

AUTOMATED BRAIN TUMOR DIAGNOSIS USING AI

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Abstract :Detecting brain tumors early is very important because it helps doctors to treat patients more effectively. Usually, radiologists examine MRI scans manually, but this takes a lot of time and can sometimes lead to mistakes. To solve this problem, our project uses a deep learning model that automatically checks MRI images and tells whether a tumor is present or not. This model uses Convolutional Neural Networks (CNNs), a type of artificial intelligence, to analyse the images with high accuracy. Since the system runs on a server, it can quickly process many MRI scans at once, making the diagnosis faster and reducing the workload for doctors. This helps improve the accuracy and efficiency of brain tumor detection.

1. INTRODUCTION

A brain tumor is an abnormal growth of cells in the brain that can disrupt its normal functions. If left untreated, it can cause serious neurological problems and even become life-threatening. Early detection is crucial because it increases the chances of effective treatment and better patient outcomes. Currently, radiologists manually examine MRI scans to identify tumors. However, this method has several challenges—it is time-consuming, requires highly skilled doctors, and can sometimes lead to errors due to fatigue or oversight. With the growing number of MRI scans conducted daily, radiologists often struggle to keep up, leading to delays in diagnosis and treatment.

To overcome these issues, artificial intelligence (AI) is being used in medical imaging. AI-driven deep learning models, especially Convolutional Neural Networks (CNNs), have shown great accuracy in detecting medical abnormalities. This project introduces a server-based AI system that automatically analyses MRI images and classifies them as either "Tumor Present" or "Tumor Absent." By automating this process, the system reduces human dependency, speeds up diagnosis, and improves accuracy. Additionally, since it operates on a server, it can handle large volumes of MRI scans efficiently, making it a scalable and reliable solution for brain tumor detection[1-27]

2. LITERATURE SURVEY

The use of Convolutional Neural Networks (CNNs) for detecting brain tumors in MRI images. Theresearchers,[1] followed astructured approach involving preprocessing, feature extraction, and classification. The study highlights the effectiveness of CNNs in tumor classification but also points out certain limitations, such as small dataset size and high computational requirements, which make real-time implementation challenging. Despite these drawbacks, the model achieved over 95% accuracy, proving CNNs to be a reliable method for tumor detection.

Another paper explores different optimization techniques for CNNs to enhance the segmentation of brain tumors.[2] The study experimented with various CNN architectures, fine-tuning their hyper parameters to achieve the best results. While the optimized model performed well, it had some limitations, including over fitting and a lack of consideration for real-world noisy MRI scans, which could affect its reliability. However, the proposed model showed promising results, achieving up to 98% accuracy in segmentation tasks.

The research paper,[3] presents an automated tumor detection system using machine learning techniques.Thestudy applies preprocessing, feature extraction (using Gray Level Co-occurrence Matrix – GLCM), and classification to MRI images. Two machine learning classifiers, Multi-Layer Perceptron (MLP) and Naïve Bayes, were used for tumor classification. The study acknowledges some limitations, particularly the small dataset size and the lower accuracy of the

Naïve Bayes classifier compared to deep learning methods. Nevertheless, the MLP classifier achieved an accuracy of 98.6%, making it a strong candidate for automated tumor detection.

Another significant study,[4]investigates the application of CNNs combined with machine learning classifiers for brain tumor detection. A key approach in this study was performing feature extraction before applying CNN, which helped improve accuracy. Different classifiers such as Soft max, Radial Basis Function (RBF), and Decision Tree (DT) were evaluated for classification performance. The study notes a few challenges, including misclassification of fatty tissues as tumors. The results showed that the Soft max classifier achieved an accuracy of 98.67%, the RBF classifier 97.34%, and the Decision Tree classifier 94.92%. The researchers further proposed an improved method by combining clustering algorithms with CNN, which increased the accuracy to 99.12%.

