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Detection And Classification Of Brain Tumor

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ABSTRACT

Brain is a unit which controls a human body. The functions are regulated such as memory, vision, hearing, knowledge, personality and problem solving. The brain tumors are the uncontrolled and abnormal development of tiny brain cells.In medical practices early detection and recognition of brain tumours accurately not detected. There are various techniques which was proposed for the segmentation of tumor in brain. Magnetic resonance imaging (MRI) is medical imaging which has high quality particularly used for imaging of brain. Magnetic resonance imaging (MRI) identifies minute detail of the human brain.

The magnetic resonance imaging (MRI) used even in diagnosis of several severe disease of medical science like brain tumors. The brain tumor detection process where image processing techniques has been applied which involves four stages such as pre-processed images, image segmentation, feature extraction, and classification of brain tumours accurately detected. There are various techniques has been proposed for the accurate segmentation of brain tumor.

INTRODUCTION

Medical image processing includes the utilization and exploration of MRI images which are taken as datasets of a brain obtained from MRI imaging for diagnosis of pathologies and guiding the medical interventions for surgical planning. Tumors are classified into two categories such as benign and malignant. A benign tumor is non-cancerous. It includes the folded close tissue where it forms a tumor that leads to development of abnormal cells. The benign tumors are not serious but it can be serious if it presses on vital structures such as blood vessels and nerves. Benign tumors is similar to fibroids where they grow in the connective tissue found in any parts of human brain. Meningiomas are found near the end of outer curve of the brain and they are same as fibroids. These tumors which form near the base of the blood tissues and tends to grow slowly where they grow quite large before they are diagnosed. Even meningiomas can grow large enough to be life threatening if they compress and affect nearby areas of the brain.

Segmentation technique is used to divide the tumor cells by application of convolutional neural network model. Convolutional neural network used for image-based datasets due to its relatively low number of network weights and the use of kernels enables the development of a deeper architecture which leads to overfitting and underfitting due to its possibility of error rates. Tumors could be detected using convolutional neural network model using deep learning techniques.

EXISTING SYSTEM

In an existing system, it has been practically applied for many reasons but using different models and algorithms in order to detect brain tumors. There are many projects which are practically applied even for breast cancers. But brain tumor is detected using Convolutional neural network where projects exist only in research papers as well as in practical way of approach and not implemented using fuzzy c-means with neural network model. There are very few projects exists in detecting a brain tumor.

In convolutional neural network (CNN), it does not combine with position and weights of the object. Due to lack of its spatially invariance to the data which are considered to be an input.A huge volume of data been trained and tested whereas the existing projects focuses on the detection of the brain tumors by using random forest and other classification algorithms.

Deep learning algorithms are implemented in real-time projects. But there are fewer projects which have been implemented. The models of the projects are trained and tested using many technical procedures. Before model is trained the main problem for developing a project has to be identified and then data is cleaned after undergoing many steps the model is trained and then tested.

Images are in form of black and white as they are scanned images of brain but for other diseases the criteria for dataset changes. There are several existing techniques which are applicable for segmentation and classification of brain tumors. But in existing system, the brain tumor is detected using website which has been created by flask framework. The classification techniques represent a study of brain tumor detection and their advantages and limitations.

PROPOSED SYSTEM

To overcome these limitations, the proposed system uses a convolution neural network (CNN) based classifier. Convolutional network-based classifier does the comparison between trained and tested dataset which gives the simplest result. The Magnetic resonance imaging (MRI) which are scanned images taken as input data and while processing the result falls into any one of the cateogory like detection of tumor cells or non-detection of tumor.In this system, the EfficientNet model used in convolutional neural network to enhance its efficiency. But the accuracy of the model is comparatively low when compared to other pre-trained models.

Brain tumor could be diagnosed at any age but there are few automated detecting systems not with greater resuts. In order to get the desired and actual outcome certain algorithms and techniques should be applied which offers a greater result. When applying a new kind of approaches, the proposed system has to undergo many changes in the accuracy and efficiency of these results. When there is a lack of proficiency and equipment are required in the areas of local populations because of the unhealthy lifestyle and usage of smart phones are growing rapidly that leads to the development of brain tumors. In proposed system, where the screening of brain tumors are recognized using classification of images, machine learning, artificial neural network and deep learning algorithms are applicable to find better accuracy rate.

