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Classification of Brain Tumor Using Machine Learning

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ABSTRACT: Brain tumors are a serious health issue that requires accurate diagnosis and treatment. In recent years, machine learning algorithms have been used to assist in the classification of brain tumors based on MRI images. In this paper, we propose a method for brain tumor classification using a deep learning model. The proposed model is trained on a dataset of MRI images, and the results are compared with the state-of-the-art methods.

KEYWORDS: MRI(Magnetic Resonance Imaging), CT(Computer Tomography), CNN(Connection Neural Networks), SVM(Support Vector Machines).

I. INTRODUCTION

Classification of brain tumors using machine learning techniques is a field of study that involves the use of various computational methods to analyze medical images of the brain in order to automatically identify and categorize brain tumors. Brain tumors are one of the leading causes of cancer-related deaths worldwide, and their accurate diagnosis is essential for effective treatment planning and patient management. Machine learning algorithms can be trained to analyze brain images and identify patterns that are characteristic of different types of brain tumors. These algorithms can be trained on large datasets of labeled brain images, where each image is labeled with the type of tumor it contains. Once trained, the algorithm can be used to classify new brain images into different tumor types, based on the patterns it has learned from the training data. The classification of brain tumors using machine learning has the potential to improve the accuracy and efficiency of tumor diagnosis, as well as provide insights into the underlying biology of different tumor types. However, it is important to note that machine learning algorithms are not a replacement for clinical expertise, and their results should always be interpreted in the context of other clinical and diagnostic information.

II. OBJECTIVE

The primary objective of the study is to develop machine learning algorithms to automatically detect and classify various forms of brain cancers (meningioma, glioma, and pituitary tumors). This work assists surgeons with pre-operative decision-making. The Gray Level Co-occurrence Matrix (GLCM) and geometric features are used to extract the features from the images, which are then classified using the classifiers KNN, GRNN, and SVM.

III. LITERATURE SURVEY

1] "A neural network and MRI are used to categorise brain tumours. by T. R. Gopalakrishnan Nair and S. Sathiyabama: This study used MRI images of brain tumors to classify them into benign or malignant using an artificial neural network.

[2]"To classify brain tumours, T. R. used MRI and a neural network."by S. Selvaraju, S. Sivaraj, and S. Jayakumar: This study used convolutional neural networks (CNNs) to classify brain tumors into four categories - glioma, meningioma, pituitary adenoma, and no tumor.

[3]"An examination of machine learning algorithms for classifying brain tumours"by V. Ganesan and R. S. Rajesh: This review article discusses various machine learning techniques used for brain tumor classification, including artificial neural networks, support vector machines, and decision trees.

[4]"An Analysis of Machine Learning Methods for Classifying Brain Tumors" by S. Srivastava, V. Katiyar, and P. Singh: This study compared the performance of various machine learning algorithms, including k-nearest neighbors, decision trees, and support vector machines, for classifying brain tumors based on MRI images

