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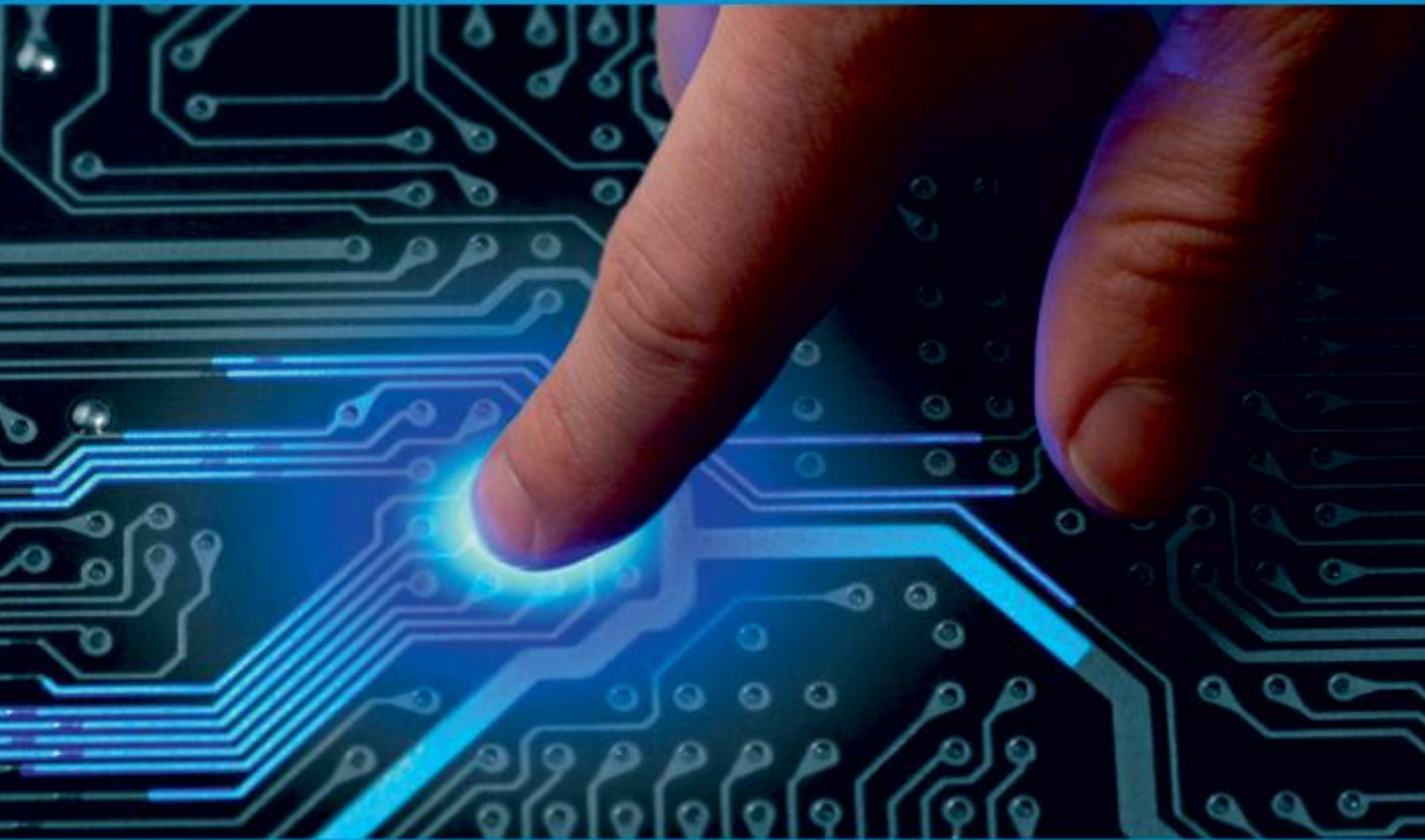

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Automated Brain Tumors Classification and Detection using Convolutional Neural Network

