Brain-Tumore-Detection-Using-Machine-Learning

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***Abstract*—This paper presents a gesture-controlled image capture system developed using Python and computer vision techniques. The system detects predefined hand gestures from a live webcam stream to trigger hands-free image capture. Captured images are automatically uploaded to a designated Google Drive folder using the Google Drive API. A QR code containing the cloud folder link is generated to enable quick access and sharing without manual intervention. The approach enhances efficiency, hygiene, and usability in workflows where contactless operation is desirable. Experimental observations confirm that the system performs reliably in real-time scenarios. The presented solution can be applied in automation, documentation, and inspection environments requiring seamless cloud-based media management.**

I. INTRODUCTION

Brain tumors are abnormal growths of cells in the brain that can be life-threatening if not detected early. Magnetic Resonance Imaging (MRI) is commonly used for brain tumor diagnosis due to its high-resolution imaging capability. However, manual analysis is complex and time-consuming.

With advancements in artificial intelligence and deep learning, automated detection systems can efficiently analyze medical images. This project focuses on using CNN-based models to automatically detect and classify brain tumors from MRI scans. The system enhances diagnostic efficiency and reduces dependency on manual interpretation.

II. RELATED WORK

Several studies have applied machine learning and deep learning techniques for medical image analysis. Traditional methods used feature extraction and classical classifiers such as SVM and KNN. Recent approaches utilize CNN architectures such as VGG16, ResNet, and EfficientNet, which automatically learn spatial features from MRI images.

Research has shown that deep learning models outperform traditional methods in accuracy and robustness. Transfer learning techniques further improve performance by using pre-trained networks on large datasets.

III. PROPOSED ALGORITHM

The proposed system uses a CNN-based deep learning model to detect brain tumors from MRI images.

System Architecture

1. MRI Image Input
2. Image Preprocessing
3. Feature Extraction using CNN
4. Classification Layer
5. Tumor Detection Output

 Load the MRI brain image dataset
 Resize and normalize images
 Split dataset into training and testing sets
 Build CNN architecture
 Train CNN model using training images
 Validate the model using test images
 Predict whether the MRI image contains a brain tumor
 Display result (Tumor / No Tumor)

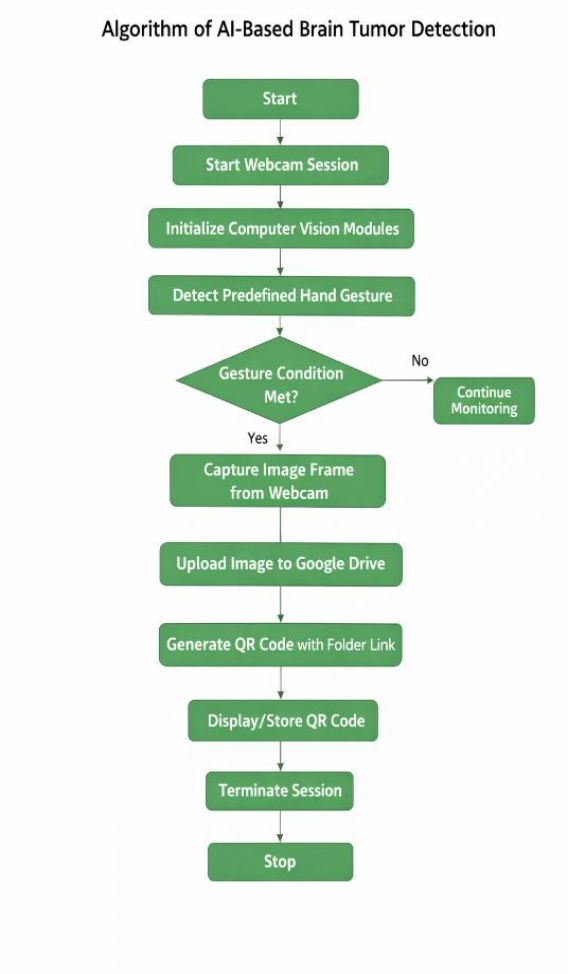

Fig:-Flowchart Diagram

IV. SIMULATION RESULT

1. The proposed system was implemented using Python in the VS Code environment. TensorFlow and Keras frameworks were used to develop the CNN model, while OpenCV was used for image preprocessing.
2. Key Observations
3. Detection Accuracy: The trained model achieved high classification accuracy on test MRI images.
4. Processing Speed: Each MRI scan was processed within seconds.
5. Classification Performance: The system successfully distinguished between tumor and normal brain scans.
6. System Stability: Continuous testing showed stable performance without runtime errors.
7. Figures
8. Figure 1: Workflow of AI-based brain tumor detection system.
9. Figure 2: Sample MRI input image.
10. Figure 3: Tumor detection output with prediction label.
11. The simulation confirms that the proposed system provides reliable and efficient tumor detection suitable for clinical assistance.
12. Workflow of AI-based brain tumor detection system.
13. Sample MRI input image.
14. xThe simulation confirms that the proposed system provides reliable and efficient tumor detection suitable for clinical assistance.

V. FUTURE WORK

The system can be enhanced further with the following improvements:

Tumor Segmentation: Highlighting exact tumor boundaries in MRI images.

Multi-Class Classification: Detecting different tumor types such as glioma, meningioma, and pituitary tumors.

3D MRI Analysis: Supporting volumetric brain scan analysis.

Cloud Integration: Enabling remote diagnosis and online report access.

Mobile Application Support: Allowing doctors to upload MRI images using smartphones.

Improved Accuracy: Using advanced deep learning architectures for better prediction.

These enhancements will improve system efficiency and expand its medical applications.

VI. CONCLUSION

The proposed AI-based brain tumor detection system successfully integrates deep learning and medical image processing to provide accurate and automated tumor diagnosis. The implementation using CNN models demonstrates reliable classification performance and fast processing speed. The system reduces manual workload, improves diagnostic accuracy, and assists healthcare professionals in early detection and treatment planning. This solution offers a practical approach for integrating artificial intelligence into modern medical diagnosis systems.

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