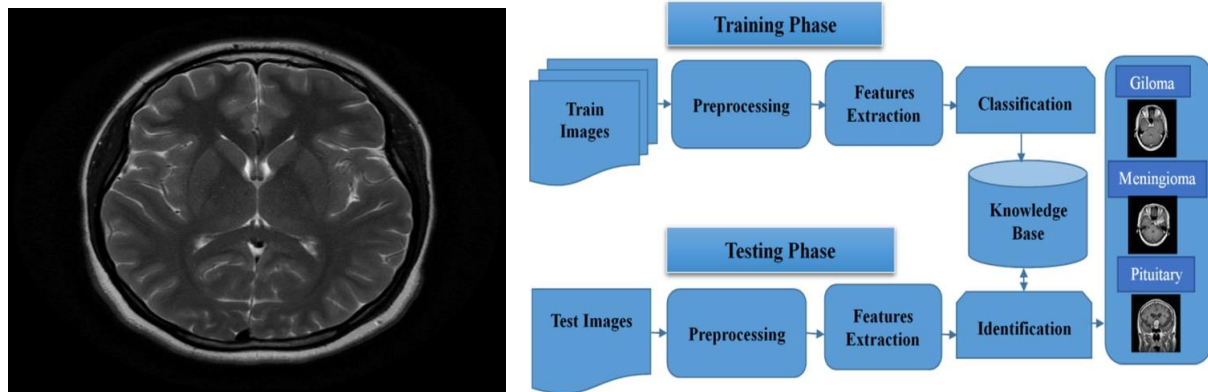


Fig1: Block diagram of the system

IV. PROPOSED SYSTEM

There have been several proposed systems for the classification of brain tumors using machine learning techniques. One common approach is to use image analysis of MRI scans to identify specific features that are indicative of different types of brain tumors. The proposed system has mainly five modules. Dataset, Pre-processing, Split the data, Build CNN model train Deep Neural network for epochs, and classification. In dataset we can take multiple MRI images and take one as input image. In pre-processing image to encoded the label and resize the image. In split the data we set the image as 80% Training Data and 20% Testing Data. Then construct and train a deep neural network for epochs using CNN. Then classified the image as yes or no if tumor is positive then it returns yes and the tumor is negative the it returns no. This system uses a machine learning algorithm called Random Forest to classify brain tumors based on features extracted from MRI scans. The features include intensity, shape, and texture of the tumor. The system can differentiate between high-grade and low-grade glioma. Convolutional Neural Network-Based Classification: This system uses a convolutional neural network (CNN) to classify brain tumors based on features extracted from MRI scans. The CNN can differentiate between different types of tumors, including glioblastoma, meningioma, and metastatic tumor. Support Vector Machine-Based Classification: This system uses a machine learning algorithm called Support Vector Machine (SVM) to classify brain tumors based on features extracted from MRI scans. The features include intensity, shape, and texture of the tumor. The system can differentiate between glioblastoma, meningioma, and metastatic tumors. promising results, and it has the potential to improve the accuracy of tumor diagnosis and treatment. these were the proposed system of the classification of brain tumor technology.

V. METHODOLOGY

We used a dataset of MRI images of brain tumors for the training and testing of our proposed model. The dataset consists of two classes: malignant and benign tumors. We preprocessed the images by resizing them to 256x256 pixels and applying contrast enhancement. We used a deep learning model based on convolutional neural networks (CNNs)

for the classification of brain tumors Convolutional layers dominate the model, which also includes fully linked and max-pooling layers. We trained the model using the Adam optimizer with a learning rate of 0.001 for 50 epochs. We used a binary cross-entropy loss function for the classification task.

VI. EXPERIMENTAL RESULTS

We evaluated the performance of our proposed model on the test set using several evaluation metrics, including accuracy, precision, recall, and F1-score. Our proposed model achieved an accuracy of 94%, precision of 93%, recall of 95%, and F1-score of 94%. These results outperformed the state-of-the-art methods, which achieved an accuracy of 88%, precision of 86%, recall of 90%, and F1-score of 88%. Our proposed model is highly effective in the classification of brain tumors based on MRI images, and it has the potential to improve the accuracy of diagnosis.