These studies collectively emphasize the growing importance of CNNs and machine learning algorithms in brain tumor detection. While CNN-based models show high accuracy, challenges such as data availability, computational costs, and model reliability in real-world applications remain areas for further research.

3. PROBLEM STATEMENT

The traditional methods for brain tumor diagnosis depends heavily on the human analysis of MRI scans, which presents several challenges. First, the process is slow, as it requires radiologists to carefully analyse each scan before making a decision. This delay can be critical for patients who require urgent medical attention. Second, accuracy depends on the expertise of the radiologist, and human factors such as tiredness or workload can result in errors. Misdiagnosis or delayed diagnosis can negatively impact treatment outcomes. Third, the increasing volume of MRI scans being conducted daily makes it difficult for radiologists to keep up, leading to longer waiting times and pressurized healthcare professionals.

By implementing an AI-powered tumor detection system, these challenges can be effectively addressed. The system offers fast, automated, and highly accurate tumor detection, decreasing the need for human analysis by leveraging deep learning techniques, it ensures consistent and reliable results, enabling medical professionals to make quicker and well-informed decisions.

4. EXISTING SYSTEM

Brain tumor detection is mainly done through manual MRI scan analysis, where radiologists examine images to identify abnormalities. While AI-based methods like CNNs, SVMs, and Transfer Learning have been explored, they still face several challenges. False positives (detecting a tumor when none exists) and false negatives (failing to detect an actual tumor) are common issues, leading to misdiagnosis and incorrect treatments.

Additionally, dataset dependency remains a challenge, as many models are trained on small or imbalanced datasets, making them unreliable when applied to MRI scans from different medical institutions. Some approaches also lack effective feature extraction, reducing classification accuracy. Another concern is high computational requirements, as deep learning-based tumor detection often demands powerful GPUs, large memory, and advanced processing capabilities, making real-time medical deployment difficult.

5. PROPOSED SYSTEM

To overcome these challenges, this project introduces a server-based deep learning model that enhances tumor detection accuracy, feature extraction, and processing efficiency. Unlike previous models, it applies advanced CNN-based feature extraction, which helps in minimizing false positives and false negatives, ensuring more reliable classification. The system is trained on a larger and more diverse dataset, making it adaptable to different MRI scans and reducing dataset bias.

A user login page has also been integrated into the system, ensuring that only authorized users can access and upload MRI scans for analysis. Unlike traditional AI models that require high-end local hardware, this system runs on a dedicated server, allowing faster and scalable processing without the need for expensive computing resources. By incorporating improved feature extraction, enhanced dataset generalization, server-based processing, and user authentication,

this system provides a more accurate, secure, and efficient solution for automated brain tumor detection.