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ABSTRACT: Automated defect detection in medical imaging has become the emergent field in several medical diagnostic applications. Automated detection of tumor in MRI is very crucial as it provides information about abnormal tissues which is necessary for planning treatment. The conventional method for defect detection in magnetic resonance brain images is human inspection. This method is impractical due to large amount of data. Hence, trusted and automatic classification schemes are essential to prevent the death rate of human. So, automated tumor detection methods are developed as it would save radiologist time and obtain a tested accuracy. The MRI brain tumor detection is complicated task due to complexity and variance of tumors. propose the machine Learning algorithms to overcome the drawbacks of traditional classifiers where tumor is detected in brain MRI using machine learning algorithm (CNN). Machine learning and image classifier can be used to efficiently detect cancer cells in brain through MRI.

KEYWORDS*:* MRI, CNN, Image Classifier, Deep Learning

I. INTRODUCTION

A brain tumor occurs when abnormal cells form within the brain. There are two main types of tumors: malignant tumors and benign (non-cancerous) tumors. These can be further classified as primary tumors, which start within the brain, and secondary tumors, which most commonly have spread from tumors located outside the brain, known as brain metastasis tumors. All types of brain tumors may produce symptoms that vary depending on the size of the tumor and the part of the brain that is involved. Where symptoms exist, they may include headaches, seizures, problems with vision, vomiting and mental changes. Other symptoms may include difficulty walking, speaking, with sensations, or unconsciousness.

A primary brain or spinal cord tumor is a tumor that starts in the brain or spinal cord. This year, an estimated 25,050 adults (14,170 men and 10,880 women) will be diagnosed with primary cancerous tumors of the brain and spinal cord. A person's likelihood of developing this type of tumor in their lifetime is less than 1%. Brain tumors account for 85% to 90% of all primary central nervous system (CNS) tumors. Worldwide, an estimated 308,102 people were diagnosed with a primary brain or spinal cord tumor in 2020.

About 4,170 children under the age of 15 will also be diagnosed with a brain or CNS tumor this year in the United States. The rest of this guide deals with primary brain tumors in adults.

Age is a factor in general survival rates after a cancerous brain or CNS tumor is diagnosed. The 5-year survival rate for people younger than age 15 is about 75%. For people age 15 to 39, the 5-year survival rate nears 72%. The 5-year survival rate for people age 40 and over is 21%. However, survival rates vary widely and depend on several factors, including the type of brain or spinal cord tumor. Talk with your doctor about what to expect with your diagnosis.

Brain tumors develop as a result of unregulated and fast cell proliferation. It can be fatal if not addressed in the early stages. Machine learning techniques are used to assist clinicians in detecting brain tumors and making judgments. The progression in the deep learning procedures involving the best classifiers impacted a significant advance in medical image processing in recent years. A brain tumor develops when brain tissues develop abnormally. The malignant tissues outgrow the healthy cells, resulting in a mass of cells that eventually transform into tumors .

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Magnetic resonance imaging (MRI) has been the gold standard for noninvasive brain tumor identification in the last few decades due to its improved soft tissue contrast . MRIs have a considerable impact on medical image processing and analysis due to their ability to provide high-resolution information about brain structure and abnormalities.

A malignant brain tumor grows significantly more quickly than a benign tumor and is more prone to spread to other parts of the brain. Primary malignant brain tumors have poor prognoses and greatly affect cognitive abilities as well as quality of life. The analysis of medical images is critical in assisting people in diagnosing various disorders. The advanced medical imaging modalities are commonly used methods for analyzing anomalies in brain tissues, which can aid in the detection of tumors in their early stages. The data are initially extracted from dataset, which contains MR pictures of the brain. The first stage of the work receives image data from various sources and forwards it to the next layer for preprocessing using linear filters. Further normalization and patch extraction are important procedures performed in the preprocessing layer to prepare the image for use by CNN. Convolution is considered as a mathematical and engineering tool which is involved in the next phase of CNN where the process feature extraction is conducted on the input image combined with multilayered support vector machine (ML-SVM) to provide optimal outcomes in the work.

II. LITERATURE REVIEW

In the paper of R. B. Dubey, he removed noises from the input of MRI image by using the Gaussian filter. Weierstrass Transform is almost similar to the Gaussian filter, which involves convolving using a Gaussian Function. The purpose of using Gaussian filter is to convert the image as a smooth image. The outlook of the image is similar to view through a translucent screen. Gaussian filter is a type of low pass filter, so by passing the filter in the high frequency regions of an image remove the noises. But it takes more time to complete the process and also more details will not be given.

Bahadure et al. proposed SVM and BWT techniques image analysis for MRI-based brain tumor detection and classification. 95% of accuracy is achieved by using this method, using skull stripping which eliminated all non- brain tissues for the detection purpose.

Joseph et al. suggested the K-means clustering algorithm for segmentation of MRI brain images along with morphological filtering for the detection of tumor images has an accuracy of 94%. Support Vector Machine for automated brain tumor classification of MRI images was proposed by Alfonse and Salem.

The author Sachdeva et al. used an Artificial Neural Net- work (ANN) and PCA–ANN for the multiclass brain tumor MRI images classification, segmentation with dataset of 428 MRI images and an accuracy of 75– 90% was achieved.

III. SYSTEM ARCHITECTURE

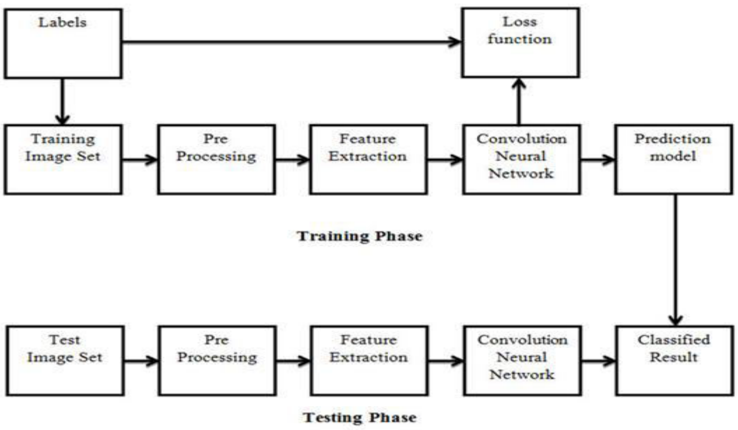

Fig 3.1 System Architecture

This figure shows the design of the system which involves training the data set , testing it and showing the results. The user first takes the dataset and then splits it. Then they train the data set according to the given conditions and then test the data. Then the result is predicted.

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IV. RESULTS

IV.I Training Dataset

The training dataset contains two types of images which are no and yes folders. These folders are used for training the model. Each folder contains about 1500 images.

