bauer et al, “Multiscale Modeling for Image Analysis of Brain Tumor Studies”,IEEE Transactions onBiomedicalEngineering,59(1):(2012).
[3]. Atiq Islam et al, “Multi-fractal Texture Estimation for Detection and Segmentation of BrainTumors”, IEEE,(2013).
[4]. Meiyan Huangetal,“BrainTumor Segmentation Based on Local Independent Projection based Classification”,IEEETransactionsonBiomedicalEngineering,IEEE,(2013).

DOI: 10.17148/IARJSET.2023.10837

[5]. AndacHamamci et al, "Tumor-Cut: Segmentation of Brain Tumors on Contrast Enhanced MR Images for Radiosurgery Applications", IEEE Transactions on Medical Imaging, 31(3):(2012).

[6]. Bjoern H. Menze et al, "The Multimodal Brain Tumor Image Segmentation Benchmark(BRATS)", IEEE Transactions on Medical Imaging, (2014).

[7]. 7. Jin Liu et al, "A Survey ofMRI-Based Brain Tumor Segmentation Methods", TSINGHUA Science and Technology,19(6)(2011).

[8]. Shamsul Hudaetal,"AHybridFeatureSelectionwithEnsembleClassificationforImbalanced Healthcare Data: A Case Study for Brain Tumor Diagnosis", IEEE Access, 4:(2017).

[9]. R. Karuppathal and V. Palanisamy, "Fuzzy based automatic detection and classification approach for MRI-brain tumor", ARPN Journal of Engineering and Applied Sciences, 9(12):(2014).

[10]. Janani and P. Meena, "image segmentation for tumor detection using fuzzy inference system", International Journal of Computer Science and Mobile Computing, 2(5): 244 – 248(2013).