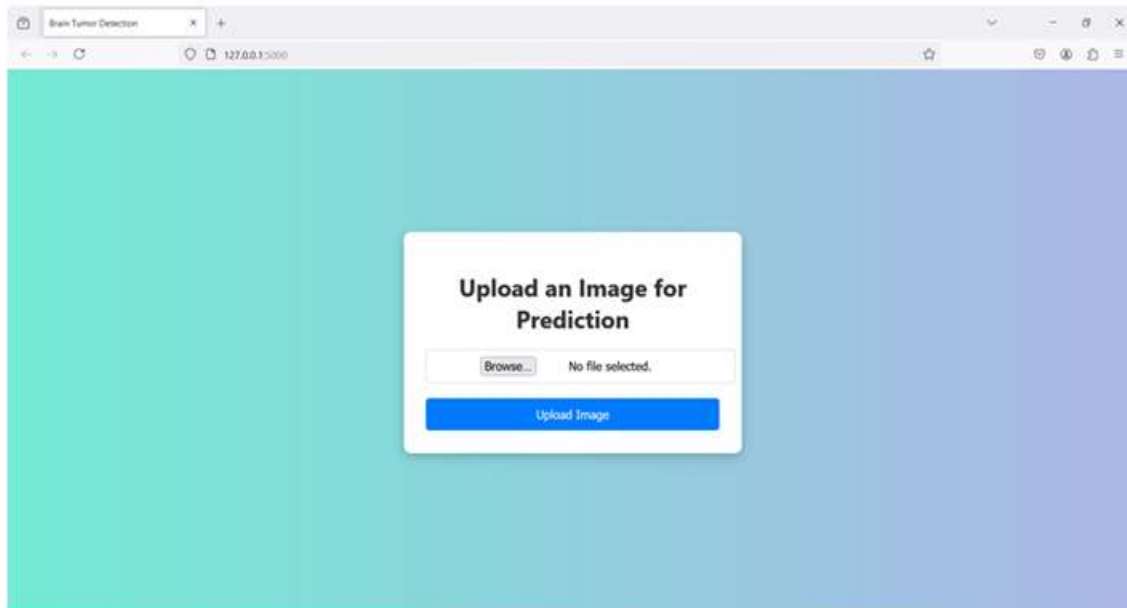
6. METHODOLOGY

The tumor detection system follows a structured step-by-step workflow to analyse MRI scans efficiently:

- 1. User Login:** The user must log in with valid credentials before accessing the system. This ensures secure access and prevents unauthorized usage.
- 2. MRI Image Upload:** After logging in, the user uploads an MRI scan to the server for analysis.
- 3. Preprocessing:** The system enhances the image by removing noise, normalizing contrast, and resizing for uniform processing.
- 4. Feature Extraction:** The CNN model extracts important patterns from the MRI scan to identify potential tumor regions.
- 5. Tumor Classification:** The deep learning model analyses the extracted features and classifies the scan as either "Tumor Present" or "Tumor Absent."
- 6. Result Display:** The system generates the final classification result, providing the user with a reliable diagnosis.

By integrating a secure login system, efficient image processing, and deep learning-based classification, this AI-powered server ensures fast, accurate, and structured tumor detection for medical professionals.

6.1. User Interface

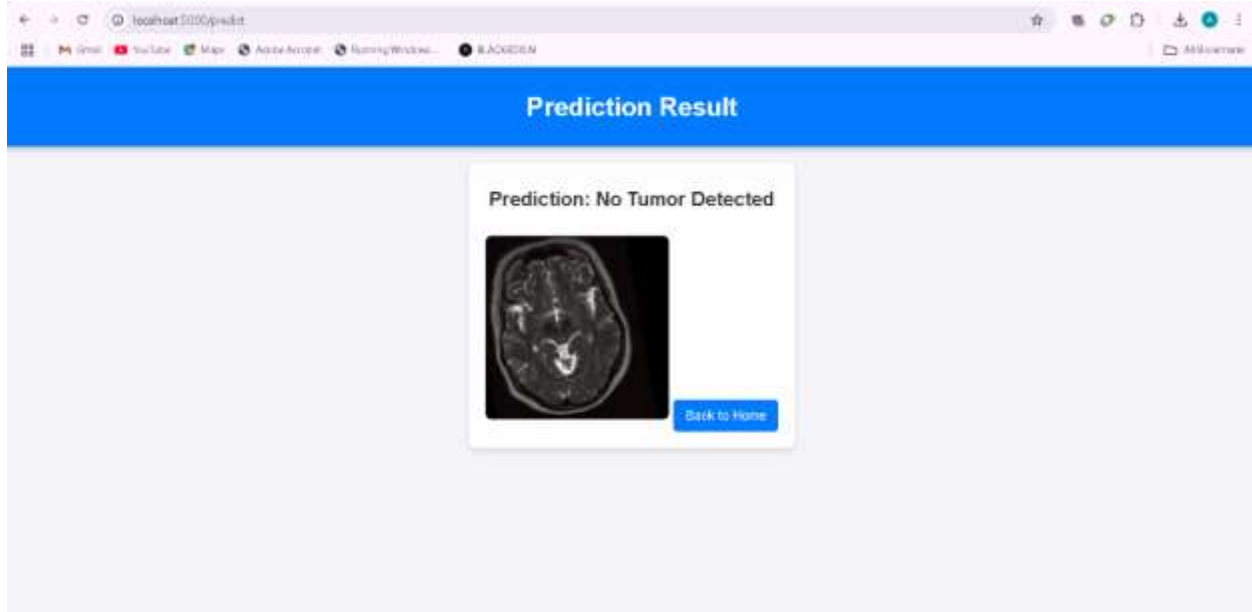
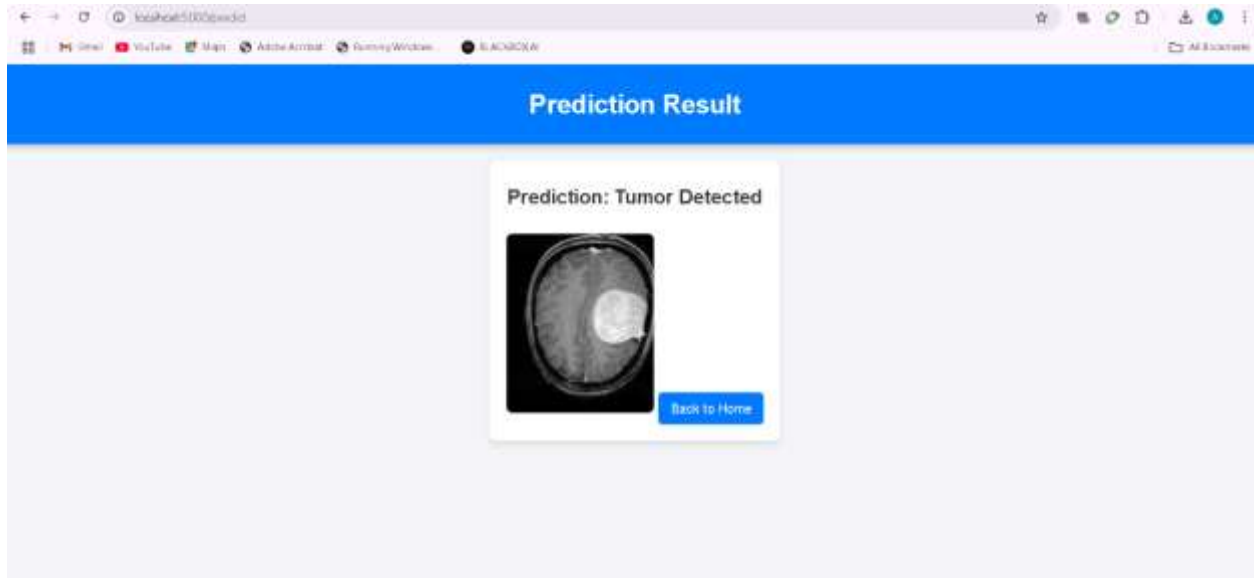


7. ADVANTAGES

The proposed AI-based brain tumor detection system provides several benefits over traditional methods. One major advantage is its ability to automate the tumor classification process, reducing the dependency on manual MRI scan analysis by radiologists. This significantly speeds up diagnosis and ensures faster decision-making in medical settings.

Additionally, the system is designed to work on a diverse range of MRI scans, improving its adaptability across different datasets. By implementing advanced CNN-based feature extraction, it enhances the accuracy of tumor detection, reducing false positives and false negatives. Since the model is server-based, multiple MRI scans can be processed efficiently without requiring high-end hardware on local machines. The inclusion of a user login system ensures secure access, making the system reliable for medical professionals.

8. RESULTS



9. CONCLUSION

This project introduces an AI-powered system that uses deep learning to automate brain tumor detection, making the diagnosis process faster and more efficient. By using Convolutional Neural Networks (CNNs), the system improves accuracy while reducing the burden on radiologists. Since it works through server-based processing, users can upload MRI scans and get quick results. Although the system currently focuses only on detecting whether a tumor is present or not, future improvements can enable it to identify tumor types, estimate size, and provide more detailed insights. With further advancements like real-time processing, offline functionality, and hospital database integration, this AI model can become a valuable tool in the medical field, helping doctors make quicker and more reliable diagnoses.