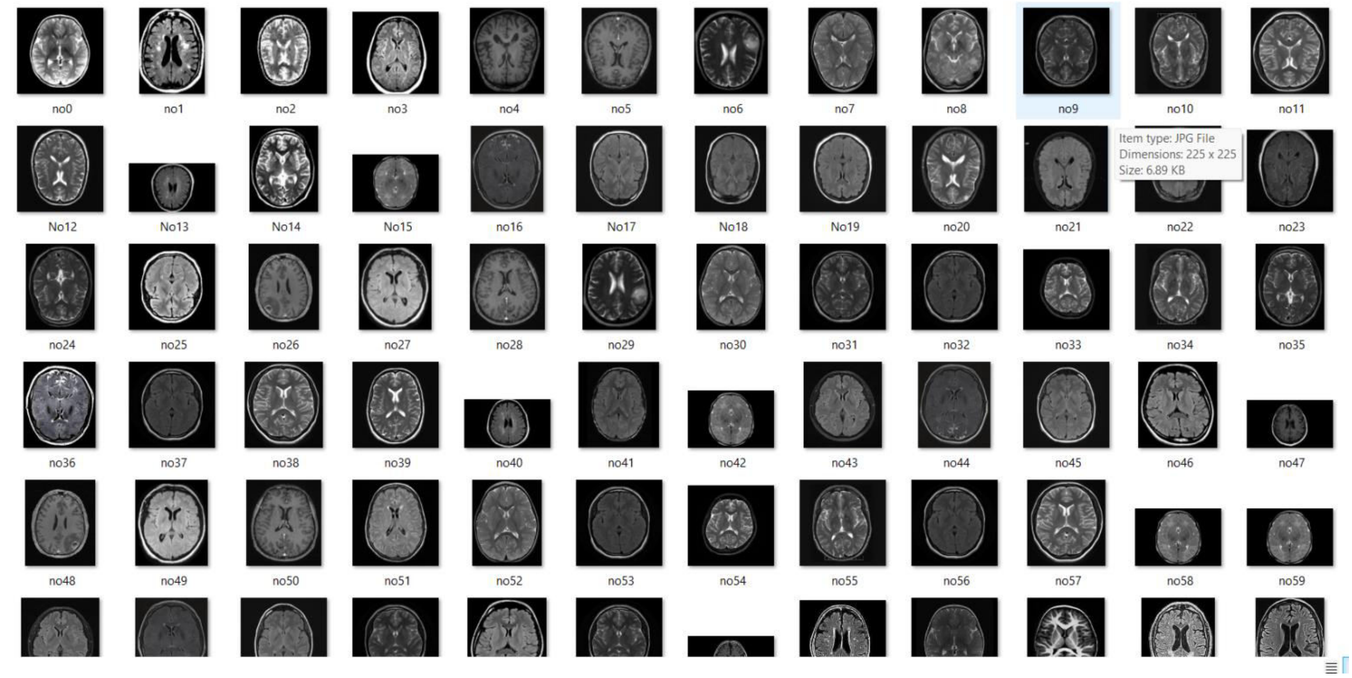

Fig 4.1 Training Dataset - I

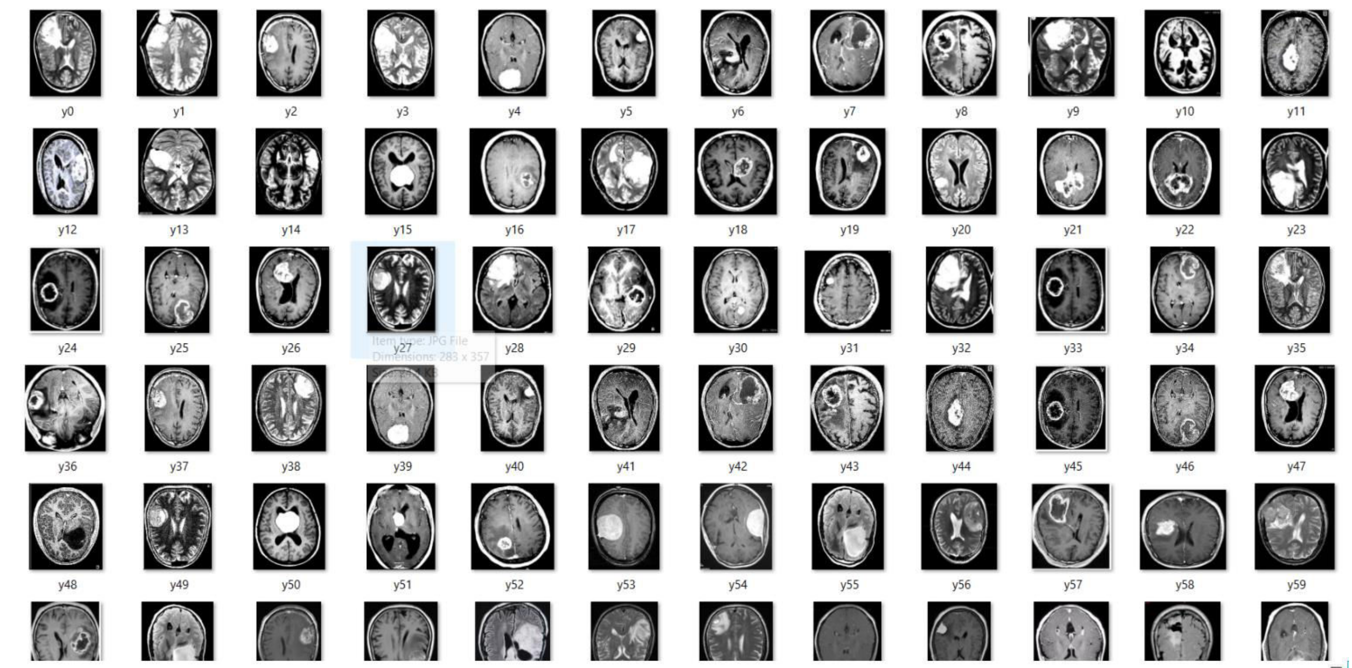

Fig 4.2 Training Dataset - II

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IV.II Testing dataset:

This folder contains brain MRI images for testing the model after it is trained. These images are used to check if the model is giving the expected results.

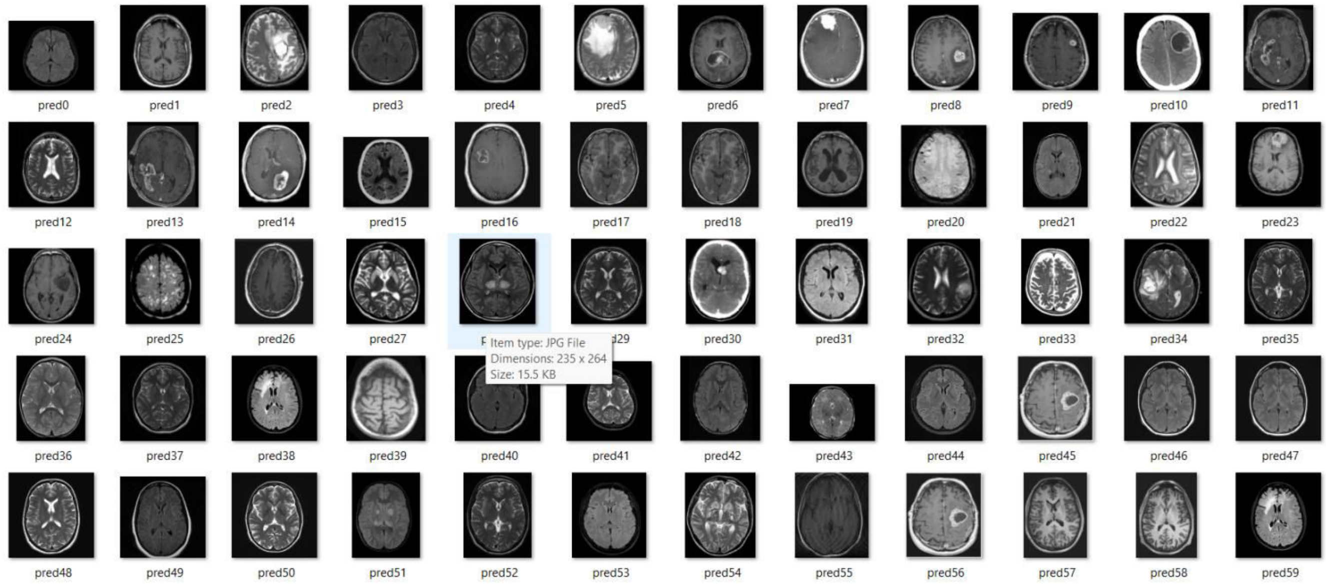

Fig 4.2.1 Testing Dataset

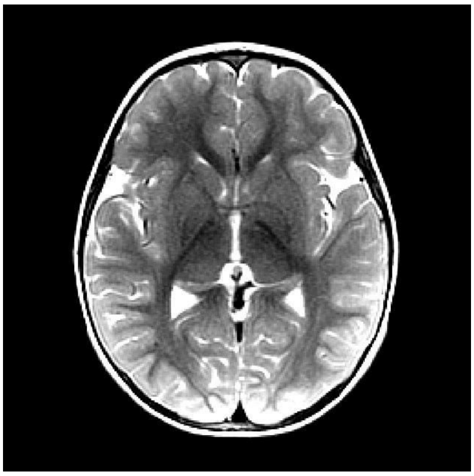

Fig 4.2.2 MRI containing tumor Fig 4.2.3 MRI without tumor

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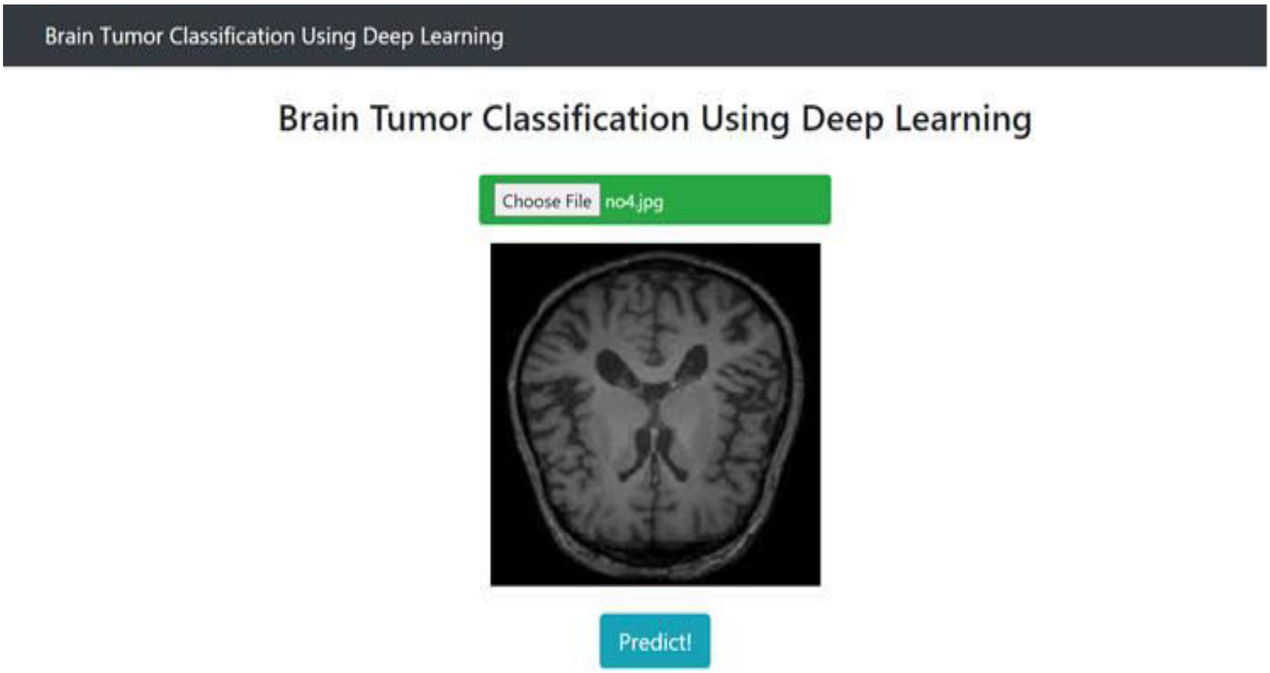

Fig 4.2.5 Prediction

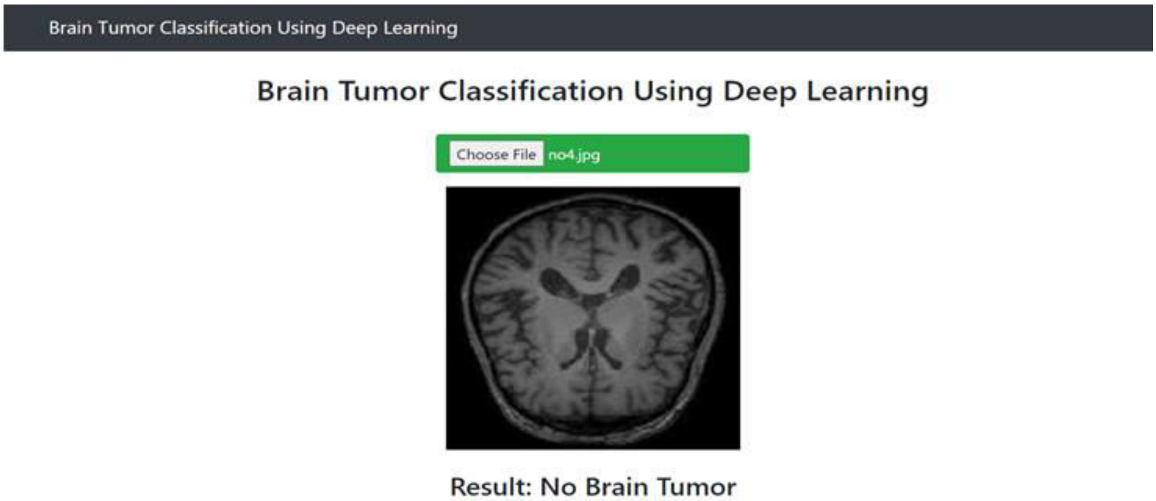

Fig 4.2.6 Result normal

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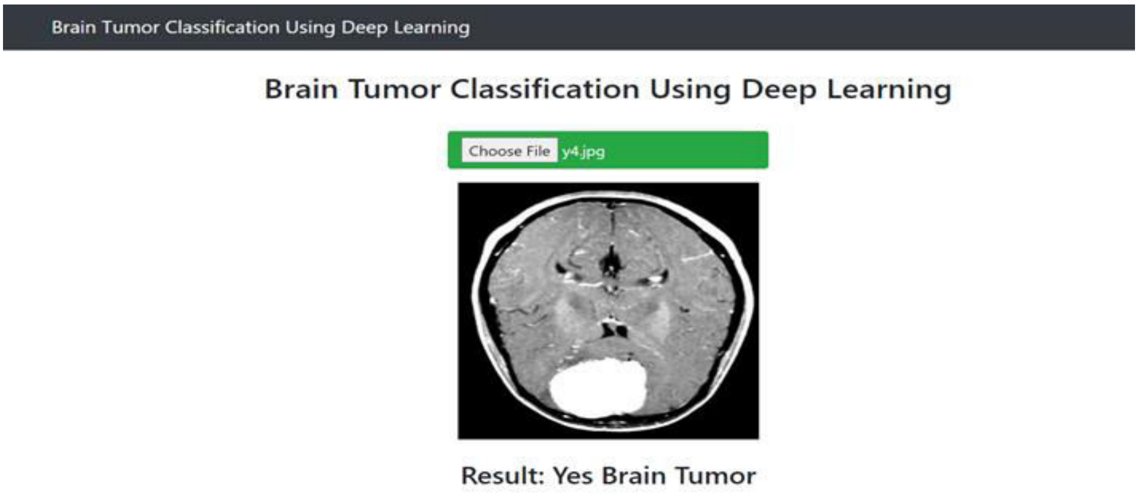

Fig 4.2.7 Result abnormal

V. CONCLUSION

In the existing system the accuracy of the model is not more than 70%. But, in the proposed system the accuracy is increased to 90%. So, we can clearly understand that the efficiency of the model is high in the proposed system. The future scope of this model is very high when compared to other models because of the efficiency and accuracy of this model. So, if any extension of this model is required then we can furtherly use some hybrid combinations of CNN algorithm.

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