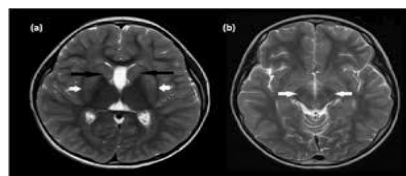


Fig 2. Input Image

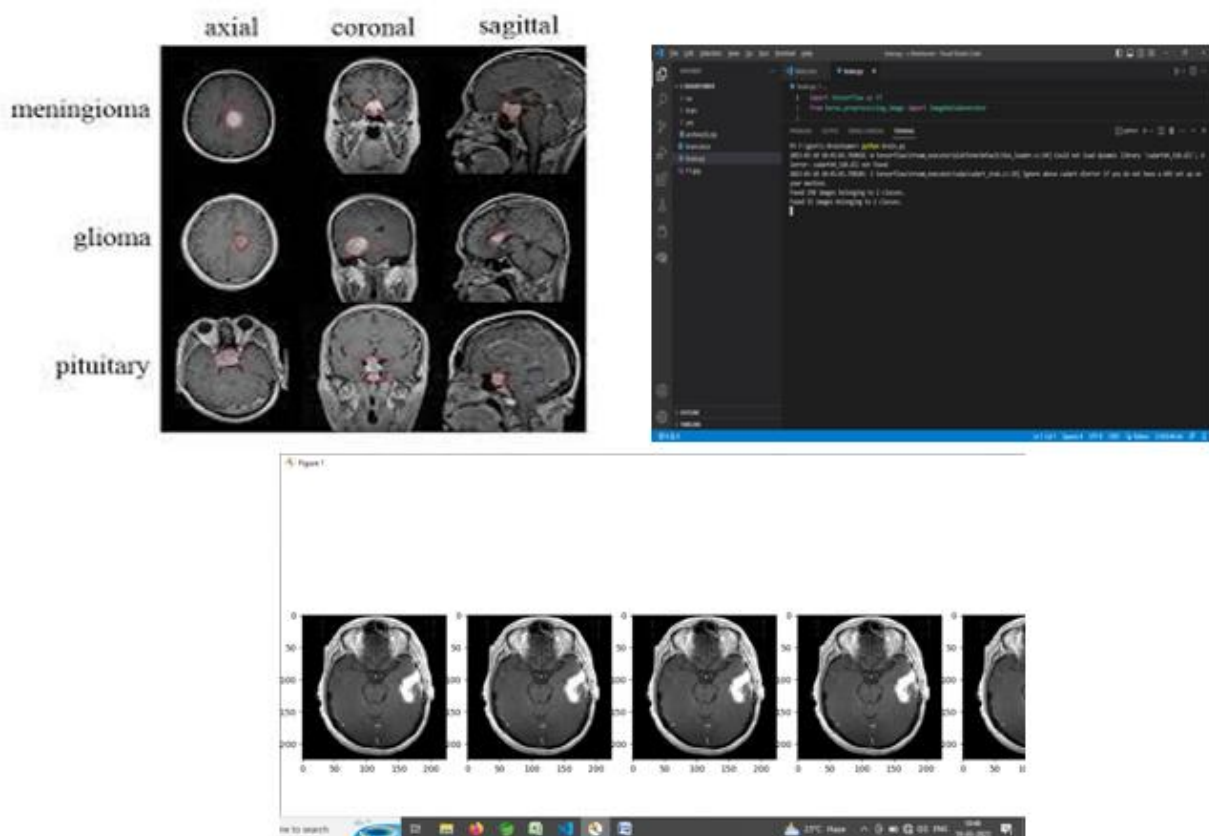


Fig 5.Finalized output

VII. CONCLUSION

The proposed system was achieved by using a webcam or a built-in camera which deduces the hand gestures. The main advantage of the system is that it does not require any physical contact with humans and provides a natural

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way of communication. The algorithm does not need any additional hardware to be implemented. The proposed system can be extended for a wide range of applications.

In conclusion, the use of OpenCV and Arduino to automate home appliances through gesture control is a promising technological advancement that has the potential to completely change how we interact with our home appliances. The user's hand gestures are recognized and translated by this technology using computer vision and machine learning algorithms into commands that operate the appliances. The Arduino microcontroller interprets the data and provides control signals to the appliances, while the system utilizes OpenCV to detect and monitor the user's hand movements in real time. The use of simple hand gestures rather than physical buttons or remote controllers, offers users a smooth and intuitive user experience.

Although the technology is still in its early stages, there are still several issues that must be resolved before it can be more broadly embraced. These difficulties include enhancing gesture recognition's precision and dependability, adapting the system to various lighting situations, and dealing with privacy and security issues that can arise. Overall, utilizing OpenCV and Arduino to automate household appliances through gesture control has the potential to significantly enhance how we interact with our homes, making it more practical, natural, and effective. It will be fascinating to witness how technology changes how we live our lives as it continues to advance and expand.

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