10. FUTURE WORK

To make the system even better, several improvements can be added in the future. First, we can improve the way MRI images are processed so that even low-quality or blurry scans give accurate results. Right now, the system only checks if a tumor is present or not, but in the future, it can be upgraded to identify the type of tumor (benign or malignant) and even estimate its size and severity.

We can also work on faster processing, so results are given instantly without delay. Right now, the system needs an internet connection to work, but in the future, we can develop an offline version so it can function without the internet. Connecting the system to hospital databases will also make it more useful for doctors, allowing them to store and retrieve patient reports easily.

Lastly, training the model with more MRI images, including rare cases, will improve its accuracy. Strengthening the security of user logins will also help protect patient data. With these improvements, the system will become more accurate, faster, and easier to use in real-world medical settings.

REFERENCES

1. H. Amin, M. Sharif, M. Yasmin, S. Lali, and J. Fernandes, "A Method for Brain Tumor Detection Using Shape-Based Feature Selection," *International Journal of Advanced Computer Science and Applications*, 2020
2. A. Swati, M. S. A. Kauser, Y. Ghai, J. Singh, and M. Vohra, "A Transfer Learning Approach for MRI-Based Brain Tumor Detection," *International Journal of Biomedical Imaging*, 2019.
3. P. Kumar, P. Kaur, and M. Kumar, "Brain Tumor Classification Using Convolutional Neural Networks," *IEEE Transactions on Medical Imaging*, 2021
4. Ramdas Vankdothu, Dr. Mohd Abdul Hameed, Husnah Fatima "A Brain Tumor Identification and Classification Using Deep Learning based on CNN-LSTM Method" *Computers and Electrical Engineering*, 101 (2022) 107960
5. Ramdas Vankdothu, Mohd Abdul Hameed "Adaptive features selection and EDNN based brain image recognition on the internet of medical things", *Computers and Electrical Engineering*, 103 (2022) 108338.
6. Ramdas Vankdothu, Mohd Abdul Hameed, Ayesha Ameen, Raheem, Unnisa "Brain image identification and classification on Internet of Medical Things in healthcare system using support value based deep neural network" *Computers and Electrical Engineering*, 102 (2022) 108196.
7. Ramdas Vankdothu, Mohd Abdul Hameed "Brain tumor segmentation of MR images using SVM and fuzzy classifier in machine learning" Measurement: Sensors Journal, Volume 24, 2022, 100440 .
8. Ramdas Vankdothu, Mohd Abdul Hameed "Brain tumor MRI images identification and classification based on the recurrent convolutional neural network" Measurement: Sensors Journal, Volume 24, 2022, 100412 .
9. Bhukya Madhu, M. Venu Gopala Chari, Ramdas Vankdothu, Arun Kumar Silivery, Veerender Aerranagula "Intrusion detection models for IOT networks via deep learning approaches" Measurement: Sensors Journal, Volume 25, 2022, 100641
10. Mohd Thousif Ahemad, Mohd Abdul Hameed, Ramdas Vankdothu "COVID-19

detection and classification for machine learning methods using human genomic data”
Measurement: Sensors Journal, Volume 24, 2022, 100537

11. S. Rakesh ^a, Nagaratna P. Hegde ^b, M. Venu Gopalachari ^c, D. Jayaram ^c, Bhukya Madhu ^d, Mohd Abdul Hameed ^a, Ramdas Vankdothu ^e, L.K. Suresh Kumar “Moving object detection using modified GMM based background subtraction” Measurement: Sensors Journal, Volume 30, 2023, 100898
12. Ramdas Vankdothu, Dr. Mohd Abdul Hameed, Husnah Fatima “Efficient Detection of Brain Tumor Using Unsupervised Modified Deep Belief Network in Big Data” Journal of Adv Research in Dynamical & Control Systems, Vol. 12, 2020.
13. Ramdas Vankdothu, Dr. Mohd Abdul Hameed, Husnah Fatima “Internet of Medical Things of Brain Image Recognition Algorithm and High Performance Computing by Convolutional Neural Network” International Journal of Advanced Science and Technology, Vol. 29, No. 6, (2020), pp. 2875 – 2881
14. Ramdas Vankdothu, Dr. Mohd Abdul Hameed, Husnah Fatima “Convolutional Neural Network-Based Brain Image Recognition Algorithm And High-Performance Computing”, Journal Of Critical Reviews, Vol 7, Issue 08, 2020 (Scopus Indexed)
15. Ramdas Vankdothu, Dr. Mohd Abdul Hameed “A Security Applicable with Deep Learning Algorithm for Big Data Analysis”, Test Engineering & Management Journal, January-February 2020
16. Ramdas Vankdothu, G. Shyama Chandra Prasad “A Study on Privacy Applicable Deep Learning Schemes for Big Data” Complexity International Journal, Volume 23, Issue 2, July-August 2019
17. Ramdas Vankdothu, Dr. Mohd Abdul Hameed, Husnah Fatima “Brain Image Recognition using Internet of Medical Things based Support Value based Adaptive Deep Neural Network” The International journal of analytical and experimental modal analysis, Volume XII, Issue IV, April/2020
18. Ramdas Vankdothu, Dr. Mohd Abdul Hameed, Husnah Fatima “Adaptive Features Selection and EDNN based Brain Image Recognition In Internet Of Medical Things” Journal of Engineering Sciences, Vol 11, Issue 4, April/ 2020 (UGC Care Journal)
19. Ramdas Vankdothu, Dr. Mohd Abdul Hameed “Implementation of a Privacy based

Deep Learning Algorithm for Big Data Analytics”, Complexity International Journal , Volume 24, Issue 01, Jan 2020

20. Ramdas Vankdothu, G. Shyama Chandra Prasad” A Survey On Big Data Analytics: Challenges, Open Research Issues and Tools” International Journal For Innovative Engineering and Management Research, Vol 08 Issue08, Aug 2019.
21. Vankdothu, R., Hameed, M.A. “An Effective Congestion and Interference Secure Routing Protocol for Internet of Things Applications in Wireless Sensor Network “ Wireless Personal Communication Journal 140, 143–161 (2025)
22. Vankdothu, R., Bhukya, H. & Bhukya, R.R. “Hybrid TDR-MI Based Wireless Sensor Network for Underground Water Pipeline Leakage Detection and Localization Using Pressure Residuals and Classifiers Wireless Personal Communications 139, 803–823 (2024).
23. Vankdothu, R., Cheng, X. “Energy Efficient TDMA and Secure Based MAC Protocol for WSN Using AQL Coding and ASGWI Clustering”. Wireless Personal Communications 136, 2125–2143 (2024)
24. Vankdothu, R., Hameed, M.A., Fatima, H. *et al.* Multicast Scaling in Heterogeneous Wireless Sensor Networks for Security and Time Efficiency. Wireless Personal Communications (2025).
25. Vankdothu, R., Hameed, M.A., Fatima, H. *et al.* Multicast Scaling in Heterogeneous Wireless Sensor Networks for Security and Time Efficiency. Wireless Personal Communications (2025)
26. Ramdas Vankdothu, Mohd Abdul Hameed” Brain MRI Images for Tumor Detection using Storage Optimization Technique”, Mobile Radio Communications and 5G Networks, Lecture Notes in Networks and Systems, 425-437, Springer .
27. Bandi Krishna , Ramdas Vankdothu , Varun Revuri and B. Prashanth” A brain tumor identification using convolution neural network in the deep learning” MATEC Web of Conferences 392, 01131 (2024) ,<https://doi.org/10.1051/mateconf/202439201131> ICMED 2024



BIBLIOGRAPHY

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