In recent years most of the image processing researchers indulged in the development of machine learning, computer vision and deep learning approaches. In proposed system, it is based on the key aspects of disease severity classification from image classification. In proposed detection system of brain tumor identified using machine learning and deep learning approacheS. These are the steps to be followed for the detection of automated system,

- Collection of data set
- Data augmentation
- Build a model in Convolutional Neural Network
- Train deep learning model
- Detection of a brain tumor

The proposed system overcome the drawbacks of the existing system because depending on patient's brain condition and their medical screening are examined from MRI images which taken as input data. Then, this data is pre-processed and exact deep learning algorithms such as convolutional neural network are applied. There are certain packages and libraries which are imported and by using deep learning models which gives better accuracy using image classification and recognition method when compared with other algorithms.

Convolutional neural network (CNN) consists of multiple layers of artificial neurons where an input image is used and each layers generate several activation functions that are passed on to the next layer. The proposed system helps the doctors to identify the tumor in brain cells by the presence of abnormal development of tissues which causes tumor. These tumors turn into a brain cancer.

Detection of brain tumors are detected using fuzzy c-means algorithm where the measures and matrices are used to evaluate the clusters into different categories. These clusters are evaluated by analysis of the clusters that has been formed. The dependency of clusters formed using coefficient of variance in analysis of each cluster. Using this algorithm, the precision value and f-score values are determined as an outcome to the classification report while building a model. The outcome for the overlapped dataset is comparatively greater than fuzzy k-means algorithm. This algorithm depends on fuzziness for the solution based on the parameter. When the value of matrix m is greater than its actual value then the classified labels of all elements belong to the parameters.

RESULTS AND DISCUSSION

Early detection of brain tumors significantly reduces the time needed for diagnosis, minimizing patient effort and costs while ensuring timely treatment to prevent fatalities. Automated systems play a crucial role in identifying tumors at an early stage. Training models to detect brain tumors involves applying specific functions to enhance accuracy. MRI scan datasets contain patient reports, and by utilizing deep learning techniques, higher precision in tumor diagnosis can be achieved. Magnetic resonance imaging (MRI) is effectively pre-processed, and the neural network is trained to determine whether a patient has a brain tumor.

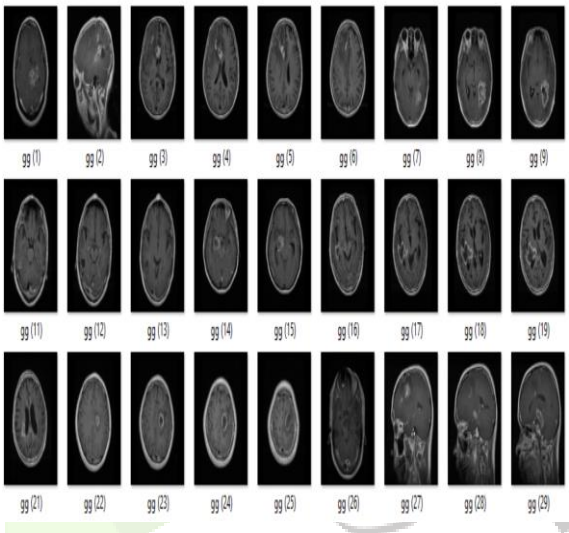

Fig 1 Sample dataset in image format

The image presented features several brain MRI scans, each sequentially labeled to represent either different patients or various cross-sectional perspectives of brain structures.

Certain scans reveal unusual growths or lesions, which may suggest the presence of brain tumors, hemorrhages, or other pathological conditions. The occurrence of bright regions in some images implies contrast-enhanced MRI, which emphasizes areas of abnormal tissue.

The collection consists of axial, sagittal, and coronal views, offering a well-rounded understanding of brain anatomy.Some scans present cross-sectional slices at varying depths, which are vital for examining tumor development or anatomical variations.These scans can aid in the diagnosis of conditions such as gliomas, meningiomas, or metastases. Determining the location, size, and spread of tumors is crucial.

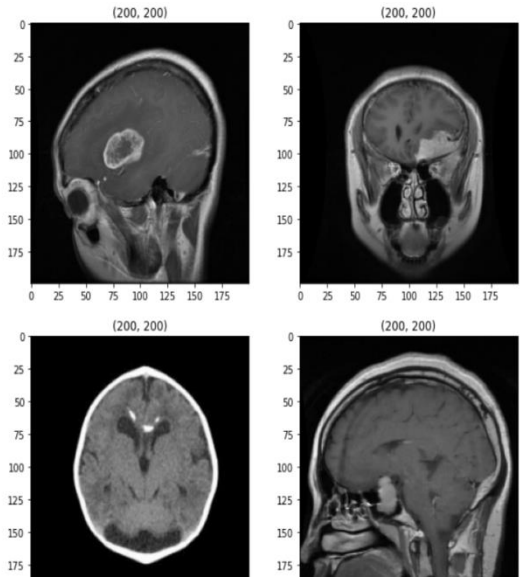

Fig 2 MRI scanned images are enumerated into an array

These images provide important information about brain anatomy and pathology, facilitating early diagnosis and treatment planning.

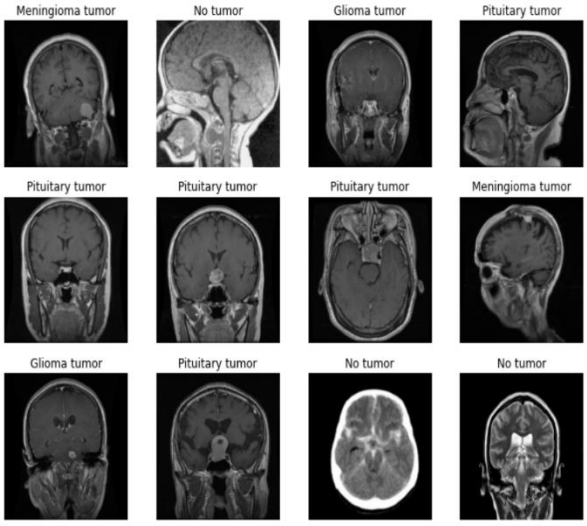

Fig 3 Images are segmented into four different classes such as no tumor, Glioma tumor, meningioma tumor and pituitary tumor

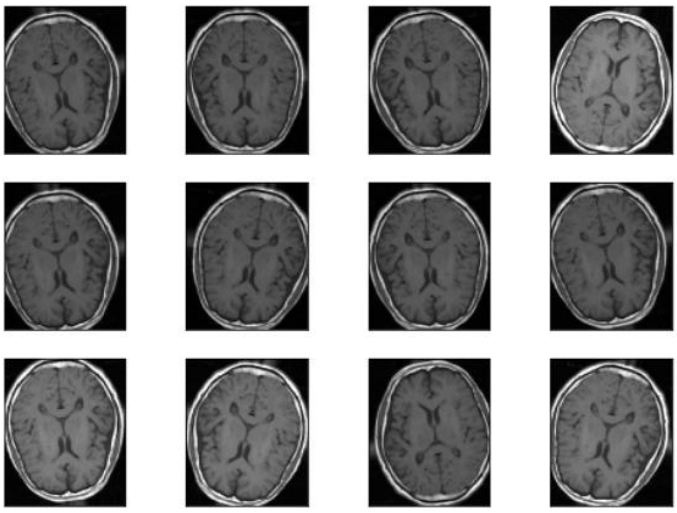

Fig 4 Data augmentation using MRI scanned images

This grid of brain MRI slices represents a structured dataset used for medical analysis based neurological research. Further analysis of detailed feature extraction to detect potential abnormalities or track disease progression done. The uniformity in images includes preprocessing steps like skull stripping, intensity normalization, and noise reduction that have been applied. These images also be used in segmentation tasks, where specific brain structures are isolated.

CONCLUSION

Early detection of a tumor in the brain significantly reduces the time required to determine diagnosis, saving effort and costs for patients and result in the timely treatment by preventing fatality rate. Automated systems for the detection of brain tumor plays an important role in detecting tumor an early stage. Training the model to detect brain tumors by applying certain functions. The datasets of MRI scanned images are reports of each patient's and by applying deep-learning techniques could achieve greater accuracy in diagnosing the tumor. The magnetic resonance image (MRI) is successfully pre-processed, and have trained the neural network to detect whether the patient has a brain tumor or not. The convolution neural network was trained with good accuracy and less loss. Based on the dataset, could further increase the accuracy. This model has the useful techniques that can be utilized to detect and to classify Brain tumor using deep